Temi di Discussione

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(Working papers)

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The views expressed in the articles are those of the authors and do not involve the responsibility of the Bank.

WHY DO (OR DID?) BANKS SECURITIZE THEIR LOANS?
EVIDENCE FROM ITALY

by Massimiliano Affinito° and Edoardo Tagliaferri°

Abstract

This paper investigates the *ex-ante* determinants of bank loan securitization by using different econometric methods on Italian individual bank data from 2000 to 2006. Our results show that bank loan securitization is a composite decision. Banks that are less capitalized, less profitable, less liquid and burdened with troubled loans are more likely to perform securitization, for a larger amount and earlier.

JEL Classification: G21, G28, C23, C24.
Keywords: securitization, credit risk transfer, capital requirements, liquidity needs.

Contents

° Bank of Italy, Economics, Research and International Relations.

1. Introduction[1]

This paper empirically picks out the main determinants that urge banks to securitize their loans – or that did so before the crisis. The interest in studying bank loan securitization was already justified by their dramatic increase in the last decade but has been further strengthened exactly by recent events in the financial markets.[2]

First, before the meltdown, the strong development of bank securitization led to theories about a new banking model, defined as the "originate-to-distribute" (O&D) model, because banks were no longer the originators and holders of loans, but had become the originators and distributors to the capital markets of both credit and related risks. Selling loans that were once considered non-marketable assets signalled a fundamental change in banking activity. Two typical banking functions lost importance: liquidity transformation (Diamond and Dybvig, 1983) and delegated monitoring (Diamond, 1984). Banks are no longer the primary holders of illiquid assets and so securitizing banks have less incentive to monitor their borrowers (e.g. Pennacchi, 1988; Gorton and Pennacchi, 1995; Loutskina and Strahan, 2007; Keys *et al*., 2008; BIS, 2008). This potentially significant change in activity raises the question as to what induces (or induced) banks to revise one of their basic business activities.

Second, since the outset of the downturn, several scholars have stressed the link between securitization and the financial turmoil. Indeed, many of them find the main feature of the crisis in securitizations. Adrian and Shin (2008b) and Greenlaw *et al*. (2008) highlight the fact that "the current credit crisis has the distinction of being the first post-securitization crisis". Borio (2008) thinks that "the O&D model may have contributed both to the build-up of risk and to the turbulence that followed." Brunnermeier (2008) points out that "what is new about this crisis is the extent of securitization." As summarized by Draghi (2008c), securitizations are a double-edged sword. Together with the other credit risk transfer (CRT) instruments, securitizations have been viewed either as a positive element of financial innovation or as a negative device of the distorted incentives that preceded the credit crisis (Ashcraft and Schuermann, 2008; Shin, 2008). The positive view, prevalent before 2007 (e.g. Greenspan, 2000), emphasized the role played by

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[2] Here we refer to securitization as any activity involving the pooling and repackaging of loans into securities, which are then sold to different kinds of investors, typically other banks, insurance companies, pension funds, and mutual funds.

securitization activity in: enabling a more efficient allocation of risk to a wider range of agents; allowing more effective risk management; in relaxing constraints on credit availability; and enhancing transparency, pricing and market liquidity. In short, the positive view underlined in the coexistence of financial stability and the exceptional boom in credit growth. The negative view, which became predominant after the financial turmoil (BIS, 2008; ECB, 2008; FSF, 2008a) but existed before it (CGFS, 2003 and 2005; Rajan, 2005; Fender and Mitchell, 2005; BIS, 2006; Allen and Carletti, 2006), emphasizes that the securitization chain misaligns incentives, leads to contagion between different sectors, and increases the risk of crisis. However, sill recently, the FSF (2008a) confirmed that securitization markets and the O&D model worked well for many years and that, when accompanied by adequate risk management and incentives, they offer a number of benefits to loan originators, investors and borrowers. At any rate, even though the financial crisis is not the focus of our paper, the suggested link between securitization and the crisis renders the analysis of the determinants of bank securitizations even more interesting.

As dealt with in the next section, the literature agrees that the question of what the determinants of securitization are is mostly an empirical one. The question first arose during the 1980s when a strand of US research dealt with the determinants of loan sales, an instrument only partially different from loan securitization (Giddy, 1985; Pavel, 1986; Pavel and Phillis, 1987; James, 1988; Donahoo and Shaffer, 1991). More recently, while the literature examining the effects of securitization is more considerable,[3] a few papers took an empirical look at the other side of the cause-effect nexus. The bulk of work covers the case of the United States, but now there are some European analyses as well. This paper joins in this empirical research, which is reviewed in detail in the following sections. Our work has the advantage of: (a) analysing all the banks in a country, using Italian bank-by-bank data from 2000 to 2006 (the Italian law governing bank loan securitization was passed in 1999); (b) verifying the determinants of both the decision to securitize and the amounts securitized; (c) allowing for the securitized loans where the originator bank continues to bear the risk;; (d) using as a measure of capital requirements the real solvency position of the banks; (e) employing several econometric models; and (f) controlling for endogeneity, autocorrelation and heteroskedasticity problems.

Our findings are both robust and economically relevant. They show that bank securitization finance involves many decisions. The banks most likely to perform securitization

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[3] Empirical literature, which analyses the effects rather than the determinants of securitizations, provides evidence that the option of transferring credit risk reduced in the USA the incentives of banks to screen and monitor loans and lowered lending standards (Demyanyk and van Hemert, 2007; Mian and Sufi, 2007; Loutskina and Strahan, 2007; Keys *et al.*, 2008; Dell'Ariccia, Igan and Laeven, 2008).

are those that are less capitalized, less profitable, less liquid and more risk-prone,. They also tend to securitize larger amounts and to do so earlier.

The rest of the paper is divided into six sections. Section 2 reviews the possible reasons that spur banks to securitize their loans according to the literature. Section 3 describes our estimation models. Section 4 presents our data and provides some descriptive statistics on Italian bank loan securitizations. Section 5 shows our main results and compares them with the recent literature. Section 6 summarizes all our robustness checks. Section 7 concludes.

2. Literature

The literature dealing with securitization proposes four main determinants of the decision to securitize bank loans: the need for new sources of funding, the transfer of credit riskiness, the search for new profit opportunities, and the role of capital.[4]

The first reason to securitize is linked to liquidity and funding needs. Banks may sell loans in order to fund their assets without trying to attract more retail deposits owing to their shortage or cost (e.g. James, 1988; Stanton, 1998 and 2002; DeYoung and Rice, 2004; Parlour and Plantin, 2008). Similarly, banks may securitize loans instead of raising deposits because they compete with commercial papers if these are preferred by investors or in order to attract long-term funds (e.g. Estrella, 2002; Loutskina and Strahan, 2007). It is important to note that securitization provides a funding source that has the benefit of not being subject to deposit insurance and reserve requirements.

The second determinant regards risk exposure. As known, loan securitization represents one of the main instruments for transferring credit risk. Hence banks with a higher share of risky loans may securitize more in order to reduce the burden on their balance sheets (Cumming, 1987; Flannery, 1994; Dell'Ariccia, Igan and Laeven, 2008) or to reduce the related expected losses (Dahiya, Puri and Saunders, 2003; Marsh, 2006). By contrast, part of the literature suggests that banks could have an incentive to securitize high-quality loans and to retain low-quality loans. This happens when economic capital linked to market discipline is much less than regulated capital and highly risk-weighted assets allow a reasonable balance between return and safety.[5]

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[4] The literature on the transmission mechanisms of monetary policy highlights that loan securitization reduces the importance of the bank lending channel. In fact, thanks to securitizations, bank size is less important because they reduce the amount of loans on the balance sheet; bank liquidity becomes less worrying because of the short-term inflows of loan sales; bank capitalization should matter less because the transfer of part of the credit risk reduces capital requirements and permits an increase of lending supply. This strand of research is sufficient to infer three out of the four determinants of the decision to securitize.

[5] Other reasons to retain low-quality loans regard asymmetric information and bank reputation. First, riskier loans are harder for outside investors to value and hence they are more costly to sell due to the lemons problem. Second, since

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For example, banks could sell loans of high quality and use the proceeds to lend to riskier borrowers increasing the expected returns with no change in capital requirements, thus aligning economic and regulated capital (Greenbaum and Thakor, 1987). This idea is corroborated by Kohen and Santomero (1980), Kim and Santomero (1988), Flannery (1989) and Blum (1999), who argued that improperly chosen risk weights increase the riskiness of banks. Nevertheless, their analysis has been variously criticised. Furlog and Keeley (1989, 1990) and Rochet (1992) showed that capital requirements reduce risk-taking incentives if banks possess a diversified portfolio. In any case, in this debate, the basic effect on securitization would not be due to the quality of loans, but to capital requirements and to profit considerations, which represent specific further determinants of securitization (Drucker and Puri, 2006; Duffie, 2008).

The third determinant of securitization activity suggested by the literature refers precisely to profit opportunities. Securitization allows banks to recognize accounting gains, when the market values of loans exceed their book values, and overvaluation of the retained interest that is carried at fair market value in the case of securitizations (James, 1988; Flannery, 1989 and 1994; Donahoo and Shaffer, 1991; DeMarzo, 2005; Karaoglu, 2005). Moreover, banks can redeploy their sold loans towards more profitable business opportunities (Greenspan, 2004; Schuermann, 2004). In addition, banks may securitize loans designed specifically for an intermediation profit rather than for long-run warehousing (Duffie, 2008).

Finally, the fourth reason to securitize involves bank capital. In order to meet both economic capital requirements, linked to market discipline, and mandatory capital requirements, linked to regulation, banks traditionally had two ways to choose from. Either they altered the numerator, for instance by retaining earnings and issuing equity, or the denominator, by cutting back assets and reducing lending or shifting into low risk-weighted assets.[6] Securitization allows a third way: banks can adjust their capital ratios by engaging in securitization. Loan securitizations avoid the disadvantages of warehousing loans and then they automatically decrease regulatory and market capital requirements (Berger and Udell, 1993; Froot, Scharfstein and Stein, 1993; Jagtiani, Saunders and Udell, 1995; Carlstrom and Samolyk, 1995; Berger,

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securitization finance has a repeated game structure, banks have an interest in maintaining their reputation so as not to lose market access.

[6] A large volume of literature studies the general effects of capital requirements on banks' conduct and then on their balance sheet items (Hall, 1993; Berger and Udell, 1994; Kim and Moreno, 1994; Hancock, Laing and Wilcox, 1995; Shrieves and Dahl, 1992; Thakor, 1996; Jacques and Nigro, 1997; Aggarwal and Jacques, 1998; Jackson *et al.*, 1999; Rime, 2001; Aggarwal and Jacques, 2001; Dionne and Harchaoui, 2003; VanHoose, 2007). This literature shows that since it is often too costly to issue new shares and the cost of equity is generally perceived to be greater than the cost of debt, banks tend to reduce lending rather than to increase capital. Further, the literature on the bank capital channel literature shows that less-capitalized banks need to adjust lending more to absorb output shocks (e.g. Gambacorta and Mistrulli, 2004).

Herring and Szego, 1995; Allen, Jagtiani and Landskroner, 1996; Froot and Stein, 1998; Jackson *et al.*, 1999; Jones, 2000; CGFS, 2003; Altunbas, Gambacorta and Marqués, 2007; FSF, 2008a).

To exemplify, it is possible to list at least five not mutually exclusive cases in which bank capital can affect securitization finance. First, low-capitalized banks might securitize their loans to adapt to mandatory capital adequacy ratios, although adaptation to regulatory minimum requirements seems the least likely reason to release capital as banks, broadly speaking, continuously hold capital in excess of regulatory minima.[7] Second, more probably, less-capitalized banks may securitize loans to free up portions of capital, for example in order to expand new and, if possible, more profitable assets. Third, through securitization, faster growing banks will see the advantage of being healthy and maintaining low capital. Fourth, some banks might operate with lower average capitalization just because they choose to become skilful at securitizing loans on a regular basis. Fifth, less-capitalized banks may securitize loans to flaunt higher so-called capital cushions, when for example they are rewarded by rating agencies, or they may maintain levels of capital in excess of their minimum requirements as a means of satisfying market requirements.[8]

When the determinants of loan securitization involve bank capital, several scholars highlight that there can be the risk of regulatory capital arbitrage, in the sense that banks could use securitization to reduce their regulatory capital requirements spuriously (e.g. James, 1988; Flannery, 1989 and 1994; Donahoo and Shaffer, 1991; DeMarzo, 2005; Karaoglu, 2005; Jackson *et al.*, 1999; Jones, 2000; Calomiris and Mason, 2004; Jobst, 2005; Ambrose, Lacour-Little and Sanders, 2005; VanHoose, 2007; FSF, 2008a,b; Kashyap, Rajan and Stein, 2008; BIS, 2008; Borio, 2008; Parlour and Plantin, 2008; Draghi 2008a,b,c; Shin, 2008; Adrian and Shin, 2008a,b,c; Greenlaw *et al.*, 2008). Actually, the literature is not entirely unanimous even in the definition of regulatory capital arbitrage. Some authors effectively view regulatory capital arbitrage as opportunistic behaviour that arises only if there is a malicious intent (e.g. Jackson *et al.*, 1999; Jones, 2000; Jobst, 2005; FSF, 2008; BIS, 2008; Borio, 2008). Others point out that regulatory capital arbitrage could occur whenever a bank realizes a capital saving (e.g. Ambrose, Lacour-Little and Sanders, 2005) and in this sense, as argued by Kashyap, Rajan and Stein (2008), any system of capital regulation inevitably creates a tendency towards regulatory arbitrage. In any case, the general consensus stresses that capital saving may cause concern only

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[7] On this evidence and on the reasons why banks prefer holding capital ratios that exceed the regulatory minima, see Gropp and Heider (2007); Flannery and Rangan (2008); Berger *et al.* (2008); and Allen, Carletti and Marquez (2008).
[8] Van den Heuvel (2005) shows that even if capital is greater than regulatory capital requirements, lower capitalized banks may optimally forgo lending opportunities in order to lower the risk of capital inadequacy in the future. In a similar way, loan securitizations might be used.

if securitizing banks reduce their capital requirements without commensurately reducing their asset risk. On the contrary, if securitization truly transfers risks off the balance sheet, then lower bank capital ratios would be consistent with lower insolvency risk. Indeed, the theory argues that under certain conditions, if banks securitize through true sales and they do not retain risks in securitized loans, capital arbitrage is socially desirable because it allows a more efficient match between economic and regulatory capital (Calomiris and Mason, 2004). In this paper we analyse the effect of capital on the decision of engaging in loan securitization in line with the previously exemplified cases. By contrast, we do not deal with the issue of regulatory capital arbitrage, which would need an *ad hoc* analysis that goes beyond our purposes in this work.

Needless to say that the role of the single determinants reviewed so far can be linked. For example, if a bank securitizes its loans to release capital with the goal of striking out towards new and more profitable investments, the causal effect can be empirically found significant both for capital and profits. However, in the same way, the effects may be completely independent. For example, through securitization, banks can pursue new profits or solve funding needs even if they are well-capitalized. They can increase capital even if they have high profits. Therefore it is still worth analysing the role of all the determinants separately.

3. Methodology

To verify the *ex-ante* determinants of securitization activity, our general specification is as follows:

$$Y_{it} = f(X_{it}; Z_{it});$$

where *Y* are the bank loan securitizations; *f(.)* stands for a distribution function; *X* and *Z* contain mostly banks' individual characteristics; *X* are regressors proxying the four main factors underlying the securitization decision reviewed in the previous section: funding, risk transfer, profit opportunities and capital; *Z* covers control variables; sub-index *i* refers to banks and *t* to the time periods.

We carry out our estimations using different models because we investigate the double decision faced by each bank of whether or not to securitize and then how much, if any, to securitize.

In order to predict the probability that a bank securitizes its loans, we use both probit and logit models. In these models, the securitized loans' amount represents our latent variable, while the observed variable can only be equivalent to one (bank *i* securitizes) or to zero (bank *i* does not securitize). For the sake of brevity, logit and probit estimation results are reported alternately since they are very similar.

In order to estimate the share of loans that banks will securitize, we use three tobit models: the standard tobit model, the tobit II model and the random effects tobit model. In these models, the dependent variable has a constrained range that is zero for a substantial part of the population and is continuous: the share of securitized loans issued yearly by each bank, obtained as the yearly sum of monthly securitization operations, on total assets.

The first model, the standard tobit, has also been adopted by several related papers and this allows us to use the same framework to compare our outcomes with those of other papers on the same subject. The so-called tobit II model is used because it allows us to overcome empirical problems inherent to the standard tobit model. In fact, the structure of the standard tobit model (also defined as tobit I) could be too restrictive because the same covariates affecting the probability of a non-zero decision also determine the level of a positive observation. Empirically, the tobit II model, also referred to as the sample selection model and estimated by the Heckman two-steps approach, can be thought of as consisting of two parts: the first part describes the binary decision of whether to securitize or not; and the second part describes the distribution of the securitized loans for those banks which actually securitize. Finally, the random effects tobit model allows us to exploit the fact that our data are over-time and to pay attention to heterogeneity with the inclusion of individual effects in the conditional mean. The tobit model for panel data is usually estimated by random effects rather than by fixed effects because the fixed effects estimations require a very high number of periods (the so-called incidental parameter problem).

Our empirical analysis includes other models – the hazard model, instrumental variables (IV) regression, two generalized methods of moments (GMM) estimators – that are used only as robustness checks and are detailed in Section 6. In particular, the IV and GMM regressions, even if they are less appropriate for our data compared to the previous models, have the purpose to allow for endogeneity, autocorrelation and heteroskedasticity problems.

4. Data and bank loan securitization in Italy

Our estimations use annual Italian bank-by-bank data from 2000 (the first year after Italian law on bank loan securitization was passed) to 2006. Data refer to all Italian banks. Data on securitizations are drawn from two different sources that report different details: the Bank of Italy's accounting supervisory reports and the Italian Central Credit Register.[9]

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[9] The first data source reports information on monthly total securitized loans and the distinction between securitizations performed through special purpose vehicles and not. The Central Credit Register reports the amounts of securitizations performed either on performing loans or on bad debts, and the loan counterparty sector of activity.

Since we use Italian data, before proceeding to detail our dataset, it is interesting to describe some stylized facts on bank loan securitization in Italy. As in other countries, Italian securitization finance grew rapidly from 1999 onwards. In eight years, the number of special purpose vehicles (SPVs) reached more than 300 entities (Table 1). Bank loan securitizations for the year amounted to 16 billion euros in 2000 and this figure more than doubled in 2007. The number of banks performing at least one securitization operation rose from 29 in 2000 to 138 in 2007. Nevertheless, the kind of securitizations partially changed. The share of bad loans on total securitized loans decreased over time, apart from in 2005 (Figure 1). The percentage share of securitized loans to non-financial firms decreased from 74 per cent in 2000 to about 37 per cent in 2006-2007; while the percentage share of securitized loans to households increased from 22 per cent in 2000 to 48 per cent in 2006 and 58 per cent in 2007 (Figure 2).

As mentioned, our dependent variables are: in the probit and logit models, dummy assuming value 1 if bank i carried out at least one securitization operation during year t; in the tobit models, the share of yearly securitized loans by each bank on total assets. We preferred to use annual data because monthly figures would artificially multiply the number of observations and would entail a random distribution of securitization activity.

In assembling our dependent variables, we take into account those loans that, while securitized, remain on banks' balance sheets (retained securitized loans), drawing our information from Bank of Italy supervisory reports. In fact, securitized loans are often tranched into risk classes that display specific risk-return characteristics and the principle of subordination, according to which base the tranches of highest risk are most susceptible to default. In many cases, securitizing banks retain just the highest risk tranches and/or other tranches in order to overcome problems of adverse selection and moral hazard. In fact, there is a lemon problem intrinsic to securitization activity because banks have better information on the creditworthiness of their borrowers, and they could overstate the credit quality of the transferred loans and have an incentive to prematurely trigger a credit event. Just to align the interests of securitizing banks and investors, instruments such as pooling, tranching and retention of tranches have been devised (Gorton and Pennacchi, 1995; DeMarzo and Duffie, 1999; Duffee and Zhou, 2001; Kiff, Michaud and Mitchell, 2002; Morrison, 2005; Sufi, 2006; Pagano and Volpin, 2008). The retained tranches are not pure securitizations because they are securitized loans that remain on the balance sheet and hence they do not transfer risk. In order to allow for them, we subtract the yearly amount of

all retained securitized loans from the total yearly amount of securitized loans before obtaining our dependent variables.[10]

Table 2 reports the summary statistics of our variables. As shown, controlling for retained securitized loans reduces the number of our sample observations because it increases the missing values. However, as a robustness check, we also ran regressions without controlling for retained securitized loans.

Bank-specific covariates are drawn from Bank of Italy supervisory reports as well. Dummy variables apart, all regressors are ratios or natural logarithms. Our regressors proxy the four basic underlying factors in the securitization decision and some control variables. First, the ratio between total deposits and total assets proxies how the funding needs affect securitization activity. The sign should be negative since banks with a larger amount of deposits need fewer alternative financing sources. Second, the effect of risk assets is seized by the ratio of bad loans on total loans. The expected sign is positive if securitizer banks are those with low-quality high-risk assets. On the contrary, it is negative if banks retain riskier loans. Third, in order to assess the effect of capital, we use the effective solvency ratio calculated as the quotient between regulatory capital and credit and market risk weighted assets. The expected sign is negative if banks use securitization to release or to make free a portion of their capital. Fourth, the ratio of return on equity (ROE) weighs the effect of profit development on the securitization choice. Banks with lower profits are likely to resort to loan securitizations to improve their profitability.

The other bank-specific regressors are mainly used as control variables, i.e. to check the results allowing for other factors. However, these further regressors are susceptible to economic interpretation as well. The natural logarithm of total assets is a proxy of bank size. The expected sign is statistically significant if asset size matters in securitization activity. It is positive if only larger banks have the necessary skills to securitize their loans. The ratio between non-interest income and interest income is a measure of banking activity diversification. The effect on securitizations can be twofold. In fact, regarding the composition of banks' portfolios, securitizing allows banks to sell certain types of loans and to originate other types of assets to diversify their businesses (e.g. Demsetz, 1999); or alternatively, banks may sell loans in order to concentrate their loan portfolio on certain types of loans for which they have a comparative advantage, thus achieving economies of scale (e.g. Phillips, 1996). Therefore, the sign is expected

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[10] To control for retained securitized loans, we use other two methods to check for robustness (Section 6) because data on securitization and on retained securitized loans are partially different. The securitization data are the yearly sums of monthly securitization operations, while data on retained securitized loans are end-of-year stocks. However, since we analyse Italian loan securitizations since their introduction, when we subtract the year change of retained securitized loans from the total yearly amount of securitized loans, we obtain a good proxy of the real size of loans sold to outside investors.

to be positive if only those banks that differentiate their activity are able to securitize their loans; while the sign is negative if banks use loan securitization just to increase diversification and therefore the less diversified a bank is, the more likely that bank would be to securitize loans. The growth rate of loans can be read as measure of bank activity development or as a further proxy of liquidity needs to fund loan development. The ratios between bonds issued and government securities held in a bank's portfolio and total assets may be viewed as further measures of liquidity needs; the net interbank position/total assets ratio may be viewed as proxy of both funding and profit opportunities. The remaining covariates are two dummies assuming value 1 if bank i is a credit cooperative bank or if it is involved in a banking group. The two dummies are used tor see whether these types of banks have different incentives to securitize their loans.

Apart from these dummies, all regressors are calculated with a lag. The idea is that, for instance, supervisory capital in time t–1 affects the securitization decision in time t. Furthermore, these lags help to resolve possible endogeneity problems. Table 3 shows the correlation coefficients among variables.

5. Results

The results of our estimations are reported in Table 4 for four models (probit, tobit I, tobit II and random effects tobit) and two specifications. Our basic specification (1) contains the four main determinants of the decision to securitize proposed by the literature: funding, risk transfer, profit opportunities and capital. Specification (2) is different from specification (1) due to the presence of the lagged dependent variable. Its estimation allows us to control for heterogeneity and autocorrelation when we also run the two GMM estimators.

Even if in the discrete choice models, the accuracy tests (McFadden's pseudo-R^2 and $R^{2)}$ typically take values that are much lower than the R^2 in the OLS model, the Wald and LR tests indicate the good quality of our estimations. As for tobit II, the coefficient of λ does not allow us to reject the null hypothesis of no correlation, while the estimated correlation coefficient ρ equals only to -0.08 indicates that the tobit II model is appropriate. Even if there are changes in the coefficients' size, the results strengthen those of the other models because they are obtained after controlling for all determinants in the first step. In general, the four main determinants proposed by the literature to explain securitization activity are significant. Therefore our first result is that bank loan securitization is a composite and many-sided decision. Results are univocal and robust across methods and specifications, with the possible exceptions of the funding proxy and the lagged dependent variable, to which we return in detail in Section 6.

As far as the funding proxy is concerned, the coefficient of the ratio between total deposits and total assets in time t–1 is always negative. It follows that more liquid banks do not need to liquidate their loans. Nevertheless, maybe the funding reason is not decisive since its effect loses statistical significance when we apply the static random effects tobit model.

Banks with a strong share of bad loans on total loans in time t–1 engage in securitization more often and for larger amounts in time t. The result, always highly significant, is consistent with Pais (2005), Gorton and Souleles (2005), Bannier and Hänsel (2007) and Martin-Oliver and Saurina (2007), who find that riskier firms securitize more. On the contrary, this result is countered in De Marzo and Duffie (1999), Calem and Lacour-Little (2004), and Ambrose, Lacour-Little and Sanders (2005) according to whom assets of higher quality seem to be sold whereas poorer quality assets tend to remain on bank's balance sheets. However, as argued by Drucker and Puri (2006) and Duffie (2008), banks seem to securitize high-quality loans when other factors are not controlled for. In fact, banks would retain low-quality loans when their after tax return is higher than that of less risky assets and when economic capital linked to market discipline is much less than regulated capital (see Section 2). Since in our estimations, we capture the effect of capital and profits through specific regressors, the effect of bad loans is genuinely positive.

The effect of ROE in time t–1 indicates that the more profitable a bank is, the less likely it is to securitize loans. All the empirical literature obtained a similar relationship between profitability measures and securitization activity.

The ratio between supervisory capital and total risk-weighed assets in the period t–1 negatively affects both the probability and the size of securitization operations in time t. Our result is consistent with the results of other analyses (Passmore, Sparks and Ingpen, 2002; Calem and Lacour Little, 2004; Cebenoyan and Strahan, 2004; Calomiris and Mason, 2004; Karaoglu, 2005; Ambrose, Lacour-Little and Sanders, 2005; Pais, 2005; Jiangli and Pritsker, 2008). By contrast, four recent empirical papers (Minton *et al.*, 2004; Bannier and Hänsel, 2007; Martin-Oliver and Saurina, 2007; Agostino and Mazzucca, 2008) have partially disputed this result and therefore merit a brief review.

Actually, of those four papers, only one (Minton *et al.*, 2004) reaches a very different result, but they seem to follow a deductive argument. They say that since unregulated finance companies and investment banks are more likely to securitize than regulated banks, this implies that securitization is not for the purposes of regulatory capital arbitrage and therefore the effect of capital is not essential. Moreover, in their sample the share of financial securitizing firms is very small (around 4 per cent); their analysis is limited to larger firms, and their measure of the capital

ratio is not the solvency ratio but the simple quotient between total book value of equity and total assets.[11] The other three papers analyse European banks and, even if they de-emphasize the result of capital, they cannot actually deny its negative effect on bank loan securitization.Indirectly, therefore, their outcomes corroborate ours. Bannier and Hänsel (2007) make a cross-country analysis of a sample of European banks for the period 1997-2004 and conclude that securitization activity seems to be strongly affected by bank-specific characteristics rather than by macroeconomic factors. They underline that banks primarily use securitization to transfer and source risk in the market. However, although their information about tier 1 capital is only available for a subgroup of banks, they cannot reject the fact that this influences banks' incentives to reduce regulatory capital, mainly for stock-listed banks. Martin-Oliver and Saurina (2007) find that liquidity needs were the main driver of securitization activities in Spain between 1999 and 2006. Nevertheless, although these authors do not control for endogeneity in any way, when they extend the analysis to a tobit model, they recognize that the amount of assets securitized increases as the solvency ratio of the bank decreases. Agostino and Mazzucca (2008) conclude that the funding hypothesis is the most consistent. However, they can only analyse a sample of Italian banks between 1999 and 2006; they do not control for endogeneity and their controls for heterogeneity are limited. Nevertheless, when they extend their analysis by carrying out some robustness checks and by adding the random effects probit model to the probit one, they find that the role of capital becomes more significant.

In specification (2) we added the lagged dependent variable. As expected, its coefficient is the most unstable, signalling possible problems of autocorrelation and heteroskedasticity and thus we also used the two GMM estimators detailed in Section 6.[12] However, the results allow us to highlight two outcomes. First, the presence of the lagged dependent variable neither nullifies nor influences the results of the other variables. Second, whenever it is statistically significant, its sign is positive. Therefore the incentive to carry out loan securitizations increases if a bank has already securitized loans in the previous year and if the share of securitized loans was higher. This result could indicate the existence of economies of scale in securitization activity, as pointed out for instance by Minton *et al.* (1997). Alternatively, there could be a demand side effect, in the sense that investors tend to rely on banks that have previously succeeded in securitizing loans.

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[11] On the use of the solvency ratio as a preferable variable to analyse banks' conduct, see Gambacorta and Mistrulli (2004).

[12] A resoluble problem arises with the dynamic random effects tobit model if the process we are estimating has been going on for a number of periods before the current sample period. The dependent variable in the first period should be conditional upon the unobserved heterogeneity but without knowing the previous state. This is not the case in our exercises because we estimate Italian bank loan securitization activity from the outset. See Verbeek (2004); Baltagi (2005).

In order to measure the relative weight of the four regressors through their marginal effects, we exploit the basic specification (1) of both the probit model and the tobit I model.[13] What emerges is that even if loan securitization increased in our sample period as shown in Table 1, the probability of a loan securitization and the average share of securitized loans are on average relatively low. The probability of engaging in securitization is only 4 per cent and the average securitized loans/total assets ratio is 0.010. Banks' capital is the main determinant, by a small margin, of securitization both in terms of probability and of quantity. In fact, when we pass from the 25th to the 75th distribution percentile of the ratio of total deposits on total assets, the probability of loan securitization decreases from 6 to 4 per cent and the securitized loans/total assets ratio decreases from 0.012 to 0.009. It increases, respectively, from 4 to 5 per cent and from 0 to 0.015 for the ratio of bad loans on total loans and decreases from 6 to 4 per cent and from 0.018 to 0.008 for the ROE. When we consider the ratio between supervisory capital and total risk-weighed assets, the probability of securitization and the share of securitized loans on total assets assume the value of, respectively, 3 per cent and 0.004 at the 75th percentile; just under 6 percent and 0.018 at the 25th percentile, and 6 per cent and 0.019 at the Basle I threshold.

Table 5 shows the means of the four basic regressors and the statistical significance of their differences when we split the sample period of securitizer banks in three time spans: the years before the first securitization, the year of the first securitization and the years after the first securitization. The idea of this exercise is that if the four determinants have a role not only in dividing not-securitizing banks from securitizers (affecting the decision of securitizing and its amount) but also in splitting banks before and after securitization, this corroborates that the determinants did affect the decision to securitize. In other words, Table 5 confirms that the four factors are the driving forces behind the decision of securitization since securitization allows banks to modify them (for a similar approach, see for example Calomiris and Mason, 2004; Santos and Winton, 2009). Moreover, this exercise allows us to shed some light on how those factors change after securitization.

In particular, results show that there is a statistically significant difference between the stages before and at securitization, and the stages before and after securitization, while there is no significant difference between the first securitization and the following ones. This seems to imply that the subsequent operations do not have different determinants compared with the first securitization. Furthermore, results suggest that once banks securitize they operate with lower capital or put the capital they have into some new businesses, decrease the weight of bad loans, reduce the funds raised through deposits and then increase profitability. These results are

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[13] The marginal effects calculated on the other models and specifications provide similar results and are available upon request.

coherent with Jiangli and Pritsker (2008) who find that securitization was able to reduce risks and increase the profitability of US banks; and with Di Cesare (2009) who finds that Italian banks that securitized have a smaller share of bad loans and a reduction in their expected credit losses.

As expected, securitization does not seem to be used to comply with mandatory capital ratios since securitizing banks exceed the minimum requirements even before the first securitization. Neither result seems to corroborate the idea that securitization raises the levels of capital since this remains on average below the previous share of total assets. By contrast, results are consistent with the other options reviewed in Section 2: securitization can be used to operate with less capital and/or to free up portions of capital for expanding new assets and/or exploiting securitization on a regular basis.

6. Robustness checks

Robustness of the previous results has been checked in several ways. In this section, we summarize all our robustness checks and report some of them in Tables 6 and 7. However, the other checks are available on request. For example, as previously explained, our first check was on the alternation and the combination of models and specifications. Nevertheless, even if we applied all the methods to all our specifications (where appropriate) in order to ensure completeness and concision, in Tables 6 and 7 we variously combined eight models (probit, logit, tobit I, tobit II, random effects tobit, IV, Areallano Bond and GMM) on ten specifications. In particular, Table 6, which contains specifications from (3) to (8), demonstrates the stability of the results by adding and alternating the use of our control variables. Table 7, which contains specifications (9) and (10), shows the stability of the results allowing for endogeneity, heterogeneity and autocorrelation.

6.1 Adding fixed effects, control variables and time spans

One concern is that results may be driven by selection across banks and years. As a control for this and in general in order to allow for the possible effect of omitted variables or macroeconomic trends, we arranged our tests as follows. First, we added both a bank-by-bank dummy and a time dummy to our cross-section models, as exemplified in specifications (3) and (6). Second, we alternated the use of other control regressors. Third, in order to take account of the time elapsed for many banks before engaging in securitization, we re-ran regressions by splitting our sample period into different time spans. In all cases the results remained stable, including the lower statistical significance of the funding proxy.

As previously noted, our control explanatory variables, added in specifications (4), (5), (7), (8) and (10), may be interpreted as well. In addition to the deposits/total assets ratio, the

funding needs may also be captured also by the growth rate of loans in t–1, which has a positive impact on the amount of securitized loans in t (specifications 5, 7 and 8). This indicates that the development of bank lending increases the need to disinvest part of the loan portfolio and contributes to attribute a role to funding reasons. The natural logarithm of total assets in time t–1, which proxies the banks' size, affects positively both the decision and the share of securitized loans (specifications 4 and 5). The result indicates the importance of sophisticated bank management. The non-interest income/interest income ratio positively affects the share of securitized loans (specifications 5, 7, 8 and 10), supporting the idea that more diversified banks are more likely to carry out loan securitization operations. The two dummies capturing the credit cooperative banks and the institutions belonging to banking groups do not affect securitization finance in any way once the other determinants have been included (specification 8).

6.2 Controlling for endogeneity, autocorrelation and heterogeneity

As previously mentioned, a second concern regards the problems of endogeneity, autocorrelation and heterogeneity that may be present in our data. To control for these, we improve our analysis mainly by implementing other models: the IV and the GMM estimations. Needless to say, these regressions are less suitable to our data than the basic models used in Section 5. Nevertheless, even if with this *caveat* and albeit they are not our first choice, these models allow us to take account of those specific inferential problems.

In particular, the endogeneity problem was addressed in two ways. As described above, the first approach consisted simply in calculating all regressors with a lag. The second approach was based on the use of IV regressions, where the dependent variable is, as in the three tobit models, the share of volume issued by each bank each year. Since potentially all our four basic regressors may have problems of endogeneity with the dependent variable, we adopted a multiple endogenous regression, where for each potential endogenous regressor an instrumental variable is included. As a vector of instruments, we tested alternately either the same four basic regressors computed with two lags[14] or the other control regressors. In specification (9), we chose to present only the first case because the Staiger and Stock (1997) methodology, based on the significance and size of the coefficients in the first step of the instrumental regression, showed us that lagged regressors have better properties which turn out not to be weak instruments.

As far as heterogeneity is concerned, we adopted four tools. First, we already described the use of random effects tobit model. Second, in the probit and logit models, the observations were clustered at bank level, thus obtaining heteroskedasticity robust standard errors and controlling for possible autocorrelations across the same bank. Third, we added individual bank

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[14] Since the regressors were calculated with one lag.

dummies in some specifications of the probit and logit models, thus capturing bank-specific effects that are constant over time. As regards the tobit II model, the abstention model (first step) included, in addition to the basic regressors, the other control variables and both individual bank and year dummies. Fourth, in order to control the results of the dynamic panel data regression, we used both the two-step Arellano and Bond (1991) GMM estimator and the one-step system GMM estimator, where the dependent variable is defined as in the tobit and IV models.

The two GMM estimators allowed us to take into account both the autocorrelation, due to the presence of the lagged dependent variable among the covariates, and individual effects characterizing the heterogeneity among the banks. The Arellano-Bond procedure consists in first differencing the model to eliminate the individual effects and then using the lagged levels of the variables as instruments for the predetermined and endogenous variables. Instruments will be valid, and will therefore not be correlated with errors as long as these are not second-order autocorrelated. The one-step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) is an evolution of the Arellano-Bond one. It consists in adding to the system the original equations in levels in order to compound additional moment conditions and increase efficiency, particularly suitable in finite samples (Windmeijer, 2005).

Remarkably, the adoption of IV regression to take into account endogeneity issues (specification 9) and the use of two GMM estimators to take into account autocorrelation and heterogeneity (specification 10) do not change the signs and the statistical significance of the regressors, including the low stability of both the funding proxy and the lagged dependent variable. Results also confirm that, when statistically significant, the latter are respectively negative and positive. Moreover, also in the IV and GMM regressions, results remained stable even when we ran different specifications in addition to specifications (9) and (10) and when we used the other covariates as instruments instead of the two period lags of the four basic regressors.

6.3 Substituting the dependent variable

In our estimations, as dependent variables, we used data on securitizations drawn alternately from two different sources (Bank of Italy accounting supervisory reports and the Italian Central Credit Register) and the results remained the same. Moreover, we ran regressions allowing for retained securitized loans in three ways. First, as mentioned, we subtracted the yearly amount of all retained securitized loans from the total yearly amount of securitized loans before obtaining our dependent variables. Second, we added retained securitized loans/total securitized loans ratio as a control variable. Third, we corrected the solvency ratio on the basis of retained securities. Furthermore, we also ran regressions without taking account of retained

securitized loans. The results did not change. Likewise, in the tobit models, in the IV regressions and in both the GMM estimators, we alternately used the ratio of securitized loans either on total assets or on total loans as dependent variables. The results were confirmed.

6.4 Estimating the securitization of performing loans

Since banks securitizing (only) good loans could have different determinants compared with banks selling (also) bad loans, we ran an additional regression, where the dependent variable was the ratio of securitized performing loans (thus excluding bad securitized loans) on total assets (or total loans). The results of all covariates were confirmed including or not including the ratio between bad loans and total loans in the estimations. When this ratio is included, it assumes the negative sign instead of the positive sign as in all our specifications consistently showing that banks characterized by a high weight of bad loans carry out less securitizations of *in bonis* loans.

6.5 Controlling for the initial decision of engaging in securitization

Our results suggest that the decisions by banks to start engaging in securitization and subsequent securitization events are not driven by different forces. To further control for this, we adopted another estimation model: a duration model based on the Weibull distribution. In our framework the hazard model allows us to estimate the length of time that elapsed from the promulgation of the Italian law on securitization until its first application by each bank. This model also confirmed the sense of our four basic covariates: in addition to being more likely to perform securitization and for a larger amount, less capitalized, less profitable, less liquid and riskier banks used securitizations earlier.

6.6 Substituting our regressors

We substituted some regressors with variables defined in a different way. In particular, we focused our attention on the proxy of funding needs that, as mentioned, is the least statistically significant covariate among the four basic determinants proposed by the literature. We already argued that the positive effect of the growth rate of loans recognizes that funding reasons play a role. Furthermore, we used two other regressors in addition to the ratio between total deposits and total assets. The first is the ratio between bonds and total assets, the idea being that some banks could prefer or be more able to fund their businesses by issuing bonds rather than by attracting deposits. The second new proxy of funding needs is the ratio between government securities held in bank's portfolio and total assets. Here the idea is that banks holding more government securities, which are typically very marketable, have less liquid needs. We included the three liquidity proxies in the estimations either all together or alternating and variously combining their presence or summing their values. Moreover, we used them in all our models and specifications.

However, the sense of the results remained the same. When the bonds/assets ratio is used alone, its effect is insignificant; while the government securities/assets ratio is significantly negative as expected. When bonds are added to deposits or when the three variables are contemporaneously present, the effect of the deposits/assets ratio prevails and the results follow those found for it. For this reason, we chose to show the results of the deposits/assets ratio. In any case, it should be stressed that the signs and the statistical significance of the other regressors did not change.

Similarly, we substituted other variables. First, we adopted as a proxy of capital requirements the ratio alternately calculated as: at the numerator of the fraction either capital and reserves or mandatory capital, and at the denominator either total assets or risk-weighted assets. Second, we proxied the riskiness borne by banks with write-offs/write-downs of loans instead of bad loans. Third, we used the net interbank position as a possible proxy of the effect of profit opportunities and liquidity needs. All results were confirmed.

6.7 Outliers and quantile regressions

Results were confirmed when we allowed for outliers in each variable of our dataset, progressively removing 10%, 15% and 20% of tail observations. Results did not change running quantile regressions on all our covariates, though the levels of significance suffered from minor changes. This suggests that the relationship between securitization finance and its determinants does not change after a certain threshold. For example, as far as the role of capital is concerned, even among more capitalized banks securitization activity decreases in the solvency ratio.

7. Summing-up

Current events in financial markets have increased the interest in studying bank loan securitization. In this paper we investigated empirically its *ex-ante* determinants in the years before the crisis analysing individual Italian bank data from 2000 to 2006. Our results are based on a wide number of models, tests and checks. The use of several methods allowed us to control for endogeneity and to take account of autocorrelation and heteroskedasticity problems. Our outcomes confirm that in Italy, even though securitization finance increased, it was on average low. The results also show that bank loan securitization was a many-sided decision. Less capitalized, less profitable, less liquid and riskier banks were more likely to securitize their loans, they securitized more and they securitized earlier. Moreover, larger and more diversified banks and those with faster growing loans and with previous practice engaged in more securitization activity. Once banks securitized, they seemed to operate with relatively low capital (although with more capital than that required by mandatory requirements), they had fewer bad loans and deposits and they seemed to reach higher profits.

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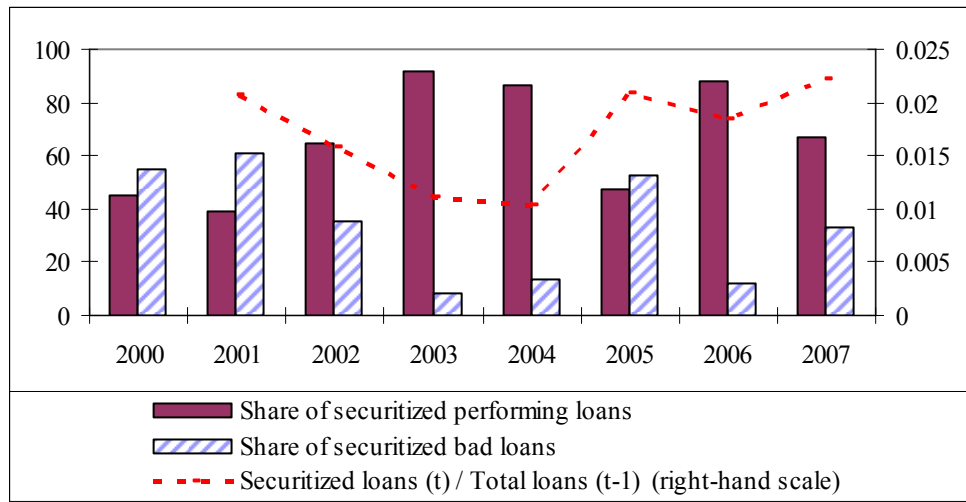
Tables and Figures

Table 1. Bank loan securitization activity in Italy: some structural indicators

	1999	2000	2001	2002	2003	2004	2005	2006	2007
Servicing in securitization	n.a.	n.a.	7	8	8	9	12	10	10
included in banking groups	*n.a.*	*n.a.*	*0*	*1*	*2*	*2*	*5*	*1*	*1*
additions during the year	*n.a.*	*n.a.*	*3*	*1*	*1*	*1*	*2*	*2*	*1*
Special purpose vehicles	n.a.	n.a.	67	133	178	206	237	276	312
included in banking groups	*n.a.*	*n.a.*	*18*	*30*	*37*	*43*	*42*	*44*	*47*
additions during the year	*n.a.*	*n.a.*	*50*	*66*	*45*	*33*	*35*	*45*	*46*
Total: Servicing + SPVs	**3**	**23**	**74**	**141**	**186**	**215**	**249**	**286**	**322**
included in banking groups	*2*	*6*	*18*	*31*	*39*	*45*	*47*	*45*	*48*
additions during the year	*n.a.*	*n.a.*	*53*	*67*	*46*	*34*	*37*	*47*	*47*
Number of banks performing at least one securitization operation	n.a.	29	45	86	74	75	94	115	138
included in banking groups	n.a.	26	35	57	55	50	60	50	n.a.
Number of securitization operations	n.a.	51	93	220	254	260	307	318	314
Total amount of securitization operations (billions of euros)	n.a.	15.8	20.5	18.0	13.7	13.9	29.6	28.2	37.1
Average amount of each operation (millions of euros)	n.a.	309	220	82	54	53	96	88	118

Source: Bank of Italy's Annual Report and supervision reports.

Figure 1. Bank loan securitization in Italy: performing and bad securitized loans

Share of securitized performing loans
Share of securitized bad loans
Securitized loans (t) / Total loans (t-1) (right-hand scale)

Sources: Bank of Italy accounting supervisory reports and the Italian Central Credit Register

Figure 2. Bank loan securitization in Italy: counterparty sector

General government   Financial institutions
Non-financial corporations   Households
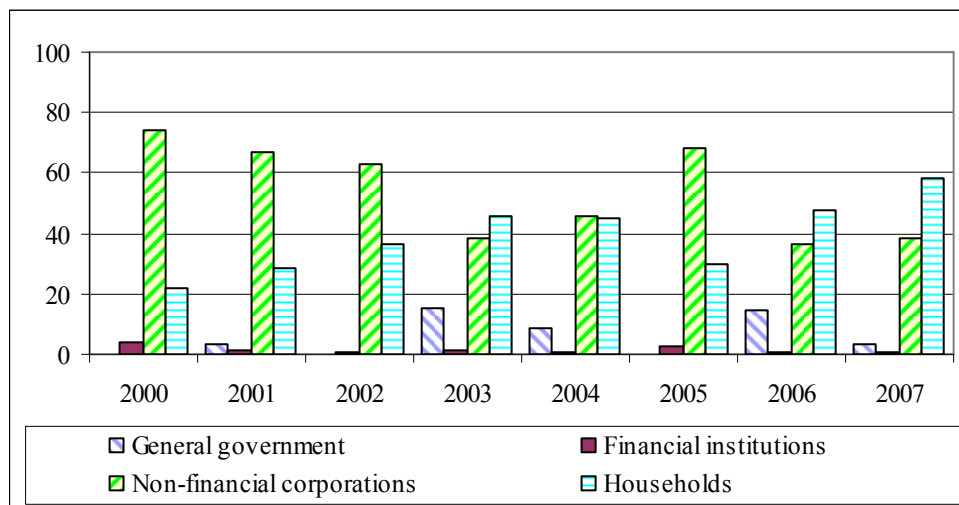
Source: Italian Central Credit Register

Table 2. Summary statistics

Variable	Proxy	Obs	Mean	Std. Dev.	Min	Max
Securitization dummy		5,482	0.094	0.293	0	1
Securitization dummy (corrected for retained securitized loans)	dependent variable in the probit and logit models	3,923	0.083	0.277	0	1
Year sum of monthly securitized loans / Total assets		5,481	0.011	0.228	0	0.110
Securitized loans (corrected for retained securitized loans) / Total assets	dependent variable in the tobit models, hazard model, IV regression and GMM estimators	3,923	0.010	0.267	0	0.110
Retained securitized loans / Total securitized loans	not transferred risk	5,445	0.089	1.89	0	1
Total deposits / Total assets	funding	5,481	0.439	0.823	0	1
Bonds / Total assets	funding	5,481	0.163	0.126	0	0.894
Government securities / Total assets	liquidity	5,481	0.142	0.122	0	0.818
Bad loans / Total loans	risk transfer	5,471	0.049	0.083	0	0.333
Regulatory capital / Total credit and market risk weighted assets	capital relief	4,772	0.103	0.045	0.055	0.471
Net interbank position / Total assets	liquidity and profit opportunities	5,481	0.022	0.252	-1	1
ROE	profit opportunities	5,419	0.111	0.563	-0.038	0.904
Ln (Total asset)	size	5,481	5.938	1.800	2.564	10.998
Growth rate of loans	businesses' development and funding	4,519	0.034	2.460	-1	0.702
Non-interest income/ Interest income	businesses' diversification	5,105	1.673	5.541	-2.856	14

Table 3. Correlation matrix

	Securitization dummy (corrected for retained securitized loans)	Securitized loans (corrected for retained securitized loans) / Total assets (t)	Total deposits / Total assets (t-1)	Bonds / Total assets (t-1)	Government securities / Total assets (t-1)	Bad loans / Total loans (t-1)	Regulatory capital / Total risk weighted assets	ROE (t-1)	Net interbank position / Total assets (t-1)	Ln (Total Asset) (t-1)	Growth rate of loans (t-1)	Non-interest income/ Interest income (t-1)	Cooperative bank dummy	Dummy for banks involved in a group
Securitization dummy (corrected for retained securitized loans)	1.000													
Securitized loans (corrected for retained securitized loans) / Total assets (t)	0.103*	1.000												
T deposits / T assets (t-1)	-0.049*	-0.021	1.000											
Bonds / Total assets (t-1)	0.109*	-0.022	-0.085*	1.000										
Government securities / Total assets (t-1)	-0.223*	-0.040	0.101*	-0.061*	1.000									
Bad loans / Total loans (t-1)	-0.011*	0.237*	0.175*	-0.148*	0.149*	1.000								
Regulatory capital / T risk weighted assets (t-1)	-0.194*	-0.004	0.137*	-0.268*	0.430*	0.250*	1.000							
ROE (t-1)	-0.030	-0.022	-0.010	-0.065*	-0.001	0.014	0.111	1.000						
Net interbank position / Total assets (t-1)	-0.103*	-0.067*	0.186*	0.016	0.230*	0.114*	0.278*	-0.053*	1.000					
Ln (Total asset) (t-1)	0.364*	0.034	-0.187*	0.090*	-0.467*	-0.225*	-0.406*	-0.051*	-0.324*	1.000				
Growth rate of loans (t-1)	0.003	-0.002	0.033	0.017	0.021	-0.084*	-0.017	0.001	0.008	-0.011	1.000			
Non-interest income / Interest income (t-1)	-0.006	0.069*	-0.001	-0.086*	-0.060*	-0.027	0.046*	0.000	0.087*	0.008	0.015	1.000		
Cooperative bank dummy	-0.235*	-0.036	0.106*	0.157*	0.561*	0.030	0.212*	0.198*	0.168*	-0.655*	0.053*	-0.091*	1.000	
Dummy for banks involved in a group	0.271*	0.039	-0.103*	-0.102*	-0.554*	-0.024	-0.272*	-0.184*	-0.187*	0.680*	-0.053*	0.082*	-0.816*	1.000

Table 4. Determinants of bank loan securitization activity
Basic specification (1) and specification (2) including the lagged dependent variable

Regressors	Probit		Tobit I		Tobit II	Random effects Tobit	
	(1)	(2)	(1)	(2)	(1)	(1)	(2)
Total deposits / Total assets (t-1)	-0.656 **	-0.511 *	-0.566 ***	-0.741 ***	-0.091 ***	-0.011	-0.078 ***
	0.317	*0.299*	*0.105*	*0.145*	*0.260*	*0.008*	*0.026*
Bad loans / Total loans (t-1)	1.261 ***	1.257 ***	2.501 ***	2.688 ***	1.448 ***	0.984 ***	1.163 ***
	0.408	*0.403*	*0.236*	*0.269*	*0.085*	*0.061*	*0.077*
Regulatory capital / Total credit and market risk weighted assets (t-1)	-11.778 ***	-9.531 ***	-9.431 ***	-9.991 ***	-0.415 ***	-0.313 ***	-0.384 ***
	2.136	*1.791*	*0.911*	*1.017*	*0.119*	*0.089*	*0.118*
ROE (t-1)	-3.399 ***	-2.962 ***	-2.627 ***	-2.741 ***	-0.178 **	-0.147 ***	-0.147 **
	0.916	*0.794*	*0.426*	*0.482*	*0.071*	*0.043*	*0.061*
Lagged dependent variable		1.108 ***		1.748 ***			-0.001
		0.101		*0.303*			*0.093*
Constant	-0.121	-0.533 ***	-0.037	0.041	0.035 **	0.008	0.035 **
	0.158	*0.137*	*0.068*	*0.077*	*0.014*	*0.009*	*0.014*
Lambda					-0.022		
	n.a.	n.a.	n.a.	n.a.	*0.077*	n.a.	n.a.
Observations	3,749	3,749	3,913	3,145	3,162	3,913	3,145
Number of groups	n.a.	n.a.	n.a.	n.a.	n.a.	760	707
Pseudo R2	0.113	0.187	0.141	0.149	n.a.	n.a.	n.a.
McFadden R2	0.486	0.529	n.a.	n.a.	n.a.	n.a.	n.a.
Wald Chi2	105.93	242.48	n.a.	n.a.	302.33	264.93	234.17
Rho	n.a.	n.a.	n.a.	n.a.	-0.078	n.a.	n.a.
LR Chi2	n.a.	n.a.	378.8	351.18	n.a.	n.a.	n.a.

This table reports regression coefficients and associated standard errors in italics. Dependent variables: in the probit model dummy assuming value 1 if bank *i* carried out at least one securitization operation during year *t*; in the tobit models and in the Heckman two-step estimator, the share of yearly securitized loans by each bank on total assets. We subtracted the yearly amount of all retained securitized loans from the total year amount of securitized loans before obtaining our dependent variables. Specifications (1) and (2) are the same for each method, varying one from the other due to the presence of the lagged dependent variable. As for the tobit II model, the abstention model (first step) includes, in addition to the basic regressors, the other control variables and both individual bank and year dummies. ***, **, * denote, respectively, statistical significance at the 1%, 5% and 10% level; n.a. means not applicable. Blanks indicate that the variable was not used in the specification.

Table 5. Securitizing banks:
means over time of the four basic determinants of loan securitization

Variables	all years	years before the first securitization			year of first securitization		years after the first securitization
	mean	mean	*difference with year of first securitization*	*difference with years after the first securitization*	mean	*difference with years after the first securitization*	mean
Supervisory capital / Total assets	0.089	0.094	***	***	0.083	n.s.	0.086
ROE	0.063	0.055	*	***	0.063	n.s.	0.072
Total deposits / Total assets	0.379	0.426	***	***	0.351	n.s.	0.338
Bad loans / Total loans	0.042	0.047	*	**	0.037	n.s.	0.038

Table reports the means and the statistical significance of the differences of the four basic determinants of bank loan securitization when we split the sample period of securitizing banks in three spans: the years before the first securitization, the year of the first securitization and the years after the first securitization. *** and * denote, respectively, statistical significance at 1 and 10% level; n.s. means statistically not significant.

Table 6. Determinants of bank loan securitization activity
Specifications (3) - (8) including control variables

Regressors	Probit	Logit	Tobit I		Random effects Tobit	
	(3)	(4)	(5)	(6)	(7)	(8)
Total deposits / Total assets (t-1)	-1.341 *0.946*			-0.500 *** *0.108*	-0.098 *** *0.026*	-0.099 *** *0.027*
Bad loans / Total loans (t-1)	12.559 *** *4.538*	2.181 *** *0.661*	3.432 *** *0.307*	2.563 *** *0.238*	1.548 *** *0.088*	1.549 *** *0.088*
Regulatory capital / Total credit and market risk weighted assets	-17.534 ** *7.917*	-15.735 *** *3.645*	-6.561 *** *0.999*	-9.506 *** *0.915*	-0.467 *** *0.118*	-0.474 *** *0.122*
ROE (t-1)	-9.096 ** *4.017*	-4.921 *** *1.541*	-1.854 *** *0.482*	-2.618 *** *0.427*	-0.159 ** *0.071*	-0.161 ** *0.071*
Ln (Total assets)(t-1)		0.229 *** *0.053*	0.159 *** *0.016*			
Lagged dependent variable		1.777 *** *0.177*	1.381 *** *0.291*			
Bank-by-bank dummy	included					
Year-by-year dummy				included		
Growth rate of loans (t-1)			0.032 * *0.019*		0.025 *** *0.006*	0.025 *** *0.006*
Non-interest income/ Interest income (t-1)			0.017 *** *0.004*		0.005 *** *0.001*	0.005 *** *0.001*
Cooperative bank dummy						-0.001 *0.018*
Dummy for banks involved in a group						-0.004 *0.019*
Constant	0.459 *0.319*	-2.897 *** *0.562*	-1.646 *** *0.168*	-0.208 ** *0.098*	0.026 ** *0.014*	0.029 *0.022*
Observations	923	3,749	3,059	3,913	3,126	3,126
Number of groups	n.a.	n.a.	n.a.	n.a.	701	701
Pseudo R2	0.173	0.191	0.191	0.146	n.a.	n.a.
McFadden R2	0.734	0.532	n.a.	n.a.	n.a.	n.a.
Wald Chi2	n.a.	299.29	n.a.	n.a.	342.14	342.2
LR Chi2	n.a.	n.a.	444.69	393.53	n.a.	n.a.

This table reports regression coefficients and associated standard errors in italics. Dependent variables: in the probit and logit models, dummies assume value 1 if bank *i* carried out at least one securitization operation during the year *t*; in the tobit models, the share of yearly securitized loans by each bank on total assets. We subtracted the yearly amount of all retained securitized loans from the total yearly amount of securitized loans before obtaining our dependent variables. For the sake of completeness and brevity, the results of each specification are shown by way of example on different models. ***, **, * denote, respectively, statistical significance at the 1%, 5% and 10% levels; n.a. means not applicable. Blanks indicate that the variable was not used in the specification.

Table 7. Determinants of bank loan securitization activity
Specifications (9) and (10) allowing for endogeneity, autocorrelation and heterogeneity

Regressors	IV	Arellano-Bond	System GMM
	(9)	(10)	(10)
Total deposits / Total assets (t-1)	-0.130	0.002	-0.064 **
	0.082	0.002	0.031
Bad loans / Total loans (t-1)	1.346 ***	0.567 ***	1.307 ***
	0.091	0.094	0.095
Regulatory capital / Total credit and market risk weighted assets (t-1)	-0.431 ***	-0.139 ***	-0.394 ***
	0.137	0.048	0.131
ROE (t-1)	-0.134 *	-0.08 ***	-0.163 **
	0.079	0.024	0.082
Lagged dependent variable	-0.029	0.01 ***	-0.010
	0.097	0.00	0.106
Non-interest income/ Interest income (t-1)		0.003 **	0.006 ***
		0.001	0.001
Constant	0.052 *	0.003 ***	0.017
	0.028	0.001	0.015
Observations	3,136	3,050	3,067
Number of groups	n.a.	683	684
Adj-R2	0.065	n.a.	n.a.
Wald Chi2	n.a.	130.22	212.76
Over-identifying restrictions: p-value	n.a.	0.626	0.000
Test for AR(1): p-value	n.a.	0.029	0.373
Test for AR(2): p-value	n.a.	0.789	0.844

The table reports regression coefficients and associated standard errors in italics. Dependent variable: the share of yearly securitized loans by each bank on total assets. We subtracted the yearly amount of all retained securitized loans from the total yearly amount of securitized loans. For the sake of completeness and brevity, the results are only shown for two specifications. Instruments are the lagged regressors. In the two-step Arellano-Bond (1991) GMM estimator, tests for AR(1) and AR(2) check that the average autocovariance in first order and second order residuals, respectively, is zero. In the one-step system GMM estimator, tests for AR(1) and AR(2) check for the presence of first order and second order serial correlation in the first-difference residuals. ***, **, * denote, respectively, statistical significance at the 1%, 5% and 10% levels; n.a. means not applicable. Blanks indicate the variable was not used in the specification.

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