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SECURITIZATION IS NOT THAT EVIL AFTER ALL

by Ugo Albertazzi[*] Ginette Eramo[*], Leonardo Gambacorta[♣] and Carmelo Salleo[**]

Abstract

A growing number of studies on the US subprime market indicate that, due to asymmetric information, credit risk transfer activities have perverse effects on banks' lending standards. We investigate a large part of the market for securitized assets ("prime mortgages") in Italy, a country with a regulatory framework analogous to the one prevalent in Europe. Information on over a million mortgages consists of loan-level variables, characteristics of the originating bank and, most importantly, contractual features of the securitization deal, including the seniority structure of the ABSs issued by the Special Purpose Vehicle and the amount retained by the originator. We borrow a robust way to test for the effects of asymmetric information from the empirical contract theory literature (Chiappori and Salanié, 2000). Overall, our evidence suggests that banks can effectively counter the negative effects of asymmetric information in the securitization market by selling less opaque loans, using signaling devices (i.e. retaining a share of the equity tranche of the ABSs issued by the SPV) and building up a reputation for not undermining their own lending standards.

JEL Classification: D82, G21.
Keywords: securitization, asymmetric information, signaling, reputation.

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Contents

1. Introduction[1]

Prior to the financial crisis, securitization was one of the defining features of the financial landscape. Banks went from being delegated monitors of borrowers, monitored in turn by depositors (Diamond and Dybvig, 1983), to being essentially underwriters of their own loans and investors in other banks' securitized assets. Securitization was thought to have stimulated loan supply, increased the liquidity of banks' balance sheets, allowed a broader range of investors to access a class of assets hitherto limited to banks and, by increasing risk diversification, to have improved financial stability (Duffie, 2007). The originate-to-distribute (OTD) model was also considered to have helped to satisfy a growing demand for safe assets (Caballero and Krishnamurthy, 2009). In fact, in 2006 the volume of asset-backed securities (ABS) issuance amounted to around 4 trillion dollars in the United States and the European Union, a value comparable to that of gross corporate bond issuance.

Then, in 2007, the bursting of the housing bubble in the United States and the collapse of the subprime mortgage market ignited the most severe global financial crisis since 1929. By the end of 2009, banks in the United States and the European Union had to be heavily recapitalized with taxpayers' funds, massive stimulus packages were put in place to avoid a repeat of the Great Depression and loud demands were heard for regulatory reform of the financial industry. Meanwhile, the market for securitized assets shrank: in 2009, ABS issuance plummeted to 1 trillion dollars and was concentrated exclusively in the US agency sector and in European securitizations used for refinancing activities with the ECB. The US subprime and Alt-A market vanished. Securitization and the new intermediation model were blamed for financial instability and for the price paid by the economy (Keys et al., 2010).

As after 1929, banks are being accused of taking advantage of informational asymmetries. Bankers' greed caused great outrage and, just as after 1929, there are plans to

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restrict banks' "proprietary" trading activities (the so-called "Volcker Rule", which draws on the initiatives by the former chairman of the Federal Reserve Paul Volcker and has been included in a set of regulations proposed on January 21, 2010 by president Barack Obama to Congress) and to re-regulate banks, for instance by increasing capital requirements for securitized assets (BCBS, 2009). But is securitization per se really so much to blame and to fear?

The basic issue with securitization is the role of asymmetric information. In particular, banks rely on soft information to grant and manage loans. Since this information cannot be credibly transmitted to the market when loans are securitized, banks might lack incentives to screen borrowers at origination or to keep monitoring them once the lending has been securitized (Gorton and Pennacchi, 1995; Morrison, 2005; Parlour and Plantin, 2007). There are also theoretical reasons why new issuance in loan secondary markets might collapse and the adverse selection problem might worsen when the collateral values used to secure the underlying loan fall (Chari et al, 2010).

Such perverse incentives would not operate if banks could find ways to overcome or at least mitigate the effects of asymmetric information at the moment of securitization.[2] First, banks may choose to securitize loans that have a relatively low content of soft information (Drucker and Puri, 2007). Second, they might retain a high share of the securitized portfolio's risk by keeping the most junior (equity) tranche as a signaling device of its (unobservable) quality or to express a commitment to keep monitoring borrowers. And since banks do not resort to securitization as a one-off process but deal with investors on a continuing basis, reputational concerns should deter them from selling lemons (Fender and Mitchell, 2009). In principle, while trying to burnish their own reputation, they might even choose to securitize loans of better-than-average (although unobservable) quality. Similar dynamics have been emphasized for banks underwriting securities issued by firms that are also their borrowers, as shown by Kroszner and Rajan (1994) for the 1920s and by Gande et

[2] Note that asymmetric information could produce frictions both i) at the securitization stage and/or in terms of suboptimal screening activity at loan origination and ii) after securitization, in terms of suboptimal monitoring. While the latter problem is relevant for the implications on financial stability, the former one, which is the focus of this paper, is relevant not only to directly evaluate the efficiency of the securitization market but also to consider the probability that the second kind of distortions could emerge. In other words, based on the theoretical models available, if there were no asymmetric information at the securitization stage, it

al. (1997) for the 1990s. Finally, there are theoretical arguments suggesting that securitization is actually optimal from a security design perspective, as it is necessary to provide the correct incentives to screen and monitor borrowers.[3]

The impact of securitization on screening/monitoring activity needs to be tested empirically. The evidence on the whole supports the thesis that the rise of subprime mortgages was accompanied by a decline in lending standards (see Dell'Ariccia et al., 2008; Mian and Sufi, 2009; Keys et al., 2010; 2011).

Despite the broadly convincing results supplied by these empirical studies, they have certain limitations that could give rise to doubts as to how far they can be generalized to other contexts and markets. First, some are based on aggregate data that are ill-suited to exploring issues of asymmetric information. Because of limitations in the information set, those based on micro data need to make assumptions about the loans that are actually securitized. Second, all these papers focus on the US subprime mortgage market, which is only a small segment of the credit market (representing less than 10% of all securitized mortgages in the U.S., and close to zero in the European Union) and one with very unique characteristics. In particular, subprime mortgages are much riskier than other mortgages (by definition) and also more information-intensive, since they are granted to borrowers with little or no track record.

In this paper, we set out to investigate banks' behavior concerning the larger part of the market for securitized assets, i.e. prime mortgages. It is worth noting that prime mortgages in the Italian market have no government guarantee, unlike the case in the US where Fannie Mae and Freddie Mac set minimum standards.[4] However, as in the US, the class of mortgages we analyze can be considered as low default risk and are typically granted to borrowers with good credit records and a monthly income that is at least three to

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would be less likely the occurrence of misalignment of incentives and dangers for financial stability in a second time.

[3] Chiesa and Bhattacharya (2007) argue that the payoff structure under securitization can enhance banks' incentives, compared to debt financing, in environments where, because of the presence of aggregate risk, banks would be rewarded too much for luck and too little for their effort. See also Gorton and Souleles (2005), for an alternative story based on bankruptcy costs.

[4] For more details on the institutional characteristics of the securitization market in the US see, among others, Frame and White (2005) and Krainer and Laderman (2009).

four times greater than their monthly housing expenses. In Italy the subprime market segment has not been able to develop because an Interministerial Credit Committee resolution has fixed the maximum loan-to-value (LTV) ratio at 80%. The LTV can exceed the 80% and rise as far as 100% of the market value of the house only if additional specific guarantees are provided (Casolaro, Gambacorta and Guiso, 2005).

Moreover, in Italy the supervisory authority has taken a very cautious prudential approach on securitization: banks may securitize primarily to facilitate turnover in the loan portfolio and to increase funding. From a prudential perspective, when there is no transfer of risk through the securitization deal, there is also no benefit in terms of reduction of regulatory capital requirements. Finally the Bank of Italy, the Italian supervision authority, demands a high level of disclosure in balance sheets on the characteristics of securitization deals. All this ensures that the securitization deals we consider here are mainstream transactions that concern only prime loans.

Our sample consists of a unique dataset of about one million household mortgages originated by 50 Italian banks in the years 1995–2006. This sample presents important advantages over existing studies. First, as already pointed out, it consists of prime mortgages, as is the case for most of the market. Second, the richness of information contained in the database allows us to control for a wide set of relevant characteristics that are not available in existing studies. These include loan-level variables, characteristics of the originating bank and, most importantly, contractual features of the securitization deal including, in particular, the seniority structure of the securities issued by the special purpose vehicle (SPV) and the amounts retained by the originator.

Our analysis also differs in the methodology used, which in our case is suggested by the similarity between the securitization market and the insurance market: both exist to allow the transfer of risk across agents. In particular, in order to test for the existence of asymmetric information, we use the framework first devised by Chiappori and Salanié (2000) for insurance contracts which, applied in the context of mortgage securitization, consists in estimating jointly two models: the probability of a loan being involved in a securitization deal and its probability of default. The explanatory variables in both equations are given by the set of variables which are observable by the "insurer" and which can affect one of the two probabilities. The test consists in evaluating the sign and significance of the

correlation between the error terms of the two equations. Loosely speaking, a correlation that is significantly positive is evidence that asymmetric information is at work in the securitization process. This methodology also helps to corroborate existing findings on the quality of households' mortgages in Italy obtained in Bonaccorsi and Felici (2010) who, based on single-equation probit regressions, document that, ex post, securitized loans exhibit a lower probability of default (in this last paper, however, no attempt is made at dealing with the endogeneity and asymmetric information dimensions of the problem).

Beyond these methodological aspects, our analysis has several other distinguishing features. One is that, as a byproduct of the testing strategy used, we obtain evidence on the characteristics of the loans that are securitized, an interesting piece of information. Most importantly, we exploit information on the structure of the securitization deals such as: the amount of the securities (ABS) issued by the special purpose vehicle (SPV) involved in the securitization, and this for each seniority class (junior, mezzanine, senior); the amount that is retained by the originating bank; the characteristics of these securities (rating, spread, maturity). Thanks to the richness of the dataset we are able to compute and use measures of the risk that is actually transferred to the market, which is a crucial element in assessing the effects of securitization on screening and monitoring incentives. We also study the pricing of these securities by checking if it takes into consideration the possible presence of asymmetric information. Overall, this information allows us to produce evidence of the two devices adopted to counteract the negative effects of asymmetric information on lending standards: signaling through retention of ABS and reputation building. To our knowledge, this is the first paper to do so.

Our main result is a strong rejection of the hypothesis of a positive correlation between the error terms of the probability of being securitized and the probability of default. On the contrary, such a correlation turns out to be significantly negative, suggesting that banks securitize loans that are on average less risky than the ones they keep in their portfolios. Consistent with previous findings on how banks deal with such issues, the choice of the loans securitized is shown to play a role in overcoming asymmetric information. Beyond this, we provide new direct evidence that the structure of the securitization deals is also chosen so as to diminish the costs of asymmetric information. None of these factors, however, is sufficient to fully capture why we get a negative correlation of the residuals,

rather than a positive one or none at all. One possible interpretation of this result, which is robust to changes in the set of control variables and in the econometric setup, is that banks, particularly at the early stage of the securitization market life, are strongly committed to building up a reputation that will allow them to ensure continued access to this important source of funding. This would be consistent with the traditional certification role performed by banks, as emphasized by Drucker and Puri (2009), who analyze straight loan sales. We provide evidence corroborating this interpretation, by looking at the dynamics of this correlation over the sample period.

The broad policy implication of the paper is that the securitization of prime mortgages can function well. The criticism leveled at rating agencies that they have granted undeserved investment-grade status to certain types of CDOs or ABS-HEL securities does not necessarily hold for "traditional ABS". The sample analyzed in this paper of "prime mortgages" showed a very low risk profile and therefore the OTD model per se cannot be blamed for having induced a deterioration in lending standards.[5] These results may also depend on the very cautious prudential approach taken by the Italian supervisory authority, which demands a high level of disclosure.

The remainder of the paper is organized as follows. Section 2 reviews the literature on securitization and outlines the contribution of our paper. Section 3 discusses the characteristics of the dataset and some institutional characteristics of the securitization market in Italy. Section 4 describes the estimation strategy. Section 5 discusses the results and their robustness by using different econometric approaches. The final section summarizes the main conclusions.

[5] This is not to say that OTD model does not pose any problem at all, but only that these are of a different nature. For example, securitization may allow an excess maturity transformation and as such create room for the "bank-run" type of crises. Although this is beyond the scope of this paper, it is useful to emphasize that there are other factors, beyond the adoption of the OTD model, which may have contributed to the low quality of the securitized loans in the United States like, in particular, the government guarantees supplied to the government-sponsored agencies (such as the Federal National Mortgage Association, known as Fannie Mae, and the Federal Home Loan Mortgage Corporation or Freddie Mac, established in 1938 and 1968, respectively) which enhanced mortgage loan liquidity by issuing and guaranteeing, but not originating, asset-backed securities.

2. Review of the literature on securitization

Adverse selection and moral hazard in the context of loan sales have been studied from different perspectives. Straight loan sales, mostly in the form of loan syndication, reduce the risk borne by the originating bank and therefore affect banks' incentives to screen loans ex ante and monitor them ex post. Gorton and Pennacchi (1995) present a theoretical model of incentive-compatible loan sales and empirically document that banks retain a larger share of the riskier loans to mitigate incentive problems. Sufi (2007) shows that the more opaque the borrower, the more concentrated the syndicate; Focarelli et al. (2008) provide evidence that the more concentrated the syndicate the lower the interest rate investors require. Along similar lines, Drucker and Puri (2009) find that sold loans contain more restrictive and additional covenants, especially when informational problems are more severe. They also find that selling loans does not hamper the lending relationship. This evidence is consistent with banks taking into account the role of informational asymmetries and finding ways of compensating for it.

Papers on syndicated loans use loan-level data but a typical deal does not involve pooling and tranching (except in some respects for Gorton and Pennacchi, 1995), which are the essential features of securitization transactions and define how risk is managed by both parties. Furthermore, the buyer knows the identity of the borrower being sold and is able to collect relevant information on her; therefore there is less scope for informational asymmetries than with an undefined portfolio of assets.

Benmelech et al. (2011) depart from the previous papers by analyzing collateralized loan obligations (CLO), a form of securitization in which the underlying loans are to middle sized and large business loans (typically a fraction of syndicated loans). In particular the authors investigate whether securitization was associated with risky lending in the corporate loan market by examining the performance of individual loans held by CLOs. Interestingly they find that adverse selection problems in corporate loan securitization are less severe than commonly believed: these loans perform no worse and, on some criteria, even better than unsecuritized loans of comparable credit quality. Since securitized loans are typically fractions of syndicated loans the authors claim that the mechanism used to align incentives in a lending syndicate also reduces adverse selection in the choice of the CLO collateral.

A second strand of the literature examines directly how securitization affects the willingness of lenders to bear the cost of monitoring and screening. Keys et al. (2010) measure the default rate of a sample of sub-prime loans and find evidence consistent with securitization being correlated with lower loan quality. They conclude that securitization is accompanied by adverse selection. One important limitation of their study is that they don't observe directly which loans are securitized so they must rely on a number of reasonable and smart assumptions on the FICO score to identify the relationship between securitization and credit risk. Furthermore, they ignore the differential effects that lender and contract characteristics can have on lenders' behavior. Keys et al. (2011) confirms the finding that securitization had an effect on subprime mortgage lenders' screening standards.

Dell'Ariccia et al. (2009) show that bank lending standards declined more in areas with higher mortgage securitization rates. This does not say much about the specifics of securitization deals but it does seem consistent with an impact of securitization on bank behavior (moral hazard). Since their dataset is aggregated at the local level, they can't measure the riskiness of individual loans and the behavior of individual lenders.

Keys et al (2009) also look at securitization and moral hazard. They find that the more regulated originators generate loans of higher quality; they interpret this result as an effect of the fact that less regulated originators are more highly leveraged and therefore more fragile. They also find that "having skin in the game" (keeping a share of the securitized loans) also makes for better-quality loans. Their general conclusion is that market incentives reduce moral hazard better than regulation. This paper is based on broadly the same data as the ones used in the paper mentioned above and suffers from the same limitations.

Similar comments hold for Mian and Sufi (2007), who infer a causal relationship between supply expansion and subsequent increases in mortgage default rates by using US zip codes to estimate within-county variation in latent demand for loans before the supply expansion occurred. In particular they show that zip codes with higher denial rates as of 1996 experienced a disproportionate increase in the supply of credit from 2001 to 2005, as the risk tolerance of the originators increased. These counties also experienced different increases in both debt-to-income ratios and in the fraction of mortgages sold in secondary market within one year of origination. Also this paper uses aggregate data that force the authors to make crucial assumptions and do not take into account differences among

originators and in securitization contracts. Finally, Krainer and Laderman (2009) use loan-level data in California to show that loans securitized with public agencies (the so-called Government-Sponsored Enterprises) are less risky than those sold to the market through private vehicles but the choice of whether to go through GSEs is considered as exogenous.

The papers on securitization confine themselves mostly to the US subprime market. The institutional characteristics of this market are such that it constitutes a very special case of securitization, from which it would be difficult to infer general conclusions about other segments of the securitization market (i.e. the much larger market for prime mortgages). Furthermore, the use of aggregate data forces the authors to make assumptions about the most important variable of their studies, i.e. the riskiness of originated loans and its evolution after securitization.

In this paper we unite the two strands of the literature on loan sales by using loan-level data with the characteristics of individual borrowers and lenders, as in the work on syndicated loans, and by examining deals that involve pooling and tranching as in the papers on securitization. Furthermore, we study prime mortgages, which constitute the vast majority of loans, and we venture outside the US to check how informational asymmetries play out in a country such as Italy with an institutional and regulatory framework similar to what is prevalent in the European Union.

Our database allows us to measure the riskiness of the borrower, to consider how certain bank characteristics (in terms for example of risk appetite, or propensity to securitize) affect their behavior and to use the information about the securitization deal (for example, whether the originator keeps the junior tranche) to understand how contractual features might help mitigate information effects.

We tackle two major challenges to empirical research in this area. The first is the endogeneity of the securitization decision. For example, loans that are bundled and sold as securities may differ in several dimensions from loans that are not securitized. We mitigate this problem by using a research strategy that directly analyzes the likelihood for a loan to be securitized or not, based on its individual characteristics. In doing so we are able to identify directly, without any arbitrary assumptions, which loans are securitized, to control for their individual characteristics and to compare them to non-securitized loans. The second is related to data availability on contractual terms, interest rates, characteristics of the seller

and of the transaction when analyzing the effect of informational asymmetries: the lack of data generally forces researchers to make at most indirect inference. We overcome this limitation thanks to the characteristics of our dataset, whose richness of information is extremely relevant in order to analyze the relative importance of adverse selection and moral hazard in securitization.

Since securitization involves a transfer of credit risk and is therefore similar to an insurance contract, we use a conceptual and empirical framework first developed for insurance contracts (see Section 4) to analyze directly the role of informational asymmetries. Therefore we are able to draw firm conclusions about adverse selection and moral hazard in the context of securitization.

3. Some stylized facts on the market for securitization in Italy

Italy's asset securitization market developed much later than America's, originating with the introduction of a specific law[6] and the launch of the single European currency.[7] As shown in Graph 1, the growth in euro-denominated securitization started in 2000 and accelerated strongly from the end of 2004 onwards; at the end of 2006 the annual net flow of asset-backed securities issuance in Italy was around one quarter of total securitized assets in the euro area. Italian banks securitized mostly mortgages to households and did not engage in sub-prime lending. Since the last quarter of 2007 the Italian securitization market has remained heavily distressed and almost all the ABS of Italian banks reported in Graph 1 (see shaded area) have been self-retained and used as collateral in refinancing operations.[8]

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[6] Unlike in the United States and United Kingdom, where a common law system is in place, most continental European countries possess a continental law framework under which a specific regulation is required to issue asset-backed securities. In this respect, Belgium, France, Germany, Greece, Italy, Portugal and Spain had to enact specific laws to remove obstacles to the development of securitisation. On the basis of Italian law, all special purpose vehicles need to be registered, to be included in a list, and they must report data to the Credit Register. Not all countries have this type of legal context.

[7] The introduction of the euro has given a strong impulse to the corporate bond and securitization markets (ECB, 2007). The disappearance of exchange rate risk among euro-area countries, the increase in financial integration (Baele et al., 2004) and a more market-based financial system have all contributed to enhancing the liquidity and size of the securitization market. As a result, institutional investors increased their cross-country exposure while issuers gained access to a broader pool of potential investors. At the same time, increased bank competition also helped by lowering underwriters' and managers' fees.

[8] Much ABS issuance in Italy (and in the euro area) since the end of 2007 has been related to their use as collateral in Eurosystem refinancing operations. According to informal estimates from market participants,

In this paper we analyze about one million mortgages contracts originated by a sample of 50 Italian banks over the period 1996-2006 and sold after the introduction of the Securitization Law. Around one fifth of these loans have been sold to the market in more than 80 securitization deals worth more than 23 billion euro. The sample represents more than 80% of bank lending that has been securitized in Italy (see Table 1).

We have constructed a database that links a number of different sources. From the Italian Credit Register we obtain information on the amount lent, the interest rate, the type of contract (fixed or adjustable rate, subsidized or not, date and place of origination), the age, gender and native town of the borrower. From information derived from the special purpose vehicles (SPVs) involved, we get information about the actual performance of the

approximately 90% of euro-denominated ABS issued in 2008 seems to have been used as collateral for ECB liquidity standing facilities rather than sold to the markets. This percentage is even higher if we consider only residential mortgage backed securities (RMBS).

securitized loans and, in particular, whether they have defaulted or not.[9] From the database of the Banking Supervision Department of the Bank of Italy we obtain information on each securitization deal (book and market values of the loan portfolio, the ratings of the relevant ABS and, for each seniority class, how many of these securities are repurchased by the originating banks) and most relevant characteristics of the banks. Importantly, for all the banks in the sample, we obtain information on all loans originated, including both those which are then securitized and those which are not.

Table 2 presents some statistical information on securitized and unsecuritized mortgages considering the main characteristics of the borrower and the lender. Looking simply at descriptive statistics the delinquency rate of securitized mortgages is lower (by around a third) than other mortgages. This finding does not rule out the hypothesis that the securitization market is subject to asymmetric information problems. Precisely because of asymmetric information, banks tend to securitize loans with specific characteristics and, in particular, those that are less opaque (for instance, we will see that loans to borrowers in some Italian regions where the assessment of credit risk is harder are less likely to be securitized). As these characteristics may be correlated with risk (borrowers in these regions also tend to be riskier), one may observe that securitized loans are less risky, even in the presence of asymmetric information.

The hypothesis that securitized loans tend to be less information-sensitive is supported by the other descriptive statistics, with just a few exceptions. A high proportion of securitized household mortgages has some form of subsidization in the interest rate (39% against 31% for the other mortgages). These mortgages on preferential terms, negotiated directly by the borrower's employer with the bank, are typically granted to civil servants or employees in large companies whose credit risk assessment is presumably less difficult. Joint mortgages represent more than half of the contracts in the sample. These are home loans, secured by real property as with regular mortgages, but granted to more than one

[9] We analyze defaulted mortgages up to December 2009. This date should include most of the defaults of loans originated in the period 1996-2006. Indeed, data on doubtful loans calculated by the Italian Credit Register indicates that repayment difficulties are typically encountered in the first part of the life of the mortgage with a maximum reached after 18 months (Bonaccorsi and Felici, 2010). See also Banco de España (2007) for a similar analysis on Spanish mortgages.

party. Typically, a joint mortgage is issued to married couples, which choose to apply for a single mortgage in order to combine their incomes and qualify for a higher loan amount. Joint mortgages imply that both borrowers are liable for repaying the loan. The plurality of guarantees attached to these contracts renders soft information less relevant for their credit risk assessment.[10] The percentage of joint mortgages is somewhat higher in the group of securitized loans.[11] Looking at the location of borrowers, those living in Southern Italy, the poorest part of the country, and with weaker legal enforcement, are less often securitized (12% against 16% for the whole sample).

Other descriptive statistics are not strongly in line with the idea that loans securitized are less information-sensitive. Around 18% and 16% of contracts have been subscribed respectively by borrowers less than 40 years old and by female borrowers. The percentages are slightly lower among securitized loans, although these borrowers could be regarded as less information-sensitive. Young people are more likely to be without a credit record and so no bank can have private information on their default probability, while female borrowers have been shown to be significantly more reliable borrowers than men (for the Italian market, Alesina et al., 2008).

Finally, there is a set of characteristics which are not directly related to the level of opaqueness of the borrower, but with implications for the level of risk. Fixed interest rate mortgages represent 14% of the whole sample, while the vast majority is at variable or semi-variable rates. Fixed-interest rate loans, which are presumably less risky for the borrower as installments stay constant when interest rates rise, are less frequent among securitized loans. On the other hand, the difference between the interest rate paid by borrowers and the corresponding interest rate on the yield curve for a similar length of the contract (the spread, a direct measure of the risk premium charged by the lender) is lower for securitized mortgages. The size of the loan is also a proxy of risk, as more highly leveraged borrowers are more likely to default. No significant differences emerge across securitized and non-securitized loans with respect to this variable.

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[10] This is relevant for Italy but would not be in other contexts, such as the U.S., where mortgages are often non-recourse loans (loan contracts where the collateral is the unique source of repayment in case of default, as the borrower is not personally liable).

[11] In a similar vein, Drucker and Puri, 2008 document that loans sold in the secondary markets for loans contain increasingly restrictive covenants.

The last part of Table 2 shows some characteristics of the banks in the sample, measured at the moment of loan origination (in terms of liquidity and capitalization). Liquidity (cash plus government bonds) is expressed as a percentage of total assets. The degree of capitalization is given by the difference between the level of prudential capital and minimum capital requirements (excess capital) over total assets. The literature has emphasized that different banks may engage to different extents in the securitization activity.[12] In our analysis, banks characteristics are used to allow for the possibility that the market infers the quality of the loans securitized also by looking at the features of the originating bank.

The first part of Table 3 gives some basic information on the securitization deals in terms of number of originating banks, seniority of the tranches (senior, mezzanine, equity) and share of each kind of seniority tranche retained by the originating intermediary. The table also highlights other important information on the quality of each operation: the rating attached to each securitization tranche, the average maturity of the pool of mortgage contracts in each tranche, the share of fixed-term mortgage contracts in each tranche, the proportion of mortgages for which the accounting value is lower than the nominal value (a measure of how much these have been "discounted" before being bundled and sold).

The analysis of the deals reveals that most transactions (70 up to 81) were originated by a single bank. Some 91% of securitized mortgages is represented by senior tranches with a very high rating and a low spread (25 basis points). The mezzanine component is 8% of the total, with lower rating and medium-level spreads (73 basis points). The equity tranche is limited to 1% of the total and it has a low rating and high average spread (104 basis points). Overall 41% of all tranches has an investment grade rating.

Data also reveal that around two thirds of all equity tranches were directly retained by the originating banks (11% for the mezzanine and 4% for the senior components, respectively). This seems to be an interesting signaling or commitment device that helps to reduce asymmetric information problems between the contractual parties and to align the interests and incentives of originators and investors. The average maturity extends from 25 years for the senior tranche to 34 years for the equity tranche. Almost all these securities are

[12] For recent papers see Panetta and Pozzolo (2010) and Affinito (2010).

at variable rate for senior and mezzanine tranches, while there is a non-negligible share (13%) of the senior tranches that is fixed-rate. In a very limited number of cases (0.4%) the accounting value of the mortgages turns out to be lower than their nominal value, in connection with losses of market value of these assets – which is due, for instance, in the case of fixed-rate mortgages, to changes in the levels of interest rates.[13] Neglecting these features of the deals, which capture the use of screening, monitoring and commitment devices, is likely to lead to an underestimation of the importance of asymmetric information. At the same time, by comparing the results obtained with and without these control variables, we can assess how effective these signaling and monitoring devices may be in attenuating the frictions generated by asymmetric information.

4. The estimation strategy

4.1 The basic framework

The methodology we apply to detect the relevance of asymmetric information effects is inspired by the similarity between the securitization market and the insurance market, as they both transfer risk across agents in the economy.

The main testable prediction of the theory on asymmetric information applied to insurance markets is that, among observationally equivalent agents seeking protection from risk, those who choose a *more comprehensive coverage* are also those characterized by a *higher accident probability*. The methodology proposed to implement this empirical test is conducted in two steps (Chiappori and Salanié, 2000; for an extensive survey see Chiappori et al., 2006).

The first step of the identification strategy requires estimating jointly, conditioning on all available information to the insurer, an equation for the probability of choosing the more comprehensive coverage contract and an equation for the probability of an accident. In

[13] It has to be kept in mind that we considered only the securitization of performing loans. We basically neglected securitizations of bad loans as in these deals issues of asymmetric information can play only a marginal role (the default has already been realized). At the same time, changes in the macroeconomic environment can induce a revision of the assessment of the default probability, even in the absence of a default. In principle, the difference between the accounting value of the mortgages in the SPV balance sheet and their nominal value may also partly reflect these considerations.

symbols, denoting Y_i a dummy equal to 1 if the insured i chooses the more comprehensive coverage contract and 0 otherwise, Z_i a dummy equal to 1 if the insured i who has an accident i chose the more comprehensive coverage contract and 0 otherwise, X_i a vector of observable characteristics of i, the two equations can be written as:

$$\text{Prob}(Y_i = 1 | X_i) = F_y (\beta_{y,0} + \beta_{y,1}' X_i + \varepsilon_{y,i}) \quad (1)$$

$$\text{Prob}(Z_i = 1 | X_i) = F_z (\beta_{z,0} + \beta_{z,1}' X_i + \varepsilon_{z,i}) \quad (2)$$

where F_y and F_y are two appropriate CDFs and $\varepsilon_{y,i}$ and $\varepsilon_{z,i}$ two well-behaved error terms. The second step requires to test the null hypothesis that $\varepsilon_{y,i}$ and $\varepsilon_{z,i}$ are not positively (significantly) correlated.

This test can be implemented also in the context of securitization. In order to do so, it is necessary to figure out, in the context of securitization deals, what is the risk which is transferred, who is the insurer, who is the insured and what is the menu of contracts the insured can choose from.

As already pointed out, the securitization market is a kind of insurance market where banks can buy protection from the risk of default of the loans in their portfolio. The insured is therefore the bank originating the loans, the insurer is the "market" (the set of investors purchasing the securities issued by the SPV and therefore bearing the risk of default of the underlying loans), the risk transferred is that of default on the loans moved onto the SPV balance sheet and the menu of contracts among which the insured can choose ranges between the two extremes of "full coverage" and of "no coverage". The former simply corresponds to the case in which an individual loan is included in a securitization operation (and no equity tranche is retained); the latter corresponds to the opposite case in which such a loan remains on the balance sheet of the originating bank.

Adopting these definitions, the analysis consists in testing the sign of the correlation of the residuals of two equations like (1) and (2) estimated on the cross-section of all the individual loans included in the sample and where Y_i is a dummy equal to 1 if loan i has

been securitized and 0 otherwise, Z_i = 1 is a dummy equal to 1 if the individual loan defaulted and 0 otherwise, X_i is a vector of the observable characteristics of loan *i*. [14]

4.2 Defining the vector of observable characteristics X_i

One important condition which needs to be satisfied when testing asymmetric information is that the characteristics observable by the insurer and relevant for the risk profile (for example, age or gender) are duly controlled for. The reason is that observable risk is likely to affect the choice of the coverage level (for instance, because the pricing of the insurance scheme is typically conditional on observable characteristics) and, moreover, to be correlated with unobservable risk. Failing to control for observable risk would induce biased results. In the specific context of securitizations one additional difficulty is that of assessing what is included in the information set of the insurer. One can make several conjectures.

4.2.1 Individual loan-level information

First, one has to evaluate if the market has information at the individual loan level or not. In principle, it is unlikely that investors purchasing the SPV-issued securities have access to such a detailed set of information. One plausible assumption would be that the market just looks at the overall characteristics of the deal, as summarized in the rating of the ABS.

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[14] There are other ways to implement the test of asymmetric information proposed by Chiappori and Salanié (2000) in the context of securitization. One alternative possibility would consist in adopting a more aggregate approach by considering the risk of losses on a given *loan portfolio*. In such a case, the contracts with "more comprehensive coverage" would be represented by the deals where the originating bank retains more of the securities issued by the SPV. In order to evaluate how much risk is actually retained, it would be necessary to consider the composition of the portfolio of securities issued by the SPV (i.e. how important are the equity and the mezzanine tranches) and, within each seniority class, how much is purchased by the originating bank. With this approach, the test of asymmetric information would require to consider only the *cross-section of securitization deals* and to verify if those with a lower level of risk retention are also those in which the loan portfolio exhibits a higher default frequency. This is different from what we have in this paper where the test of asymmetric information consists in verifying, in the *cros-section of all loans*, if those which are securitized are less likely to default. We focus on the disaggregate approach because the use of micro-level data compared to more aggregate information, has the big advantage of exploiting a much finer and larger set of information (in the dataset, we have information on more than one million of mortgages, compared to more than 80 securitization operations). In particular, given the different hypothesis which can be made about what is included in the market's information set, the use of individual loan data also allows us to check what happens once we condition on individual loan characteristics..

On the other hand, it should be taken into account that these deals are often conducted through arrangers, typically international investment banks. The main role of these institutions is to materially organize the deals and an important part of this activity precisely consists in verifying the quality of the loans involved (for instance, by inspecting the relevant documents but also by direct examination of the underlying real estate). Depending on how easily the arranger can transmit such information to third parties, one cannot exclude that through such activity all information asymmetries are resolved and this is why in the benchmark regressions the vector of control X_i includes the available characteristics at the individual loan level. These are represented by a large set of dummies capturing both borrower's characteristics (mainly age, gender, place of birth, place of residence, distance from the lender's headquarter) and contract's characteristics (size of the loan, interest rate spread, date of origination, type of interest rate indexation, if it is a mortgage on preferential terms/rate, if it has a joint liability).

The number of controls we utilize to take into account heterogeneity in observable risk at the individual loan level is quite large. On top of that, we also have the spread applied on each loan. The spread is a "catch-all" variable that summarizes all the characteristics relevant for the risk profile.[15] This is particularly true in our regressions, where we also control for differences across loans in the lender's market power in the *local* market (see below). This should be sufficient to overcome some limitations of the dataset, such as the lack of information on the loan-to-value ratio, the length of the mortgage contract and the income of the borrowers.

4.2.2 Characteristics of the originating bank

A second issue concerns the possibility that the market assesses the quality of the securitized loan portfolio by looking also at the characteristics of the originating bank. One obvious reason for this is that banks may show different ability or willingness in screening borrowers. Accordingly, in the analysis we take into account of a number of bank-specific characteristics that have been shown in the literature to be relevant in influencing loan supply, in particular, the level of bank capital, the liquidity ratio, banks' size, their market

power and profitability. These time-varying bank features are taken, for each loan, at the date of its origination.

As pointed out by Chiappori and Salanié (2000) in the case of the insurance market the choice of whether to get full coverage or not could also be determined by totally different factors (say, preferences or risk aversion) that, by coincidence, turn out to be positively correlated with risk. To address this issue, in some regressions we also take into account all, even unobservable, time-invariant bank features by including a set of bank dummies.

4.2.3 Characteristics of the securitization deal

While it is not clear if the market information set includes the characteristics of the individual securitized loans, it certainly includes all the relevant characteristics of the securitization deal, such as: the size of the whole deal, the seniority structure of the portfolio of SPV-issued securities, the characteristics of these securities (maturity, spread, rating), the discount applied as measured by the difference between the nominal value and the sale price of the entire portfolio. As already emphasized, an important aspect of a securitization transaction is represented by the share of securities retained by the bank (within each seniority class). This information is important for two reasons: first, if the bank retains some risk, the risk actually borne by the market mechanically decreases; second, it is commonly argued that such risk retention by the originating bank is a signaling device to certify the quality to the market (or, equivalently, it is a commitment device to continue monitoring these loans).

Other characteristics of the deal which we consider are the number of originating banks (a large number of lenders may generate coordination failures and an associated reduction of the loan portfolio quality) and the experience of the originating bank in the securitization market (how many deals it carried out before the one considered). The latter feature is meant to capture possible reputational effects which may induce "beginners" to sell above-average quality loan portfolios.

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[15] This is perfectly consistent with market practices. For instance, in the syndicated loan market, loans are classified (into leveraged and non-leveraged) *only* according to the spread.

As a final remark, it is useful to point out that in our analysis it is not necessary to take into account the pricing of the "insurance". In models of asymmetric information, both the principal and the agent are assumed to be rational and to correctly anticipate each other's equilibrium strategic behavior. The insurer anticipates that the "full coverage" contract is more likely to be picked up by agents that exhibit both higher observable and non-observable risk, and will price accordingly (lemon "discount"). This, however, is irrelevant for the test as it can be shown that, in general, the equilibrium (endogenous) pricing does not change the implications of asymmetric information on the correlation between contract choice and accident probability (see Chiappori and Salanié (2000) for a discussion on this point).

4.3 Alternative approaches

In order to evaluate the robustness of the results obtained with respect to the methodology used, we also conduct a treatment effect analysis where the (endogenous) treatment of the individual loan consists in including it in a securitization deal. The main advantage and at the same time the main limitation of this more structural approach consists in forcing us to make some identification assumptions. In particular, in the treatment equation the probability of being securitized is assumed to be exogenously influenced by bank characteristics not included in the main regression for the default probability, such as the location of the bank headquarters (a dummy for banks located in Southern Italy), bank profitability (ROE) and, for each loan, the bank's market share in the local market where the loan is issued. The most important limitation of this approach, which is the reason why we explore it for the sake of a robustness test, is that it requires a linear form for the main regression, which might not be satisfactory in our context where the dependent variable is the default dummy.

5. Results

5.1 The empirical strategy

Given our analogy with the insurance industry, in using the Chiappori and Salanié (2000) framework we must define the information set of the "insurer", in our case the buyers

of securitized products. In the best case scenario, buyers have as much information as we have about individual loans and borrowers and about originators. This is entirely plausible, since arrangers offer a third-party certification service that includes checking individual contracts, and they have the incentive to be as thorough as possible. However buyers might have less information (e.g. they might not know in detail the characteristics of the contracts, borrowers or originators). In this case, if we include information that is not available to them, we bias the result in the direction of excluding asymmetric information effect (we would be overestimating the information set of the "insurer"). Therefore we start by using all the control variables we have, then exclude some.

In general before using the bi-probit specification illustrated in section 4.1 we run a basic probit regression in which the dependent variable is *Z* (equals to one in case of default, zero otherwise) and we include among the independent variables *Y* (equals to one if the mortgage is securitized, zero otherwise). Clearly *Y* has a high chance of being endogenous, but this first run gives an intuition of what the results might be.

Our control variables allow us to analyze asymmetric information across space: differences among borrowers, types of contract and originators, characteristics of the securitization deal. We then check whether asymmetric information effects change across time, and whether they depend on the degree of risk transfer of the deal. Finally, we run robustness checks, in particular by using treatment effect models for the endogeneity of the securitization variable.

5.2 The baseline setup

As a preliminary step, we start by running a basic probit regression that models the probability of default conditional on the set of control variables and on the dummy for securitized loans (see Table 5, Column I). The set of control variables represents the market's information set which is assumed to include contract types, individual borrower's characteristics and bank and origination year fixed effects.[16]

[16] As previously pointed out, we could make several assumptions about what is included in the market's information set and what is not. Below, we will illustrate and discuss the results obtained under several alternative choices.

The main result of the baseline regression, a probit with all the information available, is that the coefficient for the Securitized dummy variable is negative and highly significant: securitized loans are much less likely to default (column II of Table 5 provides the marginal effect, around 3% less than other mortgages). This result is consistent with Bonaccorsi di Patti and Felici (2010), who find that Italian securitized mortgages are less likely to be delinquent and to default.

Now a short discussion of the coefficients of the control variables, even though what we really care about is the relationship between securitization and risk. Since these coefficients are stable in terms of magnitude and significance across most specifications we don't comment on them in the other sections.

The coefficients of the variables that describe the borrowers' characteristics are all significant and with the expected sign. Mortgages on preferential terms have a lower probability of default; as they are granted mostly to employees of large firms or civil servants, with higher job security and more stable salaries, they may be expected to be less risky than average. Fixed-rate mortgages have a lower probability of default, maybe also because they leave part of the interest rate risk with the lender (this finding is in line with Paiella and Pozzolo, 2007). Borrowers from Southern Italy have a higher probability of default, corroborating the idea that this part of the country is distinguished by a higher "background risk" (see, among others, Panetta, 2003). And, as already shown in the literature, women borrowers have a lower probability of default (Alesina et al., 2009). Young borrowers (under 40) have a higher probability of default (for the U.S. see Athreya, 2008), probably reflecting their higher income uncertainty. Joint mortgages turn out to be less risky, as intuition would suggest since the presence of an additional guarantor reduces default risk. The coefficient for loan size reveals that larger mortgages have a higher probability of default, reflecting the effect of leverage on risk. The greater the distance to the bank's headquarters, the higher the probability of default. Similar findings have been explained by arguing that the soft information used by banks to assess creditworthiness is more widely available where the bank has its territorial roots and where costs of monitoring tend to be lower (see Berger et al. 2005; Casolaro and Mistrulli, 2009). The dummy Emigrant takes the value of 1 if the borrower's residence is in a province that is different from the province of birth, and of 0 otherwise. This variable should capture additional

asymmetric information effects as there might be less soft information on borrowers who might not have been in the same place for long. As expected, loans to Emigrants are more likely to default.[17]

Finally, loans with higher spreads have a higher probability of default. As the spread is in theory a sufficient statistic for the bank's assessment of the borrower's risk, this should come as no surprise. In our setup, where we control directly for many of the borrower's characteristics, the spread captures differences in the level of risk connected with those which are relevant for the assessment of credit risk, but are not available in the dataset (borrower's income, the loan-to-value ratio and maturity of the mortgage).

We then discuss variables that describe bank-specific characteristics. Again, although we are not directly interested in assessing the role of these variables in the default equation, we also consider them as in principle the market might evaluate the quality of the securitized assets by looking at the characteristics of the originator.[18] All variables are measured at the moment of origination of the loan. The excess capital to assets ratio is defined as the difference between total supervisory capital and supervisory requirements, over total assets. Loans granted by banks with higher excess capital are more likely to default. This is consistent with the idea that the level of bank excess capital is chosen by financial intermediaries in a way that is consistent with its risk profile: highly capitalized banks choose an overall riskier strategy (and grant high-risk loans). Mortgages granted by banks with a higher liquidity ratio (cash and securities over total assets) display a lower default probability

The results of this basic probit regression, however, cannot be taken at face value as many of the right-hand variables are clearly endogenous: the risk profile of the borrower is likely to influence the choice of loan contract. Most importantly, an issue of endogeneity may arise in particular for the dummy for securitized loans which, precisely because of adverse selection, may be itself influenced by the default probability.

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[17] There are few coefficients switching their sign in the regression for the probability of being securitized. As already pointed out, these coefficients are those of a reduced form and we should not attach too much emphasis to them. Nonetheless, we will show that in more complete specifications their sign will again be the "correct" one.

[18] All the regressions in Table 4, including those already remarked, include bank-fixed effects.

As explained in Section 4, the way to proceed, based on the framework developed by Chiappori and Salanié (2000), requires us to estimate a system of two equations, one for the default probability and one for the probability of being securitized, with the same set of explanatory variables summarizing the market's information set, and then to test the correlation of the residuals.

The coefficients of the control variables in the regression for the default probability have the same sign and almost exactly the same magnitude and level of significance as in our

baseline probit (see Table 5, Column III).[19]

Also the coefficients in the model for the probability of being securitized are significant. More opaque loans, those for which issues of asymmetric information are more relevant, should be less likely to be included in a securitization deal; on the other hand, banks might want to get rid of them if opaqueness is associated to risk. Loans to young borrowers, who tend to have little credit history from which the originating bank could obtain private information, turn out more likely to be included in a securitization operation. Loans to borrowers living close to the bank's headquarters, for which the lender can more easily obtain soft information and carry out its monitoring activity, are not just less risky but also less opaque and less likely to be securitized. Joint mortgages, thanks to the additional guarantee they provide, are similar to loans with more covenants that diminish the effects of asymmetric information (Drucker and Puri, 2009); coherently, they display a higher probability of being sold. The coefficient for the dummy denoting a mortgage on preferential terms, granted to people with a more stable income stream (civil servants or employees in large companies), characterizes borrowers whose credit risk profile is more easily evaluated and, indeed, the coefficient turns out to be positive. Symmetrically, mortgages granted in Southern Italy are typically seen as more opaque (for example, because of higher tax evasion which decreases the information content of "hard facts" based on official records[20]) and are

[19] More generally, it has to be kept in mind that this framework is aimed at obtaining a correct evaluation of the conditional correlation between the probability of default and that of being securitized. As the two equations are reduced forms, the interpretability of the coefficients is not essential for the analysis. The interpretation provided, although reasonable, should be taken with caution as we are not estimating causal relationship.

[20] See, for instance, Brosio et al. (2002).

indeed less likely to be securitized. The higher trustworthiness of female borrowers can be used to explain not just their lower default probability but also to argue that they belong to a more transparent credit segment, with a higher probability of being securitized.

The remaining regressors seem more correlated with risk rather than with the level of transparency; therefore, they are not subject to an obvious interpretation. At any rate, the coefficients for these variables suggest that, everything else being equal, securitization is easier in less risky segments of the credit market. The probability of being sold is indeed higher for mortgages with a fixed rate and with a smaller spread.[21] Only the result for size of the loan goes in the opposite direction, as the larger it is (and the riskier the loan), the higher the probability of it being included in a securitization operation, possibly because of some fixed administrative costs which might make high-value mortgages more suitable for this purpose.

Going to the objective of this exercise, the conclusion is that the main result is unchanged: the negative correlation between the residuals of the two probit regressions, significant at a 1% level, leads to a strong rejection of the hypothesis that in the securitization market riskier loans have a higher probability of being sold.[22] This is not to say that asymmetric information is not an issue but that the market is able to find ways to counter it or at least to diminish its effects. As suggested by the coefficients in the regression for the probability of being securitized, the first and most obvious way to do so is to securitize the loans characterized by the lower level of opacity.

When we reduce the information set available to the "insurer", by keeping either only information on contracts and borrowers but not originators (Table 6), or only information on originators but not on contracts types of borrowers (Table 7), the result is the same: the correlation between residuals is negative, significant at the 1% level and almost of the same size as the full information set (the coefficient of the Securitization dummy in the basic probit regression is almost the same as in the baseline, full information specification).

5.3 Characteristics of the securitization deal

The results presented in the previous section suggest that the market is able to find ways to contrast asymmetric information problems or at least to mitigate its effects. As previously argued, one obvious tool for the market to contrast asymmetric information in the securitization market is to select loans characterized by a lower level of opacity. However, this is not sufficient to fully explain our findings as not only the correlation among the residual is not significantly positive, but it is significantly negative, revealing that banks tend to securitize better-than-average loans. We therefore explore the role played by the mechanisms that are usually considered to help banks signal the quality of their assets and, in particular, we check how the results are affected by the way in which the securitization deal is structured. All the deal characteristics are interacted with the Securitization dummy. We cannot use the bi-probit set up because deal characteristics are defined only for securitized loans. In Table 8 we follow the same pattern analyzed before: first the full information set, then only contract and borrowers' characteristics, then only originators' characteristics. As the coefficients are very similar across the three simple probit regressions, we discuss them only once.

The coefficient of the Securitized dummy remains negative, significant at the 1% level and of the same magnitude as in Tables 5–7. A brief discussion of the coefficients of the variables that describe the securitization deals follows.

The size of the equity tranche is an indicator of the riskiness of the pool of loans being securitized. We include it, as well as the share of the equity tranche retained by the originator, which is proportional to how much "skin in the game" the originator wants to keep, and signals therefore the commitment both to securitize "safe loans" and to monitor securitized loans after the deal. Both coefficients are significant and with the expected sign.

The number of securitizing banks might also influence the quality of the pool of loans:

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[21] One way to read this evidence is to argue that the level of transparency does not matter if the general level of risk is sufficiently low. In this situation indeed even "bad types" are not going to default. It should be noted, however, that banks also conducted securitizations of bad loans, which is itself a quite risky segment as presumably the uncertainty about the recovery rates is quite high.

[22] It is interesting to point out that this apparently surprising result of a negative correlation among the residuals in an exercise aimed at testing asymmetric information has been found also in other contexts (for example, Chiappori and Salanié, 2000, looking at data on car insurance).

each bank might have an incentive to contribute riskier-than-average loans and thus free-ride on the reputation of other participants.[23] Indeed the coefficient of this variable, added in the Default probit regression, is positive and significant.

We also include a dummy variable equal to 1 if the accounting value of portfolio of the securitized loans is lower than its face value, and 0 otherwise. The coefficient of this variable is not significant: the variable doesn't seem to contain any additional information on the risk of loans.

Finally, we add as a control variable the share of the securitization deal that is investment grade: other things being equal (in particular the share of the equity tranche) the higher it is, the higher the quality of the pool of loans. As expected, the coefficient of this variable is significant and negative in the Default probit regression.

In a bi-probit framework (unreported; results available from the authors) the correlation between residuals is still significantly negative, although smaller in absolute value than that in Table 5 (–24.9% against –31.2% of the baseline bivariate probit; the difference is significant at a 1% level of confidence). This is consistent with the view that the structure of securitization deal, and in particular the share of the equity tranche retained by the bank, is chosen so as to contrast asymmetric information issues.

5.4 The role of the spread as a catch-all variable for credit risk

As already discussed, one important control variable in our estimations is the spread, which is meant to be a catch-all measure for risk (at least for what is not directly controlled for by the other variables). One possible problem with this is that if the market infers the risk of a loan from its spread, then this could generate the possibility for banks of under-pricing strategically high-risk loans with the idea of selling them in a second step. We check the relevance of this issue by conducting the estimation separately on two sub-samples: one comprises the loans issued until 1999, the year of the introduction of the law allowing banks to operate in the securitization market; the second comprises the remaining observations.

By comparing the relationship between the probabilities of being securitized and of

[23] All the deals with multiple originators in our sample are operations conducted by pooling loans issued by

defaulting for loans originated before and after 1999 we do not observe a discernible difference between the two periods (Table 9). The coefficient of the Securitized dummy in the reduced form regression is still negative and significant and of similar magnitude for loans originated after 1999. The same can be said of the correlation coefficient between the residuals of the Default and the Securitized regressions; most control variables keep the same sign. The development of a market for securitized instruments was not accompanied by laxer lending standards.

One striking result of our regressions is that not only is the correlation among the residuals not positive, but it is significantly negative, suggesting that in the period analyzed banks sold loans with a quality that was higher than one should have expected on the basis of observable characteristics. One explanation for this is reputation-building. If banks care about having access to this important source of funding, then they may try to build up their own reputation by selling better-than-average quality loans (therefore at an "actuarially lower" price) until they have a sufficient "reputation stock" allowing them to operate in this market.

To verify whether this took place, we check how this correlation evolved over time. We therefore perform an analysis similar to that presented in Table 5 but at a more disaggregated level: we run regressions on all the sub-samples distinguished by the year of origination. We then plot the time-series of the correlation coefficients among the residuals of the two equations (Fig. 2).[24] The curve stays flat until 2004, then it starts converging towards zero. This pattern is consistent with the presence of a reputation mechanism: as long as banks are building up their own reputation, they tend to securitize better-than-average loans and, on the other hand, for fear of loosing their newly acquired reputation, they do not sell below-average lemons, even after a few years.[25]

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different banks belonging to the same banking group.

[24] This exercise provide a robustness test also with respect to another non fully satisfactory aspect of our main baseline regressions, which is related to the fact the definition of two dependent variables neglects the time available for the loan going into default or being securitized since its origination. By conducting estimation for groups with homogeneous date of origination, this possible limitation is overcome.

[25] The lager size of the confidence band at the beginning of the period is due to the fact that we have fewer observations for those years but it is also consistent with the patterns that we should observe in the presence of reputation mechanisms. In fact, at the early stage of the market, the equilibrium requires that the presence of banks selling, on average, good-quality loans comes with some other banks exploiting the asymmetric information by selling lemons (these banks are those not interested in accessing this source of finance in the

As a final test we wanted to check if results are still valid if the spread from the set of observable variables (see Table 10) is removed. The reason for this test is twofold. First, the spread may reflect private information available for the bank but not for the market; second the spread could endogenously reflect the expected default probability of the mortgage that is not incorporated in the vector X. The test confirmed the robustness of the results.

5.5 High vs low risk transfer

A potential issue is that, if the originator retains much of the risk, for example by holding onto the equity tranche, then the deal does not mean much in terms of insurance against default – it becomes only a bank-internal portfolio re-arrangement in which the choice of loans being securitized does not necessarily depend on risk but might depend on liquidity needs. For example, in 2007–2009 almost all the deals were self-securitizations arranged to be used as collateral to tap the central bank's liquidity.

In order to address this issue, we re-define our Securitized dummy as: High Risk Transfer (HRT) equals one if the loan is sold in a deal in which the equity tranche is above the median (transaction with relatively high risk) and in which the originator's equity stake is below the median (deal in which the originator sells relatively more risk), and zero otherwise. All loans sold in transactions that don't satisfy this requisite are treated as not securitized.

The result of the bi-probit analysis, with the three formats of full information, only contracts and borrowers, only originators, is that the correlation between residuals is still negative, significant at the 1% level (Table 11) and slightly smaller than for the same specifications with the Securitized dummy taking a value of one for any deal. This confirms our main result that banks securitize better-than-average mortgages.

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future and therefore not interested in building up their reputation). Therefore, one implication of an equilibrium based on reputation is that at the early stage of the market we should observe a higher heterogeneity of behavior, which may account for the larger confidence bands in the estimation of the correlation among the residuals.

Is there any systematic difference between loans securitized in high- and low-risk transfer deals? To analyze this issue we look only at securitized loans, and run our standard bi-probit framework on them.[26]

The result is that the correlation becomes positive: loans belonging to HRT deals have a higher probability of default (Table 12). In other words, banks sell loans that are better than average even in HRT deals (see results of Table 11) but, when choosing how much risk to keep given the characteristics of the deal, they keep a higher share of risk in deals in which loans are of better quality. There are two possible explanations for this behavior: banks could be signaling which deals are lower risk (the ones in which they keep more "skin in the game"), or they could be doing some form of cherry-picking, selling the riskier deals and keeping the better ones.

We check whether there is any difference between HRT before and after 1999 (the beginning of securitization in Italy); the correlation is positive and larger for loans originated before 1999 (Table 13), meaning that the quality of the pre-securitization law loans inserted in the retained bundles were better off than other mortgages. This is consistent both with banks needing to give stronger signals at the inception of a new market, and of them being less able to do cherry picking as investors become better at evaluating deals.

We can not offer any firm conclusions on this point, but we have some tentative evidence. For a subsample of deals (37 out of 81) we have data on the spread paid by the senior tranche. If the share of equity retained by the originator is correlated with some form of cherry-picking, the spread on the senior tranche should be higher (investors suspect a lemon and ask for a premium); if on the other hand the higher share is due to some form of signaling, the spread should be lower (investors recognize that it is a "safer" deal). In a simple OLS regression with a dummy for non-triple A rating (control for risk) and past securitizations (reputation) as control variables (as well bank-fixed effects) we find that when the share of retained equity is higher the spread on the senior tranche is lower (Table 14): this is more consistent with signaling than with cherry picking.

[26] Here we are closer than ever to Chiappori and Salanié (2000): HRT=1 is very similar to Comprehensive Coverage, and HRT=0 to Partial Coverage.

5.6 A horse race among high-quality mortgages

The pool of loans that can be securitized at a given date *t* consists of all performing loans at that date. This means that as long as banks wait for some time after origination before including them into a securitization operation, the pool of loans that are actually securitized is drawn from a sample which is self-selected and over-represents good-quality contracts. The reason for this is that at the time of securitization (for example, two years since origination) some of the loans would have already defaulted and as such cannot be securitized; moreover, the proportion of loans defaulted "prior" to securitization (i.e. in the first two years of life) will tend to be higher among the bad quality ones. This implies that securitized loans are drawn from a distribution of higher quality compared to the entire population, the more so the longer the time elapsed from origination to securitization.[27] This issue, moreover, could be expected to be empirically relevant given that, as shown in Figure 3, most of the mortgages going into default do so in the first years of their life.

To check the robustness of the previous results, we re-ran our tests by considering separately securitized loans by vintage. By doing so we can rebalance the estimation sample in a way that allows us to compare securitized loans with non-securitized loans drawn from a distribution which is fully comparable with that from which securitized loans are drawn.

Consider for example the loans securitized in the second year of life (i.e. aged one). The rebalancing of the dataset is done in three steps. (*i*) We drop from the estimation all non-securitized mortgages that defaulted in the first year of life (i.e. those that could not be securitized in their second year of life). (*ii*) We set as non-securitized all securitized loans that have been sold after the second year of life. (iii) We drop from the estimation sample all mortgages securitized during their first year of life.

The results of the estimation on this sub-sample are presented in the first panel of Table 15, for the baseline regression (full information set specification). All the main findings are confirmed: only few coefficients lose statistical significance or change sign; the

[27] We thank Bernard Salanié for this observation.

sign of the correlation among the residuals, although smaller in absolute value, remains negative and highly significant.[28]

As in the full sample most of the securitized mortgages are sold in the second to fourth year of life (i.e. when aged one to three; Figure 3), we repeated this exercise by considering only securitized loans which are sold in their third year of life (i.e. aged two) and then by considering only securitized loans which are sold in their fourth year of life (i.e. aged three). Again, all the results. presented in the second and third panel of Table 15 respectively, are confirmed.

5.7 Alternative econometric approaches

As a final robustness check, we run the same set of regressions using a two-step treatment model, which considers the effect of an endogenously chosen variable (Securitized) on another endogenous variable (Default), conditional on two sets of independent variables. In our selection equation the dependent variable is the Securitized dummy and to avoid identification problems with the main equation we add bank characteristic variables such as the location of the bank's headquarters, the bank's return on equity and a measure of its market power (a weighted average of its Herfindahl indices on provincial loan markets).[29] In the main equation the dependent variable is the Default dummy; once again, the coefficient of the Securitized dummy (from the selection equation) is negative and significant (Table 16), in all four cases.

We also compare the marginal effect of Securitized mortgages on Default in the two settings: our baseline regression in which we don't control for endogeneity and the two-step treatment model. The marginal effect is very similar in both cases, and around 3 percentage

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[28] In order to limit computational issues, which turn out to prevent the estimation of these models, regressions have been conducted on a randomly chosen sub-sample (representing 30% of the full sample) and without the set of dummies for banks. Estimations conducted on even smaller sub-samples shows that the inclusion of the bank dummies leaves the results unchanged (estimations not displayed and available from the authors).

[29] These variables should be more correlated with the probability for a bank to securitize a loan than with the loan's probability of default. Bank headquarter's location and market power control for the ability of a credit intermediary to tap funds in the local market. This could alter a bank's willingness to securitize the loan but should not be correlated with its default probability. On the other hand, what is relevant for a loan's default is the borrower's area of residence as included in the default equation. The ROE could signal a bank's quality

points: a Securitized loan has a probability of default that is 3 percentage points lower than a non-securitized loan. This is consistent with our descriptive statistics (Table 2) and reassures us that the results we obtain in our baseline regression are robust.

6. Conclusions

The subprime mortgage crisis in the US has highlighted some limits of the originate-to-distribute model, an intermediation approach adopted by banks that originate, repackage and then sell their loans to the market. In this paper we investigate banks' behavior as it relates to the larger part of the market for securitized assets, i.e. prime mortgages. Our sample consists of a unique dataset of more than one million household mortgages originated by 50 Italian banks in the 10 years prior to the financial crisis. The richness of information contained in the database allows us to control for a wide set of relevant characteristics that are not available in existing studies, including: loan-level variables, characteristics of the originating bank and, most importantly, contractual features of the securitization deal including, in particular, the seniority structure of the securities issued by the SPV and the amount retained by the originator.

Our results suggest that securitized loans have a lower probability of default, indicating that the securitization market can provide an appropriate tool for transferring credit risk efficiently. This result is consistent with the idea that the choice of the loans to be securitized is made with the aim of overcoming asymmetric information problems. Beyond this, we provide new direct evidence that the structure of the securitization deals is also chosen with a view to mitigating the costs of asymmetric information. We find evidence consistent with the fact that banks, particularly at the early stage of the securitization market life, are strongly committed to building up a reputation that will allow them to ensure repeated access to this important source of funding. This is consistent with the traditional certification role performed by banks, as emphasized by Drucker and Puri (2009). It obviously depends also on the sound institutional and supervisory framework provided by Italian authorities, which demand a high level of disclosure in securitization deals. Further

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to the market. A high ROE in t-1 could increase the probability of securitizing a loan at t. This variable should not have a strong causal correlation with future defaults, once one controls for borrowers' characteristics.

research, conducted on cross-country data, could help disentangle the institutional and the financial parts of this result.

The broad policy implication of our paper is that the securitization of prime mortgages is a soundly functioning market and should not be excessively penalized. The OTD model per se cannot be blamed for having induced reckless risk-taking; securitization is not always bad after all.

Tables and figures

Table 1

REPRESENTATIVENESS OF THE DATASET WITH RESPECT TO ITALIAN SECURITIZATION MARKET[(1)]

Years	Banks included in the sample					Italian Banking System			Coverage of the sample (A)/(B)*100
	Total lending to households (mln euro)	Sold loans (A) (mln euro)	Number of borrowers that have been sold	Number of banks in the sample that have securitized their loan	Sold loans as a percentage of total lending at t-1	Total lending to households (mln euro)	Sold loans (B) (mln euro)	Sold loans as a percentage of total lending at t-1	
2000	34,094	746	8,289	9	3.7	55,524	811	1.9	92.0
2001	39,559	2,804	31,156	18	8.2	64,466	3,238	5.8	86.6
2002	52,823	2,354	18,954	22	4.6	81,445	2,589	4.0	90.9
2003	65,738	4,884	41,149	22	7.3	100,930	5,490	6.7	89.0
2004	82,951	2,354	16,409	16	2.8	129,861	3,468	3.4	67.9
2005	103,045	3,686	27,622	20	3.7	163,523	5,344	4.1	69.0
2006	119,963	9,576	80,088	20	8.8	195,853	11,567	7.1	82.8
Total	*498,173*	*26,404*	*223,666*	50	*6.8*	*791,602*	*32,508*	*5.3*	81.2

Notes: (1) Bad loans are excluded.

Table 2

BREAKDOWN OF THE DATASET BY CHARACTERISTICS OF MORTGAGE CONTRACT, BORROWER AND BANK[(1)]

Year of loan origination	Number of contracts (units)	Share of contracts with respect to total	Delinquency rate (share)	Average mortgage value (1000 euro)	Spread (average)	Mortgages on preferential terms/rate (share)	Joint mortgages (share)	Fixed rate mortgages (share)	Borrower resident in south and Island (share)	Female borrower (share)	Borrower with less than 40 years old (share)	Borrower close to bank headquarter (share)	Bank size (total assets, mln euro)	Bank liquidity-to-total asset ratio (%)	Excess capital w.r.t. minimum capital requirement over total assets (%)
	Securitized mortgages														
1996-1999	8,164	15.9%	2.8%	126,050	1.20	18.4%	61.0%	26.7%	10.2%	13.7%	6.4%	15.1%	30465	9.2%	1.7%
2000-2002	60,375	21.9%	2.2%	122,915	0.92	26.8%	61.5%	20.4%	11.1%	14.0%	12.0%	8.4%	42810	7.2%	2.5%
2003-2006	134,429	17.2%	1.5%	128,382	0.27	46.0%	57.6%	9.1%	12.7%	16.1%	20.0%	9.0%	39915	5.3%	2.6%
1996-2006	202,968	18.3%	1.7%	126,660	0.50	39.2%	58.9%	13.2%	12.1%	15.4%	17.1%	9.1%	40320	6.0%	2.5%
	Other mortgages														
1996-1999	43,301	84.1%	8.0%	119,205	1.04	24.0%	57.7%	18.8%	12.2%	14.5%	6.0%	16.4%	40335	8.7%	2.6%
2000-2002	215,260	78.1%	5.9%	115,778	0.96	25.6%	57.2%	14.5%	11.9%	15.6%	11.7%	8.0%	67603	6.8%	3.0%
2003-2006	646,423	82.8%	3.9%	131,141	0.47	33.4%	54.8%	14.0%	18.8%	17.0%	21.8%	7.7%	41706	4.0%	2.2%
1996-2006	904,983	81.7%	4.5%	126,915	0.61	31.1%	55.5%	14.4%	16.8%	16.6%	18.6%	8.2%	46708	4.9%	2.4%
	All mortgages														
1996-1999	51,465	100.0%	7.2%	120,275	1.06	23.1%	58.2%	20.0%	11.9%	14.4%	6.1%	16.2%	38,604	8.8%	2.4%
2000-2002	275,635	100.0%	5.1%	117,336	0.95	25.9%	58.1%	15.8%	11.7%	15.2%	11.7%	8.1%	61,185	6.9%	2.9%
2003-2006	780,852	100.0%	3.4%	130,668	0.44	35.5%	55.3%	13.2%	17.7%	16.9%	21.5%	7.9%	41,393	4.2%	2.3%
1996-2006	1,107,951	100.0%	4.0%	126,869	0.59	32.5%	56.1%	14.1%	16.0%	16.3%	18.3%	8.3%	45,472	5.1%	2.5%

Notes: (1) Securitization refers to performing loans. Securitization of bad loans are excluded from the analysis.

Table 3

BREAKDOWN OF THE DATASET BY CHARACTERISTICS OF THE SECURITIZATION DEAL[(1)]

Variables	Mean	Std. Dev.	Min	Max
Number of originating banks	1.31	1.06	1.00	9.00
Senior tranche weigthed average (2)	0.91	0.17	0.02	1.00
Mezzanine tranche weigthed average (2)	0.08	0.15	0.00	0.88
Equity tranche weigthed average (2)	0.01	0.03	0.00	0.98
Senior tranche retained by the originator	0.04	0.16	0.00	1.00
Mezzanine tranche ratained by the originator	0.11	0.27	0.00	1.00
Equity tranche retained by the originator	0.66	0.45	0.00	1.00
Rating senior tranche (3)	1.04	0.10	1.00	1.41
Rating mezzanine tranche (3)	5.93	1.36	3.00	7.51
Rating equity tranche(3)	9.00	0.00	9.00	9.00
Investment grade (4)	0.41	0.49	0.00	1.00
Spread senior	0.25	0.18	0.08	0.98
Spread mezzanine	0.73	0.49	0.35	2.75
Spread equity	1.04	0.27	0.70	3.30
Maturity senior tranche (5)	25.62	9.17	8.63	40.00
Maturity mezzanine tranche (5)	27.05	9.58	8.94	40.00
Maturity equity tranche (5)	34.59	2.33	31.65	37.43
Fixed senior tranche	0.01	0.09	0.00	0.65
Fixed mezzanine tranche	0.00	0.00	0.00	0.00
Fixed equity tranche	0.13	0.35	0.00	1.00
Low value (6)	0.00	0.07	0.00	1.00

Note: (1) Statistics are calculated on 81 deals. However, information on the spread is available only for 37 deals. - (2) Weighted by the nominal value of each tranche. - (3) Ratings are represented by numerical numbers that go from 1 (low risk) to 9 (high risk). - (4) Investment grade is a dummy that takes the value of one if a specific securitization tranche as an investment grade rating (greater than BBB).- (5) Years. - (6) Low value is a dummy that takes the value of one for those securitization tranches that have an accounting value lower than the nominal value of the underlying mortgages.

Table 4

VARIABLES DESCRIPTION

Variables	Description
Endogenous variables:	
Securitized	Dummy equals to 1 if the mortgage has been securitised and 0 elsewhere.
Default	Dummy equals to 1 if the borrower has gone into default.
Mortgage and borrower characteristics:	
Mortgage on preferential terms/rate	Dummy equals to 1 if the mortgage has preferential terms/rate and 0 elsewhere.
Spread	Difference between the interest rate on the mortgage and the corresponding rate with the same maturity on the yield curve
Fixed rate mortgage	Dummy equals to 1 if the mortgage has a fixed rate and 0 elsewhere.
South and Islands	Dummy equals to 1 if the borrower is resident in the Mezzogiorno and 0 elsewhere.
Female	Dummy equals to 1 if the borrower is a female and 0 elsewhere.
Close to bank headquarter	Dummy equals to 1 if the borrower is resident in the same province of the bank headquarter and 0 elsewhere.
Young (<40)	Dummy equals to 1 if the borrower is less than 40 years old and 0 elsewhere.
Joint mortgage	Dummy that takes the value of 1 is the mortgage is secured by real property given to more than one party (i.e. a married couple).
Mortgage value	Nominal value of the mortgage contract.
Emigrants	Dummy that takes the value of 1 if the borrower's residence is in a province that is different from the province of birth, and of 0 otherwise.
Bank-specific characteristics:	
Liquidity ratio	Cash plus government bonds as a percentage of total assets at the time of the securitization.
Excess capital to asset ratio	Difference between the level of prudential capital and minimum capital requirements (excess capital) over total assets
Bank ROE	Bank profit over total equity.
Bank Market Power	Weighted average of bank's Herfindahl indices on provincial loan markets where it operates.
Deal characteristics:	
Equity tranche	Percentage of the lowest quality (highest credit risk) tranche in a pool of mortgage loans.
Equity tranche retained	Percentage of the lowest quality (highest credit risk) tranche in a pool of mortgage loans that is retained by the bank.
Number of originating banks	Number of banks involved in the origination of the securitizion deal
Accounting value low	Dummy variable equals to 1 if the accounting value of portfolio of the securitized loans is lower than its face value, and 0 otherwise
Investment grade	Dummy variable equals to 1 if the tranche has an investment grade and zero elsewhere.

Table 5

CONTROLLING FOR CONTRACT, BORROWER AND BANK CHARACTERISTICS

Explanatory variables	(I) Probit regression		(II) Marginal effect		(III) Seemingly unrelated bivariate probit			
	Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Securitized_i=1)$	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Securitized	-0.570 ***	0.008	-0.029 ***	0.001				
Mortgage on preferential terms/rate	-0.282 ***	0.006	-0.018 ***	0.000	-0.284 ***	0.006	0.044 ***	0.004
Spread	0.002 ***	0.000	0.0001 ***	0.000	0.002 ***	0.000	-0.007 ***	0.001
Fixed rate mortgage	-0.280 ***	0.008	-0.019 ***	0.001	-0.287 ***	0.008	0.060 ***	0.006
South and Islands	0.193 ***	0.007	0.015 ***	0.001	0.202 ***	0.006	-0.137 ***	0.005
Female	-0.131 ***	0.007	-0.008 ***	0.000	-0.131 ***	0.007	0.011 **	0.005
Close to bank headquarter	-0.189 ***	0.009	-0.011 ***	0.000	-0.174 ***	0.009	-0.148 ***	0.006
Young (<40)	0.036 ***	0.006	0.001 ***	0.000	0.025 ***	0.006	0.099 ***	0.005
Joint mortgage	-0.346 ***	0.006	-0.025 ***	0.000	-0.356 ***	0.006	0.151 ***	0.004
Log of mortgage value	0.203 ***	0.006	0.014 ***	0.000	0.182 ***	0.006	0.188 ***	0.004
Emigrants	0.346 ***	0.005	0.028 ***	0.000	0.332 ***	0.005	0.078 ***	0.004
Liquidity ratio	-0.235 **	0.105	-0.016 **	0.007	-0.092	0.103	-0.975 ***	0.078
Excess capital to asset ratio	0.881 ***	0.221	0.060 ***	0.015	2.343 ***	0.223	-16.939 ***	0.223
Bank fixed effects	Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes	
Sample period for mortgages	1996 - 2006		1996 - 2006		1996-2006			
No of observations	1,107,951		1,107,951		1,107,951			
Pseudo R2	0.079		0.079					
Correlation coefficient between the residuals of the two equations					-0.312*** (standard error 0.004)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 6

CONTROLLING ONLY FOR CONTRACT AND BORROWER CHARACTERISTICS

Explanatory variables	(I) Probit regression		(II) Marginal effect		(III) Seemingly unrelated bivariate probit			
	Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Securitized_i=1)$	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Securitized	-0.571 ***	0.008	-0.029 ***	0.000				
Mortgage on preferential terms/rate	-0.283 ***	0.006	-0.018 ***	0.000	-0.285 ***	0.006	0.048 ***	0.004
Spread	0.002 ***	0.000	0.0001 ***	0.000	0.002 *	0.001	-0.006 ***	0.001
Fixed rate mortgage	-0.279 ***	0.008	-0.019 ***	0.001	-0.287 ***	0.008	0.060 ***	0.006
South and Islands	0.193 ***	0.007	0.015 ***	0.001	0.203 ***	0.006	-0.147 ***	0.005
Female	-0.132 ***	0.007	-0.008 ***	0.000	-0.131 ***	0.007	0.012 **	0.005
Close to bank headquarter	-0.190 ***	0.009	-0.011 ***	0.000	-0.174 ***	0.009	-0.143 ***	0.006
Young (<40)	0.036 ***	0.006	0.003 ***	0.000	0.026 ***	0.006	0.099 ***	0.005
Joint mortgage	-0.346 ***	0.006	-0.025 ***	0.000	-0.355 ***	0.006	0.149 ***	0.004
Log of mortgage value	0.202 ***	0.006	0.014 ***	0.000	0.180 ***	0.006	0.194 ***	0.004
Emigrants	0.346 ***	0.005	0.029 ***	0.000	0.333 ***	0.005	0.071 ***	0.004
Bank fixed effects	Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes	
Sample period for mortgages	1996 - 2006		1996 - 2006		1996-2006			
No of observations	1,107,951		1,107,951		1,107,951			
Pseudo R2	0.079		0.079					
Correlation coefficient between the residuals of the two equations					-0.312*** (standard error 0.004)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 7

CONTROLLING ONLY FOR BANK-SPECIFIC CHARACTERISTICS

Explanatory variables	(I) Probit regression		(II) Marginal effect		(III) Seemingly unrelated bivariate probit			
	Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(Securitized_i=1)$	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Securitized	-0.559 ***	0.008	-0.032 ***	0.000				
Liquidity ratio	-0.227 **	0.101	-0.018 **	0.008	-0.076	0.099	-1.083 ***	0.078
Excess capital to asset ratio	1.305 ***	0.210	0.101 ***	0.016	2.742 ***	0.205	-17.009 ***	0.222
Bank fixed effects	Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes	
Sample period for mortgages	1996 - 2006		1996 - 2006		1996-2006			
No of observations	1,107,951		1,107,951		1,107,951			
Pseudo R2	0.038		0.038					
Correlation coefficient between the residuals of the two equations					-0.296*** (standard error 0.004)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 8

CONTROLLING FOR CHARACTERISTICS OF THE SECURITIZATION DEAL

Explanatory variables	(I) Contract, borrower and bank characteristics				(II) Contract and borrower characteristics				(III) Bank specific characteristics			
	Probit regression Dependent variable: $P(Default_i=1)$		Marginal effect Dependent variable: $P(Default_i=1)$		Probit regression Dependent variable: $P(Default_i=1)$		Marginal effect Dependent variable: $P(Default_i=1)$		Probit regression Dependent variable: $P(Default_i=1)$		Marginal effect Dependent variable: $P(Default_i=1)$	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Securitized	-0.597 ***	0.016	-0.029 ***	0.001	-0.595 ***	0.016	-0.029 ***	0.001	-0.576 ***	0.016	-0.033 ***	0.001
Securitized*Equity tranche	0.901 ***	0.204	0.061 ***	0.014	0.860 ***	0.204	0.059 ***	0.014	0.900 ***	0.204	0.070 ***	0.014
Securitized*Equity tranche retained	-0.163 ***	0.024	-0.011 ***	0.002	-0.169 ***	0.024	-0.012 ***	0.002	-0.167 ***	0.024	-0.013 ***	0.002
Securitized*ln(number of originating banks)	0.308 ***	0.020	0.021 ***	0.001	0.306 ***	0.020	0.021 ***	0.001	0.306 ***	0.020	0.024 ***	0.001
Securitized*Accounting value low	0.111	0.112	0.008	0.009	0.108	0.112	0.008	0.009	0.177	0.112	0.016	0.011
Securitized*Investment grade	-0.049 ***	0.016	-0.003 ***	0.001	-0.050 ***	0.016	-0.004 ***	0.001	-0.029 *	0.016	-0.002 *	0.001
Mortgage on preferential terms/rate	-0.281 ***	0.006	-0.018 ***	0.000	-0.281 ***	0.006	-0.018 ***	0.000				
Spread	0.002 ***	0.000	0.000 ***	0.000	0.002 ***	0.000	0.000 ***	0.000				
Fixed rate mortgage	-0.284 ***	0.008	-0.019 ***	0.001	-0.283 ***	0.008	-0.019 ***	0.001				
South and Islands	0.193 ***	0.007	0.015 ***	0.001	0.193 ***	0.007	0.015 ***	0.001				
Female	-0.131 ***	0.007	-0.008 ***	0.000	-0.131 ***	0.007	-0.008 ***	0.000				
Close to bank headquarter	-0.189 ***	0.009	-0.011 ***	0.000	-0.189 ***	0.009	-0.011 ***	0.000				
Young (<40)	0.036 ***	0.006	0.003 ***	0.000	0.036 ***	0.006	0.003 ***	0.000				
Joint mortgage	-0.346 ***	0.006	-0.025 ***	0.000	-0.346 ***	0.006	-0.025 ***	0.000				
Log of mortgage value	0.203 ***	0.006	0.014 ***	0.000	0.203 ***	0.006	0.014 ***	0.000				
Emigrants	0.346 ***	0.005	0.028 ***	0.000	0.346 ***	0.005	0.028 ***	0.000				
Liquidity ratio	-0.275 ***	0.105	-0.019 ***	0.007					-0.270 **	0.105	-0.021 ***	0.008
Excess capital to asset ratio	0.708 ***	0.222	0.048 ***	0.015					1.141 ***	0.211	0.088 ***	0.016
Bank fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Sample period for mortgages	1996 - 2006		1996 - 2006		1996 - 2006		1996 - 2006		1996 - 2006		1996 - 2006	
No of observations	1,107,951		1,107,951		1,107,951		1,107,951		1,107,951		1,107,951	
Pseudo R2	0.080		0.079		0.080		0.080		0.039		0.039	

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 9

CONTROLLING FOR THE INTRODUCTION OF THE SECURITIZATION LAW

Explanatory variables	(I) Probit regression (prior securitization law) Dependent variable: $P(Default_i=1)$		(II) Seemingly unrelated bivariate probit (prior securitization law) Dependent variable: $P(Default_i=1)$		(II) Seemingly unrelated bivariate probit (prior securitization law) Dependent variable: $P(Securitized_i=1)$		(III) Probit regression (after securitization law) Dependent variable: $P(Default_i=1)$		(IV) Seemingly unrelated bivariate probit (after securitization law) Dependent variable: $P(Default_i=1)$		(IV) Seemingly unrelated bivariate probit (after securitization law) Dependent variable: $P(Securitized_i=1)$	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Securitized	-0.697 ***	0.044					-0.582 ***	0.011				
Mortgage on preferential terms/rate	-0.557 ***	0.039	-0.538 ***	0.039	-0.119 ***	0.032	-0.294 ***	0.007	-0.293 ***	0.007	0.027 ***	0.006
Spread	0.004 **	0.002	0.004 **	0.002	-0.002	0.003	0.001 ***	0.000	0.001 *	0.001	-0.014 ***	0.002
Fixed rate mortgage	-0.231 ***	0.032	-0.259 ***	0.032	0.287 ***	0.026	-0.277 ***	0.010	-0.284 ***	0.010	0.090 ***	0.007
South and Islands	0.238 ***	0.034	0.262 ***	0.034	-0.237 ***	0.035	0.178 ***	0.009	0.186 ***	0.009	-0.128 ***	0.006
Female	-0.007	0.035	-0.009	0.034	0.048	0.035	-0.136 ***	0.009	-0.136 ***	0.009	0.018 ***	0.007
Close to bank headquarter	-0.123 ***	0.036	-0.111 ***	0.034	-0.116 ***	0.036	-0.193 ***	0.013	-0.174 ***	0.013	-0.169 ***	0.008
Young (<40)	0.076	0.047	0.055	0.047	0.182 ***	0.049	0.025 ***	0.008	0.015 *	0.008	0.098 ***	0.007
Joint mortgage	-0.156 ***	0.027	-0.166 ***	0.026	0.124 ***	0.026	-0.354 ***	0.008	-0.364 ***	0.007	0.153 ***	0.006
Log of mortgage value	0.336 ***	0.027	0.285 ***	0.024	0.392 ***	0.029	0.197 ***	0.008	0.177 ***	0.008	0.177 ***	0.006
Emigrants	0.140 ***	0.029	0.121 ***	0.029	0.138 ***	0.027	0.352 ***	0.007	0.338 ***	0.007	0.079 ***	0.005
Liquidity ratio	-2.282 **	1.160	-1.784	1.265	-2.364	4.951	0.585 ***	0.138	0.720 ***	0.137	-1.248 ***	0.107
Excess capital to asset ratio	-1.501	3.124	-3.028	2.793	3.047	2.021	0.454	0.297	1.970 ***	0.301	-17.78 ***	0.308
Bank fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Sample period for mortgages	1996-1999		1996-1999				2000 - 2006		2000-2006			
No of observations	51,465		51,465				1,056,486		1,056,486			
Pseudo R2	0.094						0.076					
Correlation coefficient between the residuals of the two equations			-0.358*** (standard error 0.024)						-0.319*** (standard error 0.006)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 10

CONTROLLING FOR SPREAD ENDOGENEITY

Explanatory variables	(I) Seemingly unrelated bivariate probit (borrowers and bank characteristics)				(II) Seemingly unrelated bivariate probit (borrowers characteristics)				(III) Seemingly unrelated bivariate probit (bank characteristics)			
	Dependent variable: P(Default$_i$=1)		Dependent variable: P(Securitized$_i$=1)		Dependent variable: P(Default$_i$=1)		Dependent variable: P(Securitized$_i$=1)		Dependent variable: P(Default$_i$=1)		Dependent variable: P(Securitized$_i$=1)	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Mortgage on preferential terms/rate	-0.286 ***	0.006	0.054 ***	0.004	-0.287 ***	0.006	0.057 ***	0.004				
Fixed rate mortgage	-0.284 ***	0.008	0.049 ***	0.006	-0.282 ***	0.008	0.047 ***	0.006				
South and Islands	0.202 ***	0.006	-0.137 ***	0.005	0.203 ***	0.006	-0.148 ***	0.005				
Female	-0.131 ***	0.007	0.011 **	0.005	-0.131 ***	0.007	0.012 **	0.005				
Close to bank headquarter	-0.174 ***	0.009	-0.148 ***	0.006	-0.174 ***	0.009	-0.143 ***	0.006				
Young (<40)	0.025 ***	0.006	0.099 ***	0.005	0.026 ***	0.006	0.098 ***	0.005				
Joint mortgage	-0.356 ***	0.006	0.151 ***	0.004	-0.355 ***	0.006	0.149 ***	0.004				
Log of mortgage value	0.182 ***	0.006	0.188 ***	0.004	0.181 ***	0.006	0.195 ***	0.004				
Emigrants	0.332 ***	0.005	0.078 ***	0.004	0.333 ***	0.005	0.072 ***	0.004				
Liquidity ratio	-0.092	0.103	-0.986 ***	0.078					-0.076	0.099	-1.080 ***	0.078
Excess capital to asset ratio	2.345 ***	0.223	-16.923 ***	0.223					2.742 ***	0.205	-17.009 ***	0.223
Bank fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Sample period for mortgages	1996-2006				1996-2006				1996-2006			
No of observations	1,107,951				1,107,951				1,107,951			
Correlation coefficient between the residuals of the two equations	-0.313*** (standard error 0.004)				-0.312*** (standard error 0.004)				-0.305*** (standard error 0.004)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 11

HIGH RISK TRANSFER: ALL SAMPLE

Explanatory variables	(I) Seemingly unrelated bivariate probit (borrowers and bank characteristics)				(II) Seemingly unrelated bivariate probit (borrowers characteristics)				(III) Seemingly unrelated bivariate probit (bank characteristics)			
	Dependent variable: P(Default$_i$=1)		Dependent variable: P(High risk transfer$_i$ =1)		Dependent variable: P(Default$_i$=1)		Dependent variable: P(High risk transfer$_i$ =1)		Dependent variable: P(Default$_i$=1)		Dependent variable: P(High risk transfer$_i$ =1)	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Preferential mortgage	-0.287 ***	0.006	-0.022 ***	0.005	-0.287 ***	0.006	-0.011 **	0.005				
Spread	0.002	0.001	-0.019 ***	0.002	0.002	0.001	-0.020 ***	0.002				
Fixed rate mortgage	-0.290 ***	0.008	0.114 ***	0.006	-0.289 ***	0.008	0.121 ***	0.006				
South and Islands	0.203 ***	0.006	-0.180 ***	0.005	0.204 ***	0.006	-0.173 ***	0.005				
Female	-0.131 ***	0.007	0.003	0.006	-0.131 ***	0.007	0.002	0.006				
Close to bank headquarter	-0.173 ***	0.009	-0.195 ***	0.007	-0.175 ***	0.009	-0.199 ***	0.007				
Young (<40)	0.026 ***	0.006	0.078 ***	0.006	0.027 ***	0.006	0.082 ***	0.006				
Joint mortgage	-0.356 ***	0.006	0.130 ***	0.005	-0.355 ***	0.006	0.136 ***	0.005				
Log of mortgage value	0.184 ***	0.006	0.137 ***	0.005	0.183 ***	0.006	0.134 ***	0.005				
Emigrants	0.334 ***	0.005	0.068 ***	0.004	0.334 ***	0.005	0.070 ***	0.004				
Liquidity ratio	-0.625 ***	0.104	-0.368 ***	0.081					-0.477 ***	0.104	-0.280 ***	0.081
Excess capital to asset ratio	0.874 ***	0.210	-2.257 ***	0.192					1.145 ***	0.203	-2.060 ***	0.192
Bank fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Sample period for mortgages	1996-2006				1996-2006				1996-2006			
No of observations	1,107,951				1,107,951				1,107,951			
Correlation coefficient between the residuals of the two equations	-0.267*** (standard error 0.004)				-0.263*** (standard error 0.005)				-0.261*** (standard error 0.005)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 12

ONLY SECURITIZED LOANS: TEST FOR HIGH RISK TRANSFER MORTGAGES

Explanatory variables	(I) Seemingly unrelated bivariate probit (borrowers and bank characteristics)				(II) Seemingly unrelated bivariate probit (borrowers characteristics)				(III) Seemingly unrelated bivariate probit (bank characteristics)			
	Dependent variable: P(Default$_i$=1)		Dependent variable: P(High risk transfer$_i$ =1)		Dependent variable: P(Default$_i$=1)		Dependent variable: P(High risk transfer$_i$ =1)		Dependent variable: P(Default$_i$=1)		Dependent variable: P(High risk transfer$_i$ =1)	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Mortgage on preferential terms/rate	-0.162 ***	0.018	-0.101 ***	0.015	-0.165 ***	0.018	-0.093 ***	0.015				
Spread	0.008 ***	0.003	-0.074 ***	0.009	0.008 ***	0.003	-0.069 ***	0.009				
Fixed rate mortgage	-0.233 ***	0.025	-0.361 ***	0.021	-0.225 ***	0.024	-0.456 ***	0.021				
South and Islands	0.174 ***	0.023	-0.059 ***	0.013	0.171 ***	0.023	-0.014	0.013				
Female	-0.144 ***	0.021	-0.037 **	0.015	-0.145 ***	0.021	-0.046 ***	0.015				
Close to bank headquarter	-0.209 ***	0.028	-0.263 ***	0.018	-0.208 ***	0.028	-0.294 ***	0.017				
Young (<40)	-0.096 ***	0.020	0.055 ***	0.015	-0.095 ***	0.020	0.048 ***	0.014				
Joint mortgage	-0.419 ***	0.017	0.127 ***	0.012	-0.417 ***	0.017	0.130 ***	0.012				
Log of mortgage value	0.155 ***	0.022	-0.181 ***	0.016	0.157 ***	0.022	-0.159 ***	0.015				
Emigrants	0.297 ***	0.015	0.093 ***	0.010	0.297 ***	0.015	0.103 ***	0.010				
Liquidity ratio	-1.746 ***	0.363	7.132 ***	0.319					-1.250 ***	0.350	7.770 ***	0.324
Excess capital to asset ratio	0.236	0.787	39.375 ***	0.866					0.853	0.759	41.650 ***	0.888
Bank fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Sample period for mortgages	1996-2006				1996-2006				1996-2006			
No of observations	202,989				202,989				202,989			
Correlation coefficient between the residuals of the two equations	0.099*** (standard error 0.012)				0.099*** (standard error 0.012)				0.100*** (standard error 0.012)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 13

ONLY SECURITIZED LOANS: TEST FOR HIGH RISK TRANSFER MORTGAGES

MORTGAGES ORIGINATED PRIOR TO THE SECURITIZATION LAW

Explanatory variables	(I) Seemingly unrelated bivariate probit (borrowers and bank characteristics)				(II) Seemingly unrelated bivariate probit (borrowers characteristics)				(III) Seemingly unrelated bivariate probit (bank characteristics)			
	Dependent variable: $P(Default_i=1)$		Dependent variable: $P(High\ risk\ transfer_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(High\ risk\ transfer_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(High\ risk\ transfer_i=1)$	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Mortgage on preferential terms/rate	-0.317 ***	0.096	0.474 ***	0.146	-0.330 ***	0.095	0.243 **	0.105				
Spread	0.005	0.004	-0.061	0.046	0.005	0.004	-0.112 ***	0.041				
Fixed rate mortgage	-0.126	0.086	-0.310 ***	0.077	-0.129	0.086	-0.344 ***	0.056				
South and Islands	0.030	0.098	0.137	0.085	0.039	0.099	0.128 *	0.069				
Female	-0.093	0.093	0.095	0.113	-0.099	0.093	-0.041	0.091				
Close to bank headquarter	-0.230 **	0.106	-0.213	0.153	-0.231 **	0.105	-0.245 ***	0.093				
Young (<40)	0.043	0.119	-0.088	0.157	0.045	0.119	-0.107	0.120				
Joint mortgage	-0.197 ***	0.070	0.320 ***	0.072	-0.198 ***	0.070	0.233 ***	0.059				
Log of mortgage value	0.125	0.084	-0.661 ***	0.098	0.141 *	0.082	-0.583 ***	0.083				
Emigrants	0.061	0.074	0.150 **	0.062	0.053	0.074	0.150 ***	0.053				
Liquidity ratio	-1.274	1.245	-30.30 ***	2.925					-0.857	1.235	-29.26 ***	2.880
Excess capital to asset ratio	13.135 *	7.132	291.21 ***	22.316					16.353 **	6.971	304.04 ***	23.640
Bank fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Origination year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Sample period for mortgages	1996-1999				1996-1999				1996-1999			
No of observations	8,164				8,164				8,164			
Correlation coefficient between the residuals of the two equations	0.147** (standard error 0.059)				0.218** (standard error 0.056)				0.134** (standard error 0.063)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 14

SPREAD ON SENIOR TRANCHE ABS

Explanatory variables	Dep. variable: spread on ABS securities in Senior tranche					
	(I)		(II)		(III)	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Dummy for not AAA rating	0.304 *	0.169	0.588 ***	0.193	0.627 ***	0.174
Retained securities in equity tranche (% of total)			-0.006 **	0.002	-0.006 **	0.002
Total amount of past securitizations					-0.112 **	0.051
Constant	0.231 ***	0.037	0.255 ***	0.034	2.589 **	1.057
Bank fixed effects (within group estimator)	Yes		Yes		Yes	
No of observations	37		37		37	
No of groups	19		19		19	
R^2: Within	0.159		0.376		0.529	
Between	0.047		0.066		0.052	
Overall	0.147		0.251		0.063	

Table 15

HORSE RACE FOR MORTGAGES WITH SAME AGE AT THE TIME OF SECURITIZATION

Explanatory variables	(I) Seemingly unrelated bivariate probit (mortgages securitized at one year of age)				(II) Seemingly unrelated bivariate probit (mortgages securitized at two years of age)				(III) Seemingly unrelated bivariate probit (mortgages securitized at three years of age)			
	Dependent variable: $P(Default_i=1)$		Dependent variable: $P(\text{High risk transfer}_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(\text{High risk transfer}_i=1)$		Dependent variable: $P(Default_i=1)$		Dependent variable: $P(\text{High risk transfer}_i=1)$	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
Mortgage on preferential terms/rate	-0.235 ***	0.011	0.063 ***	0.013	-0.215 ***	0.011	0.021 **	0.009	-0.189 ***	0.011	0.143 ***	0.011
Spread	0.001 *	0.000	-0.016 ***	0.006	0.001 *	0.000	-0.004	0.006	0.001 *	0.000	0.000	0.000
Fixed rate mortgage	-0.272 ***	0.016	-0.065 ***	0.015	-0.251 ***	0.018	0.144 ***	0.012	-0.207 ***	0.022	0.227 ***	0.015
South and Islands	0.228 ***	0.013	-0.123 ***	0.012	0.226 ***	0.014	-0.131 ***	0.011	0.229 ***	0.018	-0.156 ***	0.015
Female	-0.121 ***	0.014	0.001	0.012	-0.112 ***	0.016	0.002	0.012	-0.075 ***	0.020	0.000	0.016
Close to bank headquarter	-0.167 ***	0.019	0.145 ***	0.013	-0.132 ***	0.022	0.115 ***	0.013	-0.134 ***	0.027	-0.026	0.018
Young (<40)	0.090 ***	0.013	0.068 ***	0.012	0.089 ***	0.015	0.043 ***	0.011	0.093 ***	0.019	0.110 ***	0.015
Joint mortgage	-0.249 ***	0.011	0.078 ***	0.011	-0.194 ***	0.013	0.058 ***	0.010	-0.152 ***	0.016	0.111 ***	0.013
Log of mortgage value	0.190 ***	0.012	-0.014	0.010	0.194 ***	0.013	0.427 ***	0.010	0.202 ***	0.016	0.250 ***	0.011
Emigrants	0.384 ***	0.009	0.104 ***	0.009	0.378 ***	0.011	0.070 ***	0.009	0.338 ***	0.014	0.088 ***	0.009
Liquidity ratio	-0.804 ***	0.138	5.282 ***	0.095	-0.788 ***	0.161	1.522 ***	0.103	-0.827 ***	0.196	0.443 ***	0.135
Excess capital to asset ratio	0.415 *	0.246	4.400 ***	0.194	0.255	0.291	-4.633 ***	0.230	0.610 *	0.370	-8.731 ***	0.332
Bank fixed effects	No		No		No		No		No		No	
Origination year dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Sample period for mortgages	1999-2006				1999-2006				1999-2006			
No of observations	313,749				295,329				272,233			
Correlation coefficient between the residuals of the two equations	-0.071** (standard error 0.011)				-0.141*** (standard error 0.012)				-0.207** (standard error 0.018)			

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Table 16

TWO STEPTREATMENT EFFECT MODELS

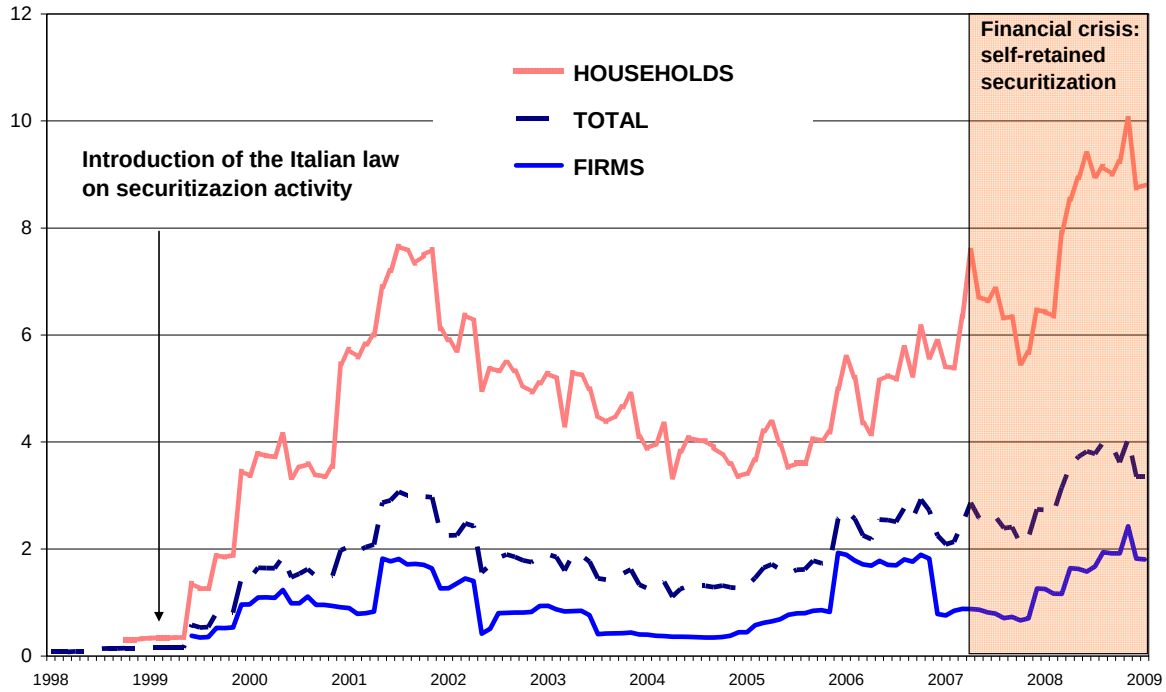
Explanatory variables	(I) Contract, borrower and bank characteristics		(II) Contract and borrower characteristics		(III) Bank-specific characteristics		(IV) Contract, borrower and bank characteristics (prior to securitization law)	
	Treatment-effects model, two-step estimates		Treatment-effects model, two-step estimates		Treatment-effects model, two-step estimates		Treatment-effects model, two-step estimates	
	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error	Coeff.	S.Error
(A) Main equation. Dependent variable is the mortgage default dummy								
Securitized	-0.022 ***	0.003	-0.025 ***	0.003	-0.033 ***	0.003	-0.055 ***	0.019
Securitized*Equity tranche	0.045 **	0.021	0.038 *	0.021	0.040 *	0.022	-0.073	0.068
Securitized*Equity tranche retained	-0.001	0.002	-0.002	0.002	0.001	0.002	0.009	0.018
Securitized*ln(number of originating banks)	0.019 ***	0.002	0.018 ***	0.002	0.019 ***	0.002	0.083 ***	0.011
Securitized*Accounting value low	0.011	0.010	0.012	0.010	0.019 *	0.010	-0.052	0.047
Securitized*Investment grade	-0.003 **	0.001	-0.003 **	0.001	-0.004 ***	0.001	-0.011	0.010
Mortgage on preferential terms/rate	-0.022 ***	0.001	-0.022 ***	0.001			-0.049 ***	0.004
Spread	0.000 ***	0.000	0.000 ***	0.000			0.001 ***	0.000
Fixed rate mortgage	-0.022 ***	0.001	-0.022 ***	0.001			-0.027 ***	0.004
South and Islands	0.016 ***	0.001	0.016 ***	0.001			0.039 ***	0.005
Female	-0.013 ***	0.001	-0.013 ***	0.001			0.001	0.005
Close to bank headquarter	-0.014 ***	0.001	-0.014 ***	0.001			-0.014 ***	0.004
Young (<40)	0.002 ***	0.001	0.002 ***	0.001			0.012 *	0.006
Joint mortgage	-0.030 ***	0.001	-0.030 ***	0.001			-0.019 ***	0.004
Log of mortgage value	0.017 ***	0.001	0.017 ***	0.001			0.052 ***	0.004
Emigrants	0.031 ***	0.001	0.031 ***	0.001			0.017 ***	0.004
Liquidity ratio	-0.046 ***	0.011			-0.048 ***	0.011	0.162	0.184
Excess capital to asset ratio	0.089 ***	0.026			0.107 ***	0.026	-0.228	0.392
Origination year dummies	Yes		Yes		Yes		Yes	
Bank fixed effects	Yes		Yes		Yes		Yes	
(B) Selection equation. Dependent variable is the securitized mortgage dummy								
Bank province	-1.557 ***	0.133	-1.557 ***	0.081	-1.557 ***	0.081	-9.488 ***	0.957
Mortgage on preferential terms/rate	0.045 ***	0.005	0.045 ***	0.005	0.045 ***	0.005	-0.095 ***	0.035
Spread	-0.006 ***	0.001	-0.006 ***	0.001	-0.006 ***	0.001	0.003	0.003
Fixed rate mortgage	0.045 ***	0.007	0.045 ***	0.007	0.045 ***	0.007	0.156 ***	0.029
South and Island	-0.148 ***	0.006	-0.148 ***	0.006	-0.148 ***	0.006	-0.190 ***	0.036
Female	0.019 ***	0.007	0.019 ***	0.007	0.019 ***	0.007	0.053	0.038
Close to bank main seat	-0.150 ***	0.008	-0.150 ***	0.008	-0.150 ***	0.008	-0.063 *	0.036
Young (<40)	0.089 ***	0.007	0.089 ***	0.007	0.089 ***	0.007	0.055	0.051
Joint mortgage	0.141 ***	0.006	0.141 ***	0.006	0.141 ***	0.006	0.111 ***	0.028
Log of mortgage value	0.194 ***	0.006	0.194 ***	0.006	0.194 ***	0.006	0.436 ***	0.030
Emigrants	0.071 ***	0.000	0.071 ***	0.005	0.071 ***	0.005	0.101 ***	0.029
Return on equity	0.027	0.185	0.027 ***	0.000	0.027 ***	0.000	0.094 **	0.047
Bank Market Power	-2.949 ***	0.014	-2.949 ***	0.134	-2.949 ***	0.134	41.318 ***	12.043
Liquidity ratio	-1.046 ***	0.093	-1.046 ***	0.096	-1.046 ***	0.096	-45.604 ***	1.491
Excess capital to asset ratio	-17.766 ***	0.232	-17.766 ***	0.246	-17.766 ***	0.246	-28.764 ***	2.234
Origination year dummies	Yes		Yes		Yes		Yes	
Bank fixed effects	Yes		Yes		Yes		Yes	
Sample period for mortgages	1996 - 2006		1996 - 2006		1996 - 2006		1996 - 1999	
No of observations	1,107,951		1,107,951		1,107,951		51,465	

Notes: Robust standard errors. The symbols *, **, and *** represent significance levels of 10%, 5%, and 1% respectively.

Figure 1

SECURITIZED LENDING IN ITALY BY SECTOR OF ECONOMIC ACTIVITY

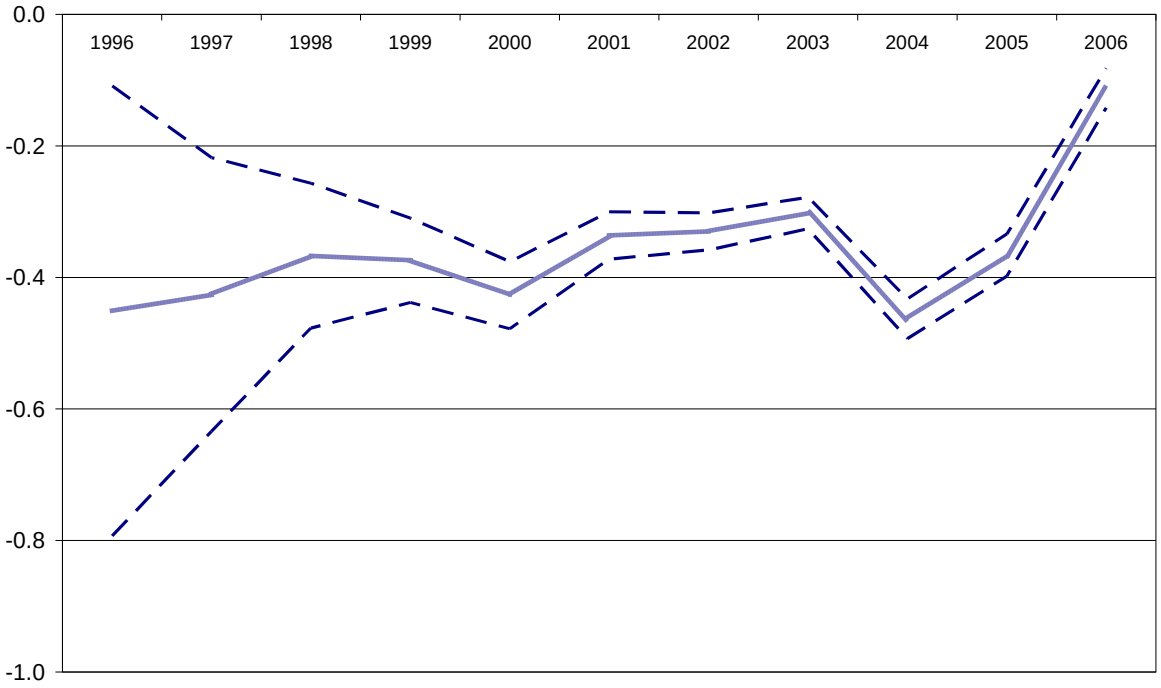
(annual flows as a percentage of the stock of lending at the beginning of the period)



Source: Bank of Italy.

Figure 2

EVOLUTION OF THE BI-PROBIT RESIDUAL CORRELATION (1)

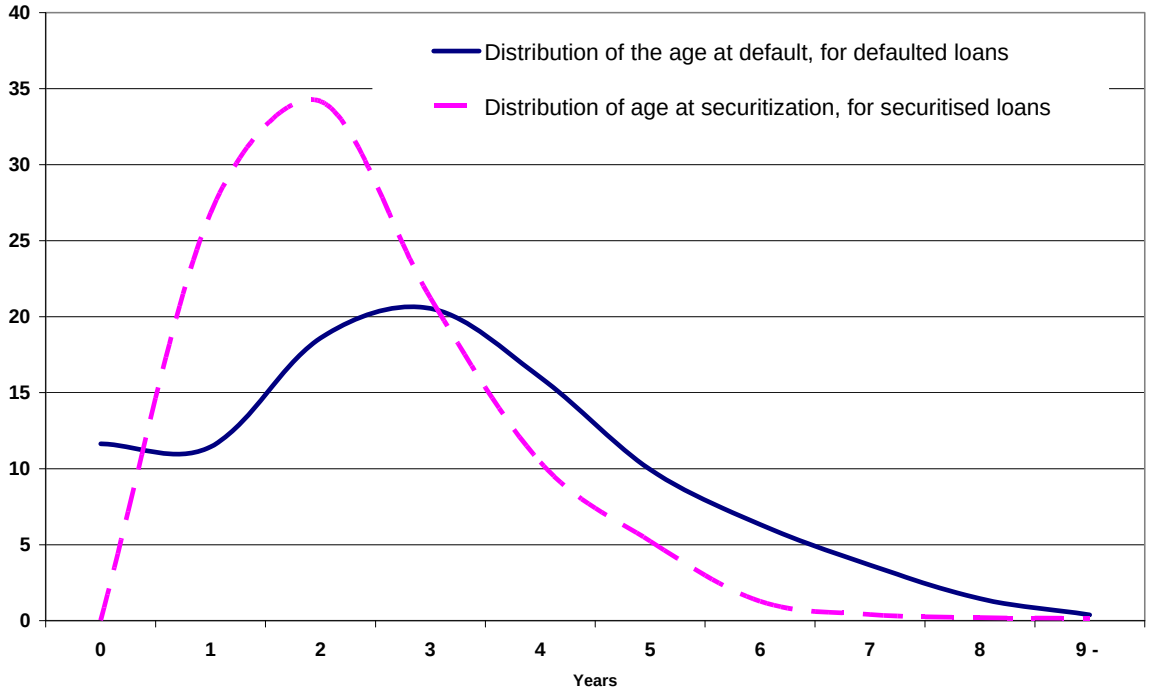


Source: Authors' calculations. (1) The dotted lines represent 95% confidence bands.

Figure 3

DISTRIBUTION OF THE AGE AT DEFAULT AND OF THE AGE AT SECURITIZATION

(percentage points)



Source: Authors' calculations.

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