Why do banks securitize assets? ♠♥

Alfredo Martín-Oliver
(Banco de España)

Jesús Saurina
(Banco de España)

November 2007

Abstract

Recent turbulences in financial markets underline the importance of understanding asset securitization, a process that allows banks to fund their credit growth and, potentially, to shed off credit risk and to arbitrage capital requirements. Similarly, recent turmoil has shown that the originate-to-distribute model might contain some perverse incentives for banks to lend and quickly package those loans and transmit the credit risk to third party investors. Our paper uses data of a country where securitization has been expanding at an exponential rate since the beginning of this decade and looks into the determinants of asset securitization for banks and the risks of the originate-to-distribute model. We distinguish between asset-backed securities (ABS) and covered bonds (with significant differences in terms of risk for the investor) so as to assess the relative importance of liquidity needs, risk profile and regulatory capital position of the bank in the securitization process The study is complemented with an analysis of the determinants of the amount securitized and with a deeper insight of the reasons to securitize depending on the type of asset backing the operation (residential mortgage backed securities or RMBS versus securities backed by loans to small and medium sized companies)

JEL: G21, G28

Key words: securitization, liquidity, covered bonds, ABS, credit risk transfer, capital arbitrage

♠ This paper is the sole responsibility of its authors and the views represented here do not necessarily reflect those of the Banco de España. We thank the very valuable comments of Eva Catarineu. Any remaining errors are entirely the authors' own responsibility.
♥ Address for correspondence: Jesús Saurina; C/Alcalá 48, 28014 Madrid, Spain. Tlf: + 34 91 338 5080; e-mail: jsaurina@bde.es.

1. Introduction

Recent turmoil in financial markets has shown the importance of asset securitization for the liquidity provision of banks, the significant differences across securitization products (in terms of risk, complexity, re-pricing, etc.) and the different strategies and risks that banks follow (i.e. the originate-to-distribute model versus the buy-and-hold model). The literature has focused up till now on security design (Glaeser and Kallal (1997), Riddiough (1997), pricing (Boudoukh et al (1997)) or the role that securitization plays in intermediation models (Pennacchi (1988), DeMarzo (2005)). However, despite the interest of these issues and the significant increase in the importance of securitization for banking activity, there is scant empirical evidence on why banks securitize assets.

Securitization is, probably, one of the most important financial innovations that occurred in the last part of the previous century. Pennacchi (1988) pointed out that securitization was going to be a fundamental change in the commercial banking business. It allows banks and also non-financial firms to obtain liquidity from assets that, otherwise, cannot be sold in liquid markets. For instance, banks can issue a covered bond referenced to a mortgage or (more commonly) to a portfolio of mortgages instead of holding them in the balance sheet for their whole maturity (i.e. during 30 years). Alternatively, banks could also sell the mortgage or a part of the whole mortgage portfolio to a special purpose vehicle (SPV) that, at the same time, funds the transaction selling mortgage-based bonds (i.e. residential mortgage backed securities or RMBS) to institutional or retail investors. The proceeds of the mortgages are used to serve the interest of those RMBS. Through the latter procedure, the bank might also get rid of the credit risk embedded in the mortgage, depending on whether or not it provides a credit enhancement to the SPV in which the bank bounds itself to assume a certain level of first losses in the mortgages securitized.

Covered bonds and asset-backed securities (ABS) have a different level of risk for investors buying them[1]. That explains why they have significantly different risk premiums. During recent turbulences covered bond spreads have increased around 10 basis points on

[1] A discussion of the differences between covered bonds and ABS is in Packer, Stever and Upper (2007).

average in the secondary market in Europe, while ABS spreads have come up more than 50 basis points. The current loss estimates for some collateralized debt obligation (CDO) tranches (i.e. mezzanine and equity) are far higher. Therefore there are significant differences across securitization products. Similarly, for the issuers of those products covered bonds are used only to refinance operations while ABS might also allow for risk reduction and regulatory capital arbitrage.

Therefore, securitization allows banks to transform into liquidity assets that otherwise would be stuck on the balance sheet until their maturity. With the new funds raised, they can increase lending. At the same time, risk transfer has increased significantly thanks to securitization. In fact, some banks are becoming more and more mere originators of loans and distributors of their risk: soon after the loan has been granted, it is packaged into a bundle of other mortgages, given a risk assessment by a rating agency and sold out through ABS. Securitization is, thus, shaping a new type of banking, one where relationship with the costumer is fading in favor of a transaction-based bank where its main proceeds come from the fees they earn originating and packaging loans.

This "originate to distribute" model is not free of risks as the recent turmoil in financial markets has shown. There are two main problems. The first one is the incentives that the lender has to properly screen and monitor borrowers, since it is going to get rid off the credit risk quickly. As Gorton and Pennacchi (1995) pointed out earlier, a bank selling loans must continue to convince loan buyers of its commitment to evaluate the credit quality of borrowers by maintaining a portion of the loan's risk. That makes asset securitization incentive compatible. The fact that some loan originators might have shed off all the credit risk in a loan securitization made the lack of confidence from investors in those ABS an accident to happen. The second problem is an excessive reliance on the wholesale market to fund lending growth (as in Northern Rock). The fact that the alternative "buy and hold" model (i.e. the bank loan is kept in the balance sheet until maturity) has been eroded during the last years makes even more compelling to understand why do banks securitize.

Banks need to hold a minimum level of regulatory capital. Up till now, under Basel I framework, that capital was a very rough function of the level of risk held in their assets. For instance, a loan to a firm needed 8% of capital, no matters what the risk of the firm was. That is one of the main reasons why banking supervisors engaged in 1999 in a thorough revision of the current capital regulatory framework. That process ended up in the so-called Basel II framework[2], in which the capital requirements of banks will be better aligned with the risk profile of their portfolios. In this way, they will be obliged to hold a higher level of capital for loans granted to high-risk borrowers. However, thanks to securitization it is possible that banks sell a part of those loans (in particular that of better quality) and with the proceeds, lend to riskier borrowers so as to increase the expected returns of their portfolio with no change in capital requirements. This would be in line with the predictions of Greenbaum and Thakor (1987) that better quality assets will be sold (securitized) and poorer quality assets will be funded with deposits under asymmetric information and without government intervention. Pennacchi (1988) considers bank regulation as one of the incentives to securitize. Calomiris and Mason (2004) and Ambrose, Lacour-Little and Sanders (2005) show that securitization of credit cards and mortgages, respectively, responds to regulatory capital arbitrage. Similarly, Thomas (1999) finds that securitization alleviates the regulatory burden.

Despite the growing importance of securitization for financial markets, there is almost no empirical paper addressing the reasons why banks want to securitize assets[3]. We do not know whether the liquidity motive is the dominant one or, on the other hand, it is the risk transfer or the capital arbitrage. It is clear that, depending on the reasons why banks securitize, the challenges are quite different for investors, rating agencies, and banking and security regulators.

[2] See Jackson (1999) and Jones (2000) for a detailed explanation of the role played by securitization in fostering Basel II review process.

[3] Dionne and Harchaoui (2003), Bannier and Hänsel (2006) and Uzun and Webb (2006) are exceptions. Donahoo and Shaffer (1991) investigate the relationship between capital requirements and securitization. A good explanation of the underlying rationale for securitization is in Cumming (1987). Financial stability issues are addressed in Allen and Carletti (2006) or in Hänsel and Krahnen (2007).

The objective of this paper is to shed some light on the determinants of banking securitization. We focus on Spain, a country where banks have resorted to securitization in an increasing way during the last years. In fact, Spain is a major issuer of ABS in Europe, only second to British banks and it is also the second issuer of covered bonds, only surpassed by German Pfandbriefe. Currently, more than 25% of the bank mortgage portfolios have been securitized, either directly or through covered bonds. The Spanish case is also interesting since it allows us to distinguish between these two very different products, covered bonds and ABS (and also the different types of assets backing the latter). In the case of covered bonds, liquidity is the only reason to securitize a bundle of mortgages, since the risk or the capital requirements do not change with the issue (i.e. the mortgages backing the covered bond remain in the balance sheet). However, in the case of the ABS banks might also securitize so as to transfer risk and/or arbitrage capital requirements.

Our results show that the main driver of loan securitization was liquidity needs. Those banks with more rapid credit growth, less interbank funding and a higher loan-deposit gap have a higher probability of both, issuing covered bonds and resorting to the asset-backed securitization, including that of mortgages. The risk profile of the bank and their solvency level do not impact the probability or the amount of assets securitized. Thus, Spanish banks have been securitizing assets only to fund their lending growth and not because their risk level was too high or their solvency ratios too low. However, when we descend to different classes of assets backing the securitization (e.g. loans to small and medium sized firms), capital arbitrage becomes more important.

The rest of the paper is organized as follows. Section 2 deals with the hypothesis we want to test and the variables used. Section 3 presents the regression results while section 4 shows some extensions of the basic model. Finally, section 5 concludes.

2. Variables, models and hypothesis to be tested

2.1. Framework

We want to test whether liquidity, risk transfer or capital needs are the drivers of the securitization process at the bank level. We have two different securitization instruments: covered bonds (the so-called *cédulas hipotecarias*) and asset-backed securities (ABS). A *cedula hipotecaria* is a security that has a dual nature of protection. It is issued by a bank which is liable for its repayment but, at the same time, it is also backed by the whole eligible mortgage portfolio of the bank. *Cédulas* promise a certain interest rate and, in case of difficulties, their holders can resort to the collateralized loans to recover the amount of the bond invested. In principle, those *cédulas* are a liability of the bank that issues them and, therefore, they are registered in the liability side of the balance sheet. In essence, a *cédula hipotecaria* is a covered bond through which the bank gets new funding. The assets backing the *cédulas* (i.e. the mortgage portfolio) remain in the balance sheet and, therefore, there is no risk shedding or capital relieve. Recently banks have started to securitize those *cédulas*. Although this is a very interesting development, we do not consider it in the paper since we focus on the determinants that a bank issue *cédulas* versus ABS. Usually, although not always, the securitization of those *cédulas* (through the so-called *cédulas singulares*) is made jointly by a group of small regional banks (savings banks usually) so as to obtain a better rating in the issue because of diversification. Therefore, we only consider the fact of issuing the *cédulas* and not their securitization to avoid double-counting (i.e. once as an issue of a *cédula* and twice as a securitization of that *cédula*).

The other way to securitize assets is through selling a portfolio of loans (either mortgages, consumer loans or loans to small and medium sized companies) to a special purpose vehicle (SPV or *fondo de titulización*) that, at the same time, issues asset-backed securities (Asset backed securities or *bonos de titulización*) to fund the transaction. Those bonds are bought by investors, for instance, via conduits or SIVs (*Special Investment Vehicles*). Many SIVs are currently under stress since they used to fund their purchases of ABS issuing commercial paper and that market is almost closed since August 2007 (i.e. investors do not trust the asset quality of SIVs as they have been buying tranches of CDOs that might contain US subprime loans, an increasingly riskier asset class). Usually, the originating bank is also the servicer of the loan portfolio (i.e. receiving monthly payment,

dealing with arrears and so on), and borrowers do not even know whether their loans have been securitized or not. Through this procedure, banks can transfer credit risk out of their balance sheets and, at the same time, alleviate capital requirements. The transfer of risk might not exist if the bank provides a credit enhancement to the SPV, consisting on a compromise to absorb a certain level of first losses in the loan portfolio that is object of the transaction. According to International Financial Reporting Standards (IFRS), the new accounting rules in force in Spain since 2005, if there is no risk transfer, the assets securitized should remain in the balance sheet.

Regulation has played a key role in the development of this market. Although it was possible for banks to issue covered bonds since 1981 (Law 2/1981 of mortgage market regulation), it was not until 1992 (Law 19/1992 of securitization vehicles) that SPV to securitize mortgages were authorized. The SPV to securitize other assets than mortgages were set out in 1998 (Royal Decree 926/1998). Finally, synthetic securitization has been only possible since 2003 (Law 62/2003)[4]. Banks only started to issue significant amounts of these assets after the main overall securitization framework was developed. That is why our analysis focuses on the period 1999-2006. We cover both commercial and savings banks as well as credit cooperatives, since the three types of banks have been actives in the securitization market[5].

Table 1 presents the evolution of the number of commercial banks, savings banks and credit cooperatives that have a positive balance of covered bonds in their liability or have issued ABS, as well as the total stock of securitized assets. Table 1 shows that at the beginning of our sample period only savings banks used the covered bonds as a mechanism to obtain liquidity (one third of the total), whereas ABS were also used by commercial banks (14 commercial banks out of 72 with respect to 21 savings banks out of 48). Both commercial and savings banks have increased the use of securitization almost

[4] Nonetheless, there has no been synthetic securitization because the Bank of Spain has not established their capital and accounting treatment. The new regulation of 2007 explicitly develops the treatment of synthetic securitizations, so it is expected that their use becomes general in the future.

[5] The three types of banks behave differently as Delgado, Salas and Saurina (2007) show.

exponentially, but the increase in the later has been more important, since in 2006 almost all savings banks had covered bonds, and the number of them which issued ABS had practically doubled with respect to 1999. On the other hand, in commercial banks the use of covered bonds has had a higher increase than that of ABS and in 2006 both forms of obtaining liquidity were used by the same number of banks. Finally, the number of credit cooperatives that have issued ABS has risen from 3 in 1999 to 31 in 2006, whereas covered bonds are only used by 3 cooperative banks at the end of the period.

The total stock of securitized assets has increased sixteen-fold in the total sample of banks. The balance of covered bonds grew at a higher rate than that of ABS, so that in 2006 the balance of the former was 95bn (126bn) of euros for commercial (savings) banks with respect to a stock of 66bn (54bn) of the later. Note that it is also of important use in large credit cooperatives, since even with the small number of them that issued covered bonds with respect to those that issued ABS (3 versus 31), the total balance of the first represents half of the outstanding balance of the second.

2.2 Database

The database for the empirical analysis refers to the population of Spanish commercial banks, savings banks and credit cooperatives in the period 1999 to 2006. The raw data comes from the confidential statements that banks are obliged to provide to Banco de España in order to fulfill their regulatory duties (i.e. regular reporting of balance sheet, profit and loss as well as solvency requirements) and from the brochures of each securitization that banks are obliged to send to the Spanish financial market regulator (CNMV). Both sources of information put together make up a unique database that allows us to study the determinants of the securitization of assets using variables that reflect the risk profile, solvency level, and liquidity needs of the banks, as well as controlling for other features that may influence in the decision of securitization. Foreign branches have been excluded from the analysis for their almost nil presence in the Spanish retail banking market. We have also eliminated banks for which we did not have information of all the variables used in the analysis (in all cases, very small banks).

Dependent variables

The main purpose of the paper is to explain the patterns and determinants of securitization in the Spanish banks. In our analysis, we relate an indicator of whether a bank issues securitized bonds with variables that capture the risk and liquidity profile of the bank in order to identify which of them govern the decision of securitizing. Therefore, our dependent variable will be constructed from the information of the stock of covered bonds and other securitizations contained in the balance sheet, as well as from the data contained in the brochures published by the CNMV at every issue of ABS (mainly to disentangle the type of asset backing the securitization). If the risk and liquidity profile of a bank in a certain year make the benefits of securitizing outweigh the costs brought about, then the stock of securitized assets observed in the balance sheet will become positive.

Our dependent variable is twofold because we will analyse the two different possibilities of bank securitization. On the one hand, the issue of covered bonds, where the endogenous variable (*COVEREDBOND*) is a dummy worth 1 if the bank has issued a covered bond during the year, and zero otherwise. On the other hand, the securitization with potential capital arbitrage and risk transfer, where the dependent variable (*ABS*) is a dummy worth 1 if the bank has issued ABS during the year, and zero otherwise. This separation allows to differentiate whether the driving forces of securitization are reduced to the need of liquidity (the only reason to issue covered bonds) or they also include incentives to capital arbitrage or risk transfer (ABS). As mentioned, Table 1 contains the information of our dependent variables: for both Covered Bonds and ABS, it shows how many banks do securitize (and therefore, *COVEREDBOND* or *ABS* would take the value of 1) out of the total sample of banks in each year.

Explanatory variables

The explanatory variables are banks' characteristics. The first set tries to proxy for liquidity needs. We include dummy variables that account for the degree of credit growth

(*HIGHGROWTH, MEDIUMGROWTH, LOWGROWTH*). They are defined by ranking the rate of growth in total loans of each bank every year and then classifying them in three groups. We use this variable instead of the rate of growth directly since we want to specifically differentiate the degree of liquidity needs (even during periods of slower loan growth there will be banks that are expanding at a larger path their loan portfolio and, therefore, they might have more liquidity needs). We also control for the structural relationship between loans and deposits, the two main asset and liability side items. Traditionally, retail deposits are used to fund loans to households and firms. If a bank is expanding significantly their loans, its traditional retail base might not be enough and it will have to resort to other sources of funding (interbank market, securitization, etc.). Thus, we include *LOAN/DEP*, the quotient between loans and deposits, as well as *INTERBANK*, the relative weight of the interbank liabilities, as proxies of the liquidity needs of the bank.

The second set of variables has to do with the risk profile of the bank. We want to test whether riskier banks are more or less inclined to securitize assets. We include the total non-performing loan ratio of the bank (*NPLTOTAL*) as well as the non-performing mortgage ratio of the bank (*NPLMORTGAGES*) to proxy that risk profile. The latter variable is included since a significant part of the securitizations are mortgage-backed. We also include a measure of the concentration of the loan portfolio (*HHIPROVINCE*), the Herfindahl-Hirshman index for each bank, based on the geographical distribution of the loan portfolio. This variable is worth 1 if the bank only operates in one of the 50 Spanish provinces, thus, showing a high level of concentration of its credit portfolio.

Finally, we include the solvency ratio (*SOLV*), as a measure of the solvency of the bank and, therefore, of the capital requirements stretching level. The lower the solvency ratio, the higher the incentives to arbitrage capital requirements through securitization are. It is important to underline that *SOLV* is calculated as the quotient between capital and risk weighted assets, thus, being a direct measure of the solvency position of the bank.

We also include a set of control variables, such as the size of the bank (*SIZE*) measured as the log of its total assets, and the weight of the mortgage portfolio

(*WEIGHTMORTG*) to control for the availability of assets to securitize. The more mortgages a bank has, the more possibilities of securitizing, independently of its liquidity, risk or capital needs (covered bonds are backed by the whole mortgage portfolio). We also control for the average cost of liabilities (*AVGCOST*) in some specifications to see whether the funding cost of the bank is also a driver of securitization. Finally, we include a dummy variable for savings banks (*SAVINGS*) and another one for credit cooperatives (*COOP*) to see whether these types of banks have more incentives to securitize assets.

Table 2 shows the mean and the percentiles 5^{th} and 95^{th} of the explanatory variables. In general, the mean values of the distribution of all the variables are quite stable over time, but there is an important dispersion across banks, as shown by the low/high levels of the $5^{th}/95^{th}$ percentiles with respect to the mean. Precisely, this high variance across banks will enable us to better identify which are the driving forces of securitization otherwise difficult to isolate from the pool. The mean value of *LOAN/DEP* stayed around values of 1 during the sample period, which suggest that the deposits of the average bank fulfill the need to finance its loans. However, the dispersion of the variable is high and the extreme values of the distribution reveal that there are banks whose deposits only cover one third of their loans and need other sources of financing. *INTERBANK* informs that there are banks whose liability is made up mainly by interbank deposits and other where this source of financing is not used. The profile of the banks' credit-risk portfolio stayed at low levels although with considerable differences among banks (*NPLTOTAL*, *NPLMORTGAGES*) whereas the geographic diversification of risk ranged from the total concentration of the business in only one province to a wide dispersion of the credits granted across provinces (*HHIPROVINCE*). The solvency ratio (*SOLV*) presents also a high dispersion, being banks with a large buffer of capital and other that are closer to the legal minimum imposed by the Basel Accord (8% of risk weighted assets). Finally, the weight of mortgages (*WEIGHTMORTG*) has increased over the sample period as a consequence of the boom in the real-state sector undergone by Spain during the last years, whereas the level of total bank assets (*SIZE*) has also risen significantly.

2.3. Models and hypothesis

The first model that we consider is a Probit regression where the variable to be explained (*COVEREDBOND*) is a dummy worth 1 if the bank has issued a covered bond during the year, and zero otherwise. We expect that liquidity variables should play a role in explaining such a decision and, at the same time, we expect both risk profile and solvency variables to play no role since Spanish covered bonds, when issued, do not allow for risk transfer or capital relief. The second model we have is also a Probit model where the variable to be explained (*ABS*) is a dummy worth 1 if the bank has securitized assets that year, different from covered bonds, and zero otherwise. We also expect that liquidity variables play a role in explaining such a securitization while, at the same time, there is now room for risk profile and solvency to be significant given that the bank can use the securitization to transfer risk and to reduce capital requirements.

All in all, the models we test are the following:

$$\Pr(COVEREDBOND_{it}=1)=F\begin{pmatrix}\alpha_0+\alpha_0^{SAVINGS}SAVINGS+\alpha_0^{COOP}COOP+\alpha_0^{LOW}LOWGROWTH+\alpha_0^{HIGH}HIGHGROWTH+\\+\alpha_1 LOAN/DEP_{it}+\alpha_2 INTERBANK_{it}+\alpha_3 NPLTOTAL_{it}+\alpha_4 NPLMORTGAGES_{it}+\\+\alpha_5 HHIPROVINCE_{it}+\alpha_6 SOLV_{it}+\alpha_7 WEIGHTMORTG_{it}+\alpha_8 SIZE_{it}\end{pmatrix} \quad (1)$$

$$\Pr(ABS_{it}=1)=F\begin{pmatrix}\beta_0+\beta_0^{SAVINGS}SAVINGS+\beta_0^{COOP}COOP+\beta_0^{LOW}LOWGROWHT+\beta_0^{HIGH}HIGHGROWHT+\\+\beta_1 LOAN/DEP_{it}+\beta_2 INTERBANK_{it}+\beta_3 NPLTOTAL_{it}+\beta_4 NPLMORTGAGES_{it}+\\+\beta_5 HHIPROVINCE_{it}+\beta_6 SOLV_{it}+\beta_7 WEIGHTMORTG_{it}+\beta_8 SIZE_{it}\end{pmatrix} \quad (2)$$

where subindex *i* refers to bank, *t* to the time period and *F*(.) stands for a distribution function. The aim of the paper is to find out which are the determinants of asset securitization from the estimation of the previous equations with a Probit model that explains the decision of securitizing as a function of the explanatory variables considered above. The variable *SIZE* is the only one that enters in logs because we expect a decreasing marginal effect of an additional unit of assets in larger banks. $\alpha_0^{SAVINGS}, \alpha_0^{COOP}, \beta_0^{SAVINGS}, \beta_0^{COOP}$ inform of the difference in the intercept of savings banks and credit cooperatives with respect to commercial banks (α_0). To avoid perfect multicollinearity, we remove the

variable *MEDIUMGROWTH* from the regression and let the intercept capture the effect of banks with medium loan growth. The coefficients of *LOWGROWTH* and *HIGHGROWTH* will reflect the difference of banks with low/high credit growth with respect the reference group (*MEDIUMGROWTH*). All the regressions include time dummy variables.

The expected sign of the coefficients may vary if the aim of the securitization in covered bonds is different to that of ABS. In this sense, as the only reason for a bank to issue covered bonds is the need of liquidity, the expected signs of the coefficients of (1) are clear cut: $\alpha_0^{LOW} < 0; \alpha_0^{HIGH} > 0; \alpha_1 > 0$ because higher credit growth and large volume of loans respect to deposits bring about higher liquidity needs; banks with relatively large interbank liabilities will be less likely exposed to financial constraints, making $\alpha_2 < 0$. Risk and solvency variables are expected to be non-significant, $\alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$, because no relationship is expected between the need of liquidity and the risk profile/capital requirements of the bank. Finally, we expect $\alpha_7 > 0$ because banks will have a larger base of mortgages that back their issues of covered bonds, whereas we do not have an *a priori* prediction for α_8.

In the case of ABS (equation (2)), the predicted signs will be exactly the same as in (1) if the only driving force for banks to issue is the need of liquidity. However, if these operations are also aimed at capital arbitrage or risk transfer, then $\beta_3, \beta_4, \beta_5, \beta_6$ will be different from 0 since banks' risk profile and solvency will be determinants of the decision to securitize. If β_6 is negative and significant, that will support the capital arbitrage argument for issuing ABS, in line with the papers quoted in Section 1. However, if β_6 is not significant, that will show that ABS are not used to arbitrage the regulator. We do not have an expected sign for β_6. Regarding bank risk profile, it might be that those banks that securitize are the riskier ones (they securitize to transfer the risk, supporting the originate to distribute model) but, arguably, it could also be that they are the less risky, supporting Gorton and Pennacchi (1995) argument of an incentive-compatible contract where the banks show a compromise to withstand the first losses and, thus, have the incentive to keep monitoring the borrowers. Therefore, we do not have a priori a sign for β_3 and β_4. Finally,

we do not have expectations towards the sign of β_5, since it controls for the risk of the bank because of geographic concentration and there is not a direct link between spatial diversification and asset securitization[6].

3. Empirical results

Table 3 shows the results from the estimation of the Probit models (1) and (2), group of columns *COVERED BONDS* and *ABS*, respectively. The first two columns show the coefficient and the standard deviation from the Probit estimations and the third displays the marginal effect of each variable on the probability to securitize, i.e. the increase in the probability to securitize given a marginal increase of a variable x_k , being all the independent variables evaluated at their mean values.

The coefficients of *SAVINGS* and *COOP* are statistically significant in both estimations, what implies that the nature of the bank influences the decision of securitization. The results for *COVERED BONDS* confirm that banks use this instrument to obtain liquidity, independently of their levels of risk or solvency. In this sense, banks with higher credit growth, larger volume of loans with respect to deposits and lower weight of the interbank deposits in their liabilities will be, *ceteris paribus*, more likely to issue covered bonds. On the other hand, neither the risk-profile variables (*NPLTOTAL*, *NPLMORTGAGES*) nor the solvency ratio (*SOLV*) are significant, supporting our hypothesis that capital and risk considerations are not taken into account in the decision of issuing these bonds. Nonetheless, *HHIPROVINCE* is negative and significant, suggesting that banks less (more) locally concentrated are more (less) likely to issue covered bonds, but surely not with the aim of arbitraging capital. Finally, the relative volume of mortgages affects positively to the probability of having bonds (as expected), as well as the size of the bank.

[6] As it is uncertain the relationship between geographic diversification and final risk taking levels. See Hughes et al (1996) and references therein for a more detailed discussion.

If we compare the previous results with those of *ABS*, we observe that, overall, the pattern is quite similar in the two groups of assets and in line with the liquidity hypotheses. That is, liquidity variables have the expected signs and are significant while non-performing loan ratios and the solvency coefficient are not significant. Therefore, ABS are issued only to obtain liquidity and, consequently, banks do not use these instruments as a means to get a higher capital ratio or to increase (decrease) the risk/return ratio of their credit portfolios. This result has important implications for banking regulators because it softens the potential concerns they might have had on the use of securitization by Spanish banks in order to increase the risk-profitability of banks' credit portfolios. Moreover, the lack of capital arbitrage contradicts most of the scant empirical evidence, which focuses on the US securitization market. Finally, the ABS are not related to the risk profile of the bank, which is evidence rejecting the originate-to-distribute model in Spain. Again, this result reinforces the original claim by Pennacchi (1988) and Gorton and Pennacchi (1995) of a bank commitment to continuous monitoring of borrowers, something that, apparently, has been absent in the securitization of subprime loans in the US market.

The analysis of the coefficients and their level of significance only gives us the idea of which variables affect the likelihood to securitize, but their value is not directly informative (as in linear regressions) of the increase in the probability given a change of the corresponding explanatory variable. Rather, this information is obtained from the computation of the marginal effects[7] (third column and sixth column of Table 3). The likelihood of issuing covered bonds (ABS) is increased by 24.3% and -5.97% (9.71% and 24.17%) if the considered bank is a savings bank or a credit cooperative instead of a commercial bank, respectively. By the liquidity of the bank, an increase of 0.1 of the ratio *LOAN/DEP* raises the probability by 0.056% in covered bonds and by 0.18% in ABS; by

[7] The marginal effect of variable x_k is computed as $\frac{d\Pr(y=1|x)}{dx_k} = f(\hat{\beta}\bar{x})\hat{\beta}_k$ ($\bar{x}$ denotes the mean values of the vector of variables x, β the estimated coefficients and $f(.)$ the density function), except for the variable *SIZE*, for which it has been computed as $\frac{f(\hat{\beta}\bar{x})\hat{\beta}_k}{\bar{x}_k}$. For the dummy variables, the marginal effect is equal to $\Pr(y=1|\bar{x}, dummy=1) - \Pr(y=1|\bar{x}, dummy=0)$

size, an increase of 1bn€ of the total assets (average of total assets is 7bn€) increases the likelihood by 0.24% in covered loans and 3.09% in ABS.

4. Extensions

4.1. Robustness of the basic models

The basic model has been estimated with a different combination of explanatory variables to evaluate possible biases that could arise due to potential multicollinearity among the explanatory variables. The different specifications are shown in Table 4, in the columns titled "*Pool* ". First, we considered the elimination of the variable *HHIPROVINCE* because, even being relevant to control for the geographical risk, it could be capturing other bank features (related to size and others) that might be affecting the rest of the estimated coefficients. We also include *AVGCOST*, the average cost of the liabilities of the bank, whose expected sign is positive provided that we deal with the correct specification. The results (Columns Pool 1 – Pool 3) show that all the coefficients of all the variables are robust to all the different specifications. The coefficient of *HHIPROVINCE* remains negative and significant when included and that of the average cost of liabilities is always positive, but only in ABS is significant at 10%.

The second robustness test refers to our chosen measure of bank solvency. According to the Basel Accord, banks have to keep at least a level of capital equal to 8% of their risk weighted assets to deal with unexpected losses. We have taken the coefficient of solvency (i.e. regulatory capital / risk weighted assets, being the regulatory capital that computed according to the Basel Accord) to evaluate the potential capital needs of banks to fulfil their minimum requirements. The potential econometric problem that may arise is that, by definition, this measure has a lower bound in values around 8%, provided all banks maintain the level of capital established by the Basel Accord, and the variable may not well capture the actual capital buffer of a bank. To solve the problem, we substitute *SOLV* by *K BUFFER*, that is, the relative capital buffer enjoyed by each bank, worked out as the

excess of capital over the capital requirements[8]. The results are shown in Column "*Pool 4*" of Table 4 and confirm that securitization does not depend on the level of solvency. The coefficients and the level of significance of the rest of variables remain unaltered.

The last robustness test refers to the estimation method used in the analysis. As the database is a panel, the model could be estimated with fixed or random effects to control for unobservable heterogeneity across individuals instead of estimating the equations with the pooled Probit model. The column "*Random Effects*" of Table 4 shows the results of the estimation of the Probit model with random effects, where now $\Pr(y_{it}=1 \mid x)=F(x_{it}\beta+\eta_i)$, being η_i the unobservable heterogeneity. The significance of the coefficients has dropped because those unobservable may be capturing effects corresponding to variables in the regression with low variation over time, but widely different across banks (as log of assets). In spite of this, the magnitude and sign of all the coefficients has not changed with this specification and the main conclusions remain unchanged.

Finally, we could estimate the model with fixed effects if we were concerned of a potential correlation between the individual effects and the explanatory variables. This does not seem to be the case, since we expect to have included all the relevant variables in the decision of securitizing and the unobservable heterogeneity (if any) is unlikely to be correlated with our explanatory variables. Moreover, this estimation technique[9] posits the additional caveat that only those banks that change from 0 to 1 are kept in the database and, therefore, the sample is reduced drastically and the available information is not fully exploited. Nonetheless, in the estimations (not shown), the significance of the coefficients

[8]

$$K\ BUFFER=\frac{Regulatory\ Capital-Min.Requirements}{Min.Requirements}=\frac{\frac{Regulatory\ Capital}{RWA}-\frac{Min.Requirements}{RWA}}{\frac{Min.Requirements}{RWA}}=\frac{SOLV-8\%}{8\%}$$

See Ayuso, Pérez and Saurina (2004) for more details.

[9] This approach is implemented through a Logit model. In the Probit case, there does not exist a sufficient statistic allowing the fixed effects to be conditioned out of the likelihood.

decreased due to the drop in the number of observations (reduced from 1500 to 400), but the signs of the coefficients were robust to the results.

4.2. Determinants of the amount securitized

The main focus of this paper is to explain why banks securities assets. However, our data allows us to go beyond that basic question and ask also about the determinants of the amounts securitized. We analyze here whether the liquidity needs still play a key role in the amounts issued or, on the contrary, there is a significant change in the basic explanatory variables of section 3. Moreover, this new perspective allows us to include new variables that reflect the profile of the loan portfolio that backs the securitization (i.e. allows for a better control of the risk). These new variables cannot be included in the former decision model because they only take positive value if the bank did securitize.

In this new framework, we consider a Tobit[10] model whose dependent variable is the log of the amount securitized and the censure comes from those banks that did not securitize and whose observed value is equal to zero. The explanatory variables will be the same as those used in the decision model, and will be extended to include characteristics of the securitization. The model is estimated with random effects to control for the unobservable heterogeneity across banks not captured by the explanatory variables. The objective is to check whether or not the determinants of the amount issued in the securitization are the same as those that drive the decision to securitize.

Table 5 shows the columns "Tobit 1", where the results of the estimation are based on the same variables as in models (1) and (2). The sign and significance of the determinants are very similar to those obtained in the decision model, with the exception of *NPLMORTGAGES* in covered bonds which now informs that the amount issued among banks that did securitize was higher for those which had a higher rate of non-performing loans (i.e. banks with riskier mortgage portfolios issue more covered bonds). Another

[10] We have also considered selection models that estimate jointly the decision and the amount securitized (i.e. the Heckman model), but the hypotheses of independence of both equations could not be rejected.

possibility would have been to estimate the model only with the observations of the banks that did securitized with a simple regression model of the amount issued in the markets. However, this estimation would not take advantage of the information of the dependent variable distribution contained in the non-securitizing banks observations. The results of this estimation (not shown) are in line with those shown this far, but the significance of the variables is reduced due to the drop in the number of observations.

The next step that we take is to control for characteristics of the securitization that may affect the amount issued by each bank. This information has been obtained out of the brochures that banks are obliged to publish through the CNMV (the Spanish regulator of the securities market) whenever they want to securitize a loan portfolio, detailing the conditions and features of the issue.

More precisely, we deal with two variables; one is the weighted average of the probability of default (thereafter, PD) of each tranche of the securitization[11], *PDPORTFOLIO*, taking the amount of each tranche as the weighting factor. As this magnitude can take different values for the same bank during a given year if that bank has carried out several securitizations of assets, we compute the weighted PD's across the different issues to obtain a single representative value for each bank and time period. Thus, we control for the level of risk of the securitized assets.

The second variable obtained from the brochures is the margin over the interbank rate that is offered in each tranche of the securitization, *MARGINPORTFOLIO*. Again, we compute the weighted average across tranches for each issue and then the weighted average across issues for each bank. Therefore, we control for the risk premium that the bank has to pay to investors in order to securitize.

[11] The brochure of a securitization contains the ratings assigned to each tranche of the issue. We have transformed those ratings into probabilities of defaults using a table of rating-PD equivalences constructed by S&P for corporate debt (Standard & Poor's, 2006).

We expect a positive sign for *MARGINPORTFOLIO*, since banks have to offer an attractive return in order to be able to allocate a larger amount of bonds in the securitization, and a negative sign for *PDPORTFOLIO* because bonds associated to a higher risk are, *ceteris paribus*, less appealing to investors.

The results for covered bonds are shown in Columns 2 and 3 of Table 5. The amount issued is positively related to the return offered in the securitization. This result is in line with the economic prediction, but the coefficient could be contaminated if the higher return was compensating a higher risk embedded in the portfolio of mortgages that backs the securitization. That is why we include in the model *PDPORTFOLIO* to control for the risk of the issue (Column 3), showing that the amount issued is more sensitive to the average return of the securitization and that the level of risk negatively affects the amount that banks can issue. Importantly, the rest of variables keep their sign and significance with respect to the specification that does not control for the portfolio characteristics, which reinforces our previous results.

The second part of Table 5 shows the estimations of the model for ABS. The results displayed in the first column suggest that the driving factors of the amount securitized are the same than those that determine the decision to securitize. However, when we control for the margin and the risk of the issue, the coefficient of solvency (*SOLV*) becomes negative and strongly significant, what implies that banks that have taken the decision to securitize issue a higher volume of assets as the solvency ratio is lower. This could be a signal that, even though the decision to securitize is not related to the capital level of the bank, banks that have securitized could take it into account in the choice of the amount to issue. Summing up, banks do not decide to use this instrument to affect their solvency coefficient but, once they have decided to securitize, those with a lower level of solvency may issue a larger amount to modify their levels of capital requirements.

4.3. Differences across underlying assets in *ABS*

As mentioned in the introduction, we have information of the type of asset that backs the securitization. Thus, for ABS we can explore whether there are differences in the behavior of banks depending on the type of loan they securitize. It might be possible that banks securitizing credit cards, auto loans or loans to small and medium sized enterprises (hereafter, SMEs) had a higher risk profile or an increased need to get rid of the risk since those products are far riskier than mortgages. In Spain, current non-performing levels are twice as high for SME loans as for mortgages. Moreover, the capital consumption differs across loan types (4% for mortgages, 8% for the other asset classes mentioned here). Thus, banks with low capital ratios might have a higher incentive to securitize those assets that consume more regulatory capital. Finally, liquidity determinants might also change since the business model might differ across specialized banks. Credit card or auto loan financial firms might have a weaker deposit basis than retail banks with a significant mortgage and/or SME loan portfolio.

Therefore, we re-estimate the basic model (2) separately for RMBS[12] and loans to SMEs. Results in Table 6 show that the drivers of securitization in RMBS are exactly the same as those that determine the securitization when no asset-type considerations are made. The similarity of the results might be due to the high weight that RMBS have within the whole portfolio. It suggests that the main reason why banks issue RMBS is to obtain liquidity from otherwise illiquid assets, without risk-adjusting or capital arbitrage considerations.

The conclusions are quite different if one focuses on the determinants to securitize loans to SMEs (Column 3, Table 6). In this case, banks also securitize to obtain liquidity (positive *HIGHGROWTH*, negative *INTERBANK*). However, the negative and significant coefficient of *SOLV* indicates that entities with lower solvency might be getting rid of

[12] We have also included the securitizations backed by consumption and auto loans in this category because of having the same borrower (households). We have done so to take into account these securitizations that have an insufficient number of observations to make up a single group. The results do not change significantly if this subgroup is excluded from the sample. Nonetheless, RMBS are the main ones, representing the 62.1% of the total ABS, whereas SMEs account for 22.3% and consumption and auto loans for 2.8%. The rest refer to securitizations of treasury bonds and other assets.

assets with a higher consumption of capital so as to improve their solvency ratios. Nonetheless, banks that do securitize these loans are those with lower risk in their portfolio (*NPLTOTAL* negative) and also in the portfolio of SMEs loans[13]. Therefore, it seems that they are increasing the level of risk of their portfolio (i.e. they keep the riskier SME loans). That is, again, different from the originate-to-distribute model, since the risk increases in the balance sheet of the bank. It might be possible that the securitization of riskier assets (such as SME loans) requires a high degree of commitment by the bank, in line with Pennacchi (1988) and Gorton and Pennacchi (1995). Finally, the negative coefficient of *WEIGHTMORTG* suggests a different specialization of banks, as the probability of issuing ABS backed by SMEs increases when the weight of mortgages decreases within the bank' loan portfolio and the bank has to consider other assets to securitize.

5. Conclusions

Securitization is the procedure through which banks can sell part of their assets to obtain liquidity, change the risk profile associated to their credit portfolio, and arbitrage capital requirements. Securitization of bank loans has been growing significantly the last two decades and is playing a key role in current financial market turbulences.

Despite the increasing importance of securitization and the potential implications that could have over the risk structure and solvency of banks, few studies have analyzed which are the empirical determinants of bank securitization. In this paper, we try to shed light to this matter, considering the three possible motivations that lead a bank to securitize. First, banks may issue covered bonds or asset-backed securities (ABS) for the mere reason to obtain liquidity. In this way, banks may transform illiquid and long term maturity assets into liquid instruments. Second, and given the bank capital requirements framework, banks

[13] This can be deduced from the combination of the coefficients of *NPLTOTAL* and *NPLMORTGAGE*: if the non-performing loan effect for the total portfolio is negative (checked even when it stands alone in the regression) and that of mortgages is positive, then that of *NPLSME* must be negative, as both, mortgages and SME loans are the main components of the loan portfolio.

may use ABS to arbitrage those capital requirements. Finally, they may securitize to change the risk profile of their portfolio (i.e. to shed off credit risk).

Spain has a securitization framework that allows for a proper and robust test of the determinants of bank securitization. Moreover, securitization has been expanding exponentially in such a way that Spain has become the second issuer of covered bonds and ABS in Europe. Covered bonds are backed by the whole mortgage portfolio and, given its design, their only purpose must be the provision of liquidity to the issuer banks. On the other hand, using ABS banks can affect their solvency ratio and risk profile, as well as their funding. Thanks to this separation, we study the determinants of securitization in both types of instruments, being able to disentangle whether the only reason to securitize is the need of liquidity or, on top of that, there are also risk and solvency drivers of that process.

We show that, overall, liquidity needs are the main and exclusive driver of securitization in Spain. Thus, the risk profile of the bank or its level of capital seems to play no role. That was the expected result for covered bonds but not necessarily for the ABS. Our results are robust to different specifications of the explanatory variables, as well as the method used to estimate the determinants of securitization. The conclusions are slightly different when we focus on the determinants of the amount securitized or when we distinguish among the assets backing the securitization. We find that RMBS (residential mortgage-backed securities) are only used to obtain liquidity, while securities backed by loans to small and medium sized companies might also be issued to arbitrage capital (but not to transfer risk). The amount issued by banks responds again to liquidity needs, though, once they have taken the decision to securitize (independent of risk and solvency motives), capital arbitrage is also present.

These results have important implications in terms of the assessment of the intermediation model that securitization is supporting. In Spain, there is no evidence of the originate-to-distribute model, that is, a model where banks grant loans and transfer the credit risk to third parties. Thus, the business model of Spanish banks regarding securitization supports earlier claims by Pennacchi (1988) and Gorton and Pennacchi

(1995) of the need for a continuous monitoring of borrowers by bank lenders, something that seems to be absent in the originate-to-distribute model.

References

Allen, F. and Carletti, E. "Credit risk transfer and contagion", *Journal of Monetary Economics* 53, 2006, 89-111.

Ambrose, B. W.; Lacour-Little, M. and Sanders, A. B. "Does regulatory capital arbitrage, reputation, or asymmetric information drive securitization?", *Journal of Financial Services Research*, 28:1 2/3, 2005, 113-133.

Ayuso, J.; Pérez, D. and Saurina, J. "Are capital buffers procyclical? Evidence from Spanish panel data", *Journal of Financial Intermediation*, 13, 2004, 249-264.

Bannier, C. E. and Hänsel, D. N. "Determinants of banks' engagement in loan securitization", Working Paper No. 171, Goethe-University, Frankfurt, 2006.

Boudoukh, J; Whitelaw, R. F.; Richardson, M. and Stanton, R. "Pricing mortgage-backed securities in a multifactor interest rate environment: A multivariate density estimation approach", *Review of Financial Studies*, Vol 10, No 2, 1997, 405-446.

Calomiris, C. W. and Mason, J. R. "Credit card securitization and regulatory arbitrage", *Journal of Financial Services Research*, 26:1, 2004, 5-27.

Cumming, C. "The Economics of Securitization". *Federal Reserve Bank of New York Quarterly Review* 12, 3, 1987, 11-23.

Delgado, J. Salas, V. and Saurina, J. "The Joint Size and Ownership Specialization in Banks' Lending" *Journal of Banking and Finance*, 2007. Forthcoming.

DeMarzo, P. M. "The pooling and tranching of securities: A model of informed intermediation", *Review of Financial Studies*, Vol 18, No. 1, 2005, 1-35.

Dionne, G. and Harchaoui, T.M. “Banks’Capital, Securitization and Credit Risk: an Empirical Evidence for Canada”. CIRPÉE, Working Paper 03-11, 2003.

Donahoo, K.K. and Shaffer, S. “Capital Requirements and the Securitization Decision,” *Quarterly Review of Economics and Business* 31, 4, 1991, 12-23.

Glaeser, E. L. and Kallal, H. D. “Thin markets, asymmetric information, and mortgage-backed securities”, *Journal of Financial Intermediation* 6, 1997, 64-86.

Gorton, G. B. and Pennacchi, G. G. “Banks and loan sales. Marketing nonmarketable assets”, *Journal of Monetary Economics*, 35, 1995, 389-411.

Greenbaum, S and Thakor, A. “Bank Funding Modes: Securitization versus Deposits”. *Journal of Banking and Finance*, 11, 1987, 379-401.

Hänsel, D. N. and Krahnen, J-P. “Does credit securitization reduce bank risk? Evidence from the European CDO market”, Mimeo, Goethe-University, Frankfurt, 2007.

Hughes, J. P. ; W. Lang, L. J. Mester and C. Moon. “Efficient Banking under Interstate Branching”. *Journal of Money, Credit and Banking*, Vol 28, No. 4, November, part 2, 1996, 1045-1071.

Jackson, P. “Capital requirements and bank behavior: the impact of the Basel accord”. Basle Committee on Banking Supervision, Working paper No. 1, April 1999.

Jones, D. “Emerging Problems with the Basel Capital Accord: Regulatory Capital Arbitrage and Related Issues” *Journal of Banking and Finance* 24, 2000, 35-58.

Packer, F.; Stever, R. and Upper, C., “The covered bond market”, *BIS Quarterly Review*, September 2007, 43-55.

Pennacchi, G. G. “Loan sales and the cost of bank capital”, *The Journal of Finance*, Vol. XLIII, No. 2, June 1988, 375-396.

Riddiough, T. J. “Optimal design and governance of asset-backed securities”, *Journal of Financial Intermediation* 6, 1997, 121-152.

Standard & Poor’s. “Annual European Corporate Default Study and Rating Transitions. Global Fixed Income Research”, February 2006.

Thomas, H. “Effects of asset securitization on seller claimants”, *Journal of Financial Intermediation*, 10, 2001, 306-330.

Uzun, H. and Webb, E. “Securitizing banks: Comparisons and Determinants”, mimeo 2006.

TABLE 1. NUMBER OF BANKS THAT SECURITIZE ASSETS AND BALANCE OF ASSET SECURITIZATION.

	COMMERCIAL BANKS					SAVINGS BANKS					CREDIT COOPERATIVES				
	Number of banks in the sample	Covered Bonds		ABS		Number of banks in the sample	Covered Bonds		ABS		Number of banks in the sample	Covered Bonds		ABS	
		Number of banks	Total amount (thousands €)	Number of banks	Total amount (thousands €)		Number of banks	Total amount (thousands €)	Number of banks	Total amount (thousands €)		Number of banks	Total amount (thousands €)	Number of banks	Total amount (thousands €)
1999	72	2	5,383,306	14	5,050,864	48	15	7,077,791	21	4,104,364	92	0	0	3	190,479
2000	68	1	6,358,300	15	9,708,706	46	14	5,945,773	30	5,154,678	90	0	0	6	343,167
2001	66	1	5,656,162	15	11,431,979	45	30	13,207,845	31	8,170,318	88	0	0	15	571,563
2002	61	3	12,416,727	16	18,215,174	45	34	20,683,326	35	12,467,037	84	0	0	17	1,377,547
2003	57	5	23,419,758	16	25,129,845	45	42	37,293,430	37	20,192,596	83	1	300,000	21	3,067,809
2004	54	9	41,058,223	17	39,705,398	45	42	52,209,011	35	25,263,149	83	3	2,000,099	26	4,901,375
2005	52	16	67,385,529	18	47,958,604	45	44	85,758,746	37	36,362,703	83	3	3,757,584	29	7,374,825
2006	51	17	95,559,544	18	65,965,610	45	44	126,393,363	37	53,477,004	83	3	5,525,000	31	10,717,328

TABLE 2. DESCRIPTIVE STATISTICS OF THE EXPLANATORY VARIABLES

The table contains information of the average and the 5th and 95th percentiles of the distribution of each variable: *LOAN/DEP* refers to the ratio of loans to deposits of other resident agents (not including banks and public administration), *INTERBANK* stands for the the relative weight of the interbank liabilities and *NPLTOTAL* and *NPLMORTGAGES* for the non-performing loan ratio and the non-performing mortgage ratio of the bank. *HHIPROVINCE* is the Herfindahl-Hirshman index for each bank computed from the distribution of its loan portfolio across the 50 Spanish provinces. Finally, *SOLV* is the solvency ratio, *WEIGHTMORTG* is the proportion of mortgages in the credit portfolio and *SIZE* is the log of the total assets of the bank.

	LOAN/DEP			INTERBANK (%)			NPLTOTAL (%)			NPLMORTGAGES(%)		
	Mean	p5%	p95%	Mean	p5%	p95%	Mean	p5%	p95%	Mean	p5%	p95%
1999	1.5	0.2	2.5	16.0	0.0	85.5	1.7	0.1	4.6	0.3	0.0	1.4
2000	1.0	0.2	2.8	15.6	0.0	86.0	1.5	0.0	5.2	0.3	0.0	1.5
2001	0.9	0.2	1.9	14.6	0.0	79.9	1.6	0.0	7.5	0.3	0.0	1.2
2002	0.9	0.2	1.9	14.3	0.0	80.9	1.5	0.0	5.4	0.3	0.0	1.1
2003	0.9	0.2	2.1	14.1	0.0	68.3	1.4	0.1	5.7	0.2	0.0	0.8
2004	1.0	0.2	2.0	13.3	0.0	68.0	1.1	0.0	3.9	0.2	0.0	0.7
2005	1.0	0.2	2.5	13.1	0.0	64.8	1.4	0.0	7.2	0.5	0.0	2.0
2006	1.1	0.2	3.0	12.9	0.0	69.3	1.2	0.1	5.3	0.4	0.0	1.4
	HHIPROVINCE			SOLV (%)			WEIGHTMORTG (%)			SIZE (log of thousands €)		
	Mean	p5%	p95%	Mean	p5%	p95%	Mean	p5%	p95%	Mean	p5%	p95%
1999	0.7	0.1	1.0	16.7	8.5	42.1	28.5	0.1	58.8	13.3	9.7	16.5
2000	0.7	0.1	1.0	16.3	8.7	42.8	28.2	0.0	57.3	13.3	9.8	16.5
2001	0.7	0.1	1.0	15.2	8.5	36.7	28.6	0.1	57.7	13.5	9.9	16.8
2002	0.7	0.1	1.0	15.7	8.7	45.1	29.9	0.2	59.5	13.6	10.0	16.9
2003	0.6	0.1	1.0	14.2	8.9	32.5	30.6	0.2	58.8	13.7	10.1	17.1
2004	0.6	0.1	1.0	13.9	8.7	32.5	31.5	0.5	62.4	13.8	10.2	17.1
2005	0.6	0.1	1.0	13.6	8.7	26.4	36.5	2.1	65.2	14.0	10.3	17.5
2006	0.6	0.1	1.0	14.1	8.6	29.5	35.9	0.9	65.8	14.1	10.4	17.8

TABLE 3. DETERMINANTS OF ASSET SECURITIZATION

Results of the estimation of the determinants of the probability that a bank securitizes, estimation with Probit Model *COVERED BONDS* refer to the estimation of equation (1) with dependent variable equal to 1 if the bank has issued covered bonds; columns under *ABS* refer to equation (2) with dependent variable equal to one if the bank has ABS. *SAVINGS* and *COOP* are dummy variables that take the value of 1 if the observation is a savings bank or credit cooperative, respectively. *LOWGROWTH* and *HIGHGROWTH* are dummies with value equal to 1 if the loan growth rate of the bank in the year is below or above the 33th and 66th percentile of the distribution, respectively. *LOAN/DEP* refers to the ratio of loans to deposits of other resident agents (not including banks and public administration), *INTERBANK* stands for the the relative weight of the interbank liabilities and *NPLTOTAL* and *NPLMORTGAGES* for the non-performing loan ratio and the non-performing mortgage ratio of the bank. *HHIPROVINCE* is the Herfindahl-Hirshman index for each bank computed from the distribution of its loan portfolio across the 50 Spanish provinces. Finally, *SOLV* is the solvency ratio, *WEIGHTMORTG* is the proportion of mortgages in the credit portfolio and *SIZE* is the log of the total assets of the bank. All the estimations contain time dummy variables

	COVERED BONDS			**ASSET-BACKED SECURITIES**		
	Coefficient	Std.Dev.	Marginal Effect (x100)	Coefficient	Std.Dev.	Marginal Effect (x100)
SAVINGS	1.87 ***	0.25	24.34	0.30 *	0.17	9.71
COOP	-1.22 ***	0.28	-5.97	0.77 ***	0.19	24.17
LOWGROWTH	-0.11	0.18	-0.48	-0.47 ***	0.12	-13.82
HIGHGROWTH	0.41 ***	0.14	2.18	0.06	0.11	1.88
LOAN/DEP	0.13 ***	0.04	0.56	0.13 ***	0.04	3.97
INTERBANK	-0.02 ***	0.01	-0.08	-0.02 ***	0.00	-0.65
NPLTOTAL	-0.08	0.05	-0.38	-0.01	0.05	-0.26
NPLMORTGAGES	0.23	0.21	1.03	0.12	0.14	3.68
HHIPROVINCE	-0.59 **	0.29	-2.65	-0.41 *	0.22	-12.73
SOLV	-0.02	0.01	-0.10	-0.01	0.01	-0.34
WEIGHTMORTG	0.01 **	0.00	0.05	0.01 *	0.00	0.17
SIZE	0.36 ***	0.06	0.00	0.67 ***	0.04	0.00

(***), (**), (*) =Significant at 10%; 5% and 1%, respectively. The marginal effect of variable x_k is computed as $\frac{d\Pr(y=1|x)}{dx_k} = f(\hat{\beta}\bar{x})\hat{\beta}_k$ ($\bar{x}$ denotes the mean values of the vector of variables x, β the estimated coefficients and $f(.)$ the density function), except for the variable *SIZE*, for which it has been computed as $\frac{f(\hat{\beta}\bar{x})\hat{\beta}_k}{\bar{x}_k}$.

For the dummy variables, the marginal effect is equal to $\Pr(y=1|\bar{x}, dummy=1) - \Pr(y=1|\bar{x}, dummy=0)$

TABLE 4. ROBUSTNESS TESTS

Robustness results of the estimations in Table 3. Columns *Pool 1, Pool 2, Pool 3, Pool 4* include different specifications in the explanatory variables.Column *Random Effects* presents the results of the estimation of the Probit model allowing for heterogeneity in the error component. *SAVINGS* and *COOP* are dummy variables that take the value of 1 if the observation is a savings bank or credit cooperative, respectively. *LOWGROWTH* and *HIGHGROWTH* are dummies with value equal to 1 if the loan growth rate of the bank in the year is below or above the 33th and 66th percentile of the distribution, respectively. *LOAN/DEP* refers to the ratio of loans to deposits of other resident agents (not including banks and public administration), *INTERBANK* stands for the the relative weight of the interbank liabilities, *AVGCOST* for the average cost of liabilities and *NPLTOTAL* and *NPLMORTGAGES* for the non-performing loan ratio and the non-performing mortgage ratio of the bank. *HHIPROVINCE* is the Herfindahl-Hirshman Index for each bank computed from the distribution of its loan portfolio across the 50 Spanish provinces. Finally, *SOLV* is the solvency ratio, *K BUFFER* is the capital buffer, *WEIGHTMORTG* is the proportion of mortgages in the credit portfolio and *SIZE* is the log of the total assets of the bank. All the estimations contain time dummy variables

	COVERED BONDS					ASSET-BACKED SECURITIES				
	Pool 1	**Pool 2**	**Pool 3**	**Pool 4**	**Random Effects**	**Pool 1**	**Pool 2**	**Pool 3**	**Pool 4**	**Random Effects**
SAVINGS	1.75 ***	1.75 ***	1.91 ***	1.91 ***	3.13 ***	0.24	0.19	0.37 **	0.37 **	1.74 **
COOP	-1.30 ***	-1.31 ***	-1.18 ***	-1.18 ***	-2.85 ***	0.71 ***	0.64 ***	0.87 ***	0.87 ***	3.13 ***
LOWGROWTH	-0.14	-0.14	-0.10	-0.10	-0.21	-0.47 ***	-0.48 ***	-0.45 ***	-0.45 ***	-0.83 *
HIGHGROWTH	0.40 ***	0.40 ***	0.42 ***	0.42 ***	0.66	0.11	0.08	0.09	0.09	-0.06
LOAN/DEP	0.14 ***	0.14 ***	0.12 ***	0.12 ***	0.17 *	0.12 ***	0.13 ***	0.12 ***	0.12 ***	-0.13
INTERBANK	-0.02 ***	-0.02 ***	-0.02 ***	-0.02 ***	-0.03 **	-0.02 ***	-0.02 ***	-0.02 ***	-0.02 ***	-0.04 ***
NPLTOTAL	-0.08	-0.08	-0.09 *	-0.09 *	-0.16	-0.02	-0.01	-0.03	-0.03	-0.01
NPLMORTGAGES	0.25	0.25	0.22	0.22	0.63	0.11	0.11	0.12	0.12	0.43
HHIPROVINCE			-0.62 **	-0.62 **	-0.86			-0.47 **	-0.47 **	-1.79 *
SOLV	-0.02	-0.02	-0.02		-0.05	-0.01	-0.01	-0.01		-0.01
K BUFFER				0.00					0.00	
WEIGHTMORTG	0.01 **	0.01 **	0.01 **	0.01 **	0.03 **	0.01 *	0.01 *	0.01 *	0.01 *	0.01
SIZE	0.42 ***	0.42 ***	0.35 ***	0.35 ***	0.84 ***	0.70 ***	0.71 ***	0.65 ***	0.65 ***	1.52 ***
AVGCOST	0.02		0.08	0.08	-0.28	0.17		0.20 *	0.20 *	0.40

(***), (**), (*) =Significant at 10%; 5% and 1%, respectively.

TABLE 5. DETERMINANTS OF THE AMOUNT SECURITIZED

Results of the estimation of the determinant of the amount securitized using a Random-Effect Tobit model. The dependent variable is the log of the assets securitized for those banks that did securitize. *SAVINGS* and *COOP* are dummy variables that take the value of 1 if the observation is a savings bank or credit cooperative, respectively. *LOWGROWTH* and *HIGHGROWTH* are dummies with value equal to 1 if the loan growth rate of the bank in the year is below or above the 33th and 66th percentile of the distribution, respectively. *LOAN/DEP* refers to the ratio of loans to deposits of other resident agents (not including banks and public administration), *INTERBANK* stands for the the relative weight of the interbank liabilities, *AVGCOST* for the average cost of liabilities and *NPLTOTAL* and *NPLMORTGAGES* for the non-performing loan ratio and the non-performing mortgage ratio of the bank. *HHIPROVINCE* is the Herfindahl-Hirshman index for each bank computed from the distribution of its loan portfolio across the 50 Spanish provinces. *SOLV* is the solvency ratio, *WEIGHTMORTG* is the proportion of mortgages in the credit portfolio and *SIZE* is the log of the total assets of the bank. Finally, *PDPORTFOLIO* is the PD of the portfolio of mortgages that backs the securitization and *MARGINPORTFOLIO* stands for the returns of each securitization in terms of the average margin with respect to the interbank rate. All the estimations contain time dummy variables.

	COVERED BONDS			**ASSET-BACKED SECURITIES**		
	Tobit 1	**Tobit 2**	**Tobit 3**	**Tobit 1**	**Tobit 2**	**Tobit 3**
SAVINGS	9.77 ***	8.42 ***	7.46 ***	4.70 ***	5.67 ***	5.44 ***
COOP	-8.40 ***	-7.53 ***	-7.43 ***	6.43 ***	6.25 ***	6.19 ***
LOWGROWTH	-1.54	-1.20	-0.77	-1.76 *	-0.08	-0.09
HIGHGROWTH	1.89 **	1.75 **	1.79 **	0.21	0.01	0.12
LOAN/DEP	0.52	0.60 *	0.51	-0.45	-0.41	-0.37
INTERBANK	-0.10 ***	-0.08 ***	-0.06 **	-0.05 **	-0.03	-0.03 *
NPLTOTAL	-0.79	-0.75 *	-0.47	-0.03	0.37 *	0.38 *
NPLMORTGAGES	2.85 **	2.94 ***	2.35 **	0.74	0.17	0.27
HHIPROVINCE	-4.51 **	-3.17 *	-1.86	-3.38 **	-2.50	-2.98 *
SOLV	-0.14	-0.07	-0.06	0.05	-0.20 ***	-0.19 ***
WEIGHTMORTG	0.09 ***	0.06 **	0.05 **	-0.01	0.01	0.01
SIZE	2.63 ***	2.15 ***	2.02 ***	3.46 ***	2.79 ***	2.78 ***
Securitized Portfolio						
PDPORTFOLIO			-25.14 ***			-1.29 ***
MARGINPORTFOLIO		73.33 ***	118.20 ***		13.64 ***	14.99 ***

(***), (**), (*) =Significant at 10%; 5% and 1%, respectively.

TABLE 6. DETERMINANTS OF ASSET-BACKED SECURITIZATION DEPENDING ON THE UNDERLYING ASSET

Results of the estimation of the determinants of the probability that a bank securitizes; estimation with Probit Model. In the Column *ALL*, the dependent variable takes the value of 1 if the banks issues *ABS* backed by securities of any kind. Similarly, in Columns *RMBS* and *SME* the dependent variable takes the value of 1 when the bank issues ABS backed by mortgages and loans to Small and Medium sized Enterprises, respectively. *SAVINGS* and *COOP* are dummy variables that take the value of 1 if the observation is a savings bank or credit cooperative, respectively. *LOWGROWTH* and *HIGHGROWTH* are dummies with value equal to 1 if the loan growth rate of the bank in the year is below or above the 33^{th} and 66^{th} percentile of the distribution, respectively. *LOAN/DEP* refers to the ratio of loans to deposits of other resident agents (not including banks and public administration), *INTERBANK* stands for the the relative weight of the interbank liabilities, *AVGCOST* for the average cost of liabilities and *NPLTOTAL* and *NPLMORTGAGES* for the non-performing loan ratio and the non-performing mortgage ratio of the bank. *HHIPROVINCE* is the Herfindahl-Hirshman Index for each bank computed from the distribution of its loan portfolio across the 50 Spanish provinces. Finally, *SOLV* is the solvency ratio, *WEIGHTMORTG* is the proportion of mortgages in the credit portfolio and *SIZE* is the log of the total assets of the bank. All the estimations contain time dummy variables.

	ALL	*RMBS*	*SME*
SAVINGS	0.30 *	0.53 ***	-0.56 ***
COOP	0.77 ***	0.69 ***	0.58 **
LOWGROWTH	-0.47 ***	-0.52 ***	-0.05
HIGHGROWTH	0.06	0.00	0.41 ***
LOAN/DEP	0.13 ***	0.10 ***	0.28
INTERBANK	-0.02 ***	-0.01 ***	-0.03 ***
NPLTOTAL	-0.01	0.00	-0.17 ***
NPLMORTGAGES	0.12	0.29	0.94 ***
HHIPROVINCE	-0.41 *	-0.05	-0.48 *
SOLV	-0.01	-0.01	-0.08 ***
WEIGHTMORTG	0.01 *	0.00	-0.02 ***
SIZE	0.67 ***	0.51 ***	0.69 ***

(***), (**), (*) =Significant at 10%; 5% and 1%, respectively.