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WHY DO BANKS SECURITISE THEIR ASSETS? BANK-LEVEL EVIDENCE FROM OVER ONE HUNDRED COUNTRIES IN THE PRE-CRISIS PERIOD

by Fabio Panetta* and Alberto Franco Pozzolo**

Abstract

We investigate the causes and consequences of securitisations using a large data set of banks from over 100 countries between 1991 and 2007, when the financial crisis caused the market to collapse. Our results show that banks were more likely to securitise their assets when they faced binding capital requirements and when the direct and indirect costs of these operations were lower (e.g., administrative expenses or losses implied in the sale of opaque assets in an imperfect information environment). We also find evidence that banks securitised their assets to contain credit risk and reduce their exposure to liquidity shocks. The ex-post effects of securitisations are consistent with these ex-ante determinants. After securitisations, banks improved their capital ratios and did not increase their riskiness. More importantly, they increased their credit supply. These results suggest that if properly used, these techniques can provide additional flexibility in managing banks' activities and risk, and can foster credit supply. But, as the crisis has made abundantly clear, provisions must be taken to ensure that some banks do not employ these new techniques in a way that increases individual and especially systemic risk.

JEL Classification: G21, G32.
Keywords: credit risk transfer, securitisation, financial derivatives.

Contents

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Introduction *

Driven by progress in screening and monitoring technologies and in financial engineering techniques, the use of securitisation by banks had increased spectacularly in the decade before the financial crisis. According to the Security Industry and Financial Markets Association, between 1997 and 2007 the outstanding value of US asset backed securities (ABS) increased by more than 400 per cent, from US$ 393 billion to US$ 1,956 billion. But with the financial crisis this market nearly collapsed, with new issues falling from US$ 290 billion in 2007 to US$ 135 billion in 2008. Despite a partial recovery in the years that followed, at the end of 2016 the outstanding value of ABSs was still US$ 1,386 million, well below pre-crisis levels.

The removal of credit risk from banks' balance sheets is nothing new,[1] but the techniques developed in the decade before the financial crisis raised a number of questions on the impact of credit risk transfer (CRT) on banks' performance and financial conditions. In fact, in the boom years before the financial crisis it was believed that a new banking paradigm had emerged,[2] in which intermediaries were better able to manage credit risk by redistributing loans to outside investors. But with the financial crisis many analysts and policymakers became extremely cautious about the advantages of CRT, emphasizing the potential risks in terms of banks' leverage and transparency.[3]

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[1] A securitisation wave had already taken place in the U.S., in the 1980s, when the ratio of loan sales to total assets rose from 1.6 to 9.0 per cent (Berger and Udell, 1993).

[2] This idea of a 'new paradigm' is itself not entirely new: Pennacchi (1988) suggested that 'The leading banks in loan-selling operations now view themselves more as originators and distributors of loans rather than as institutions holding loans as assets', and Berger and Udell (1993) wrote that 'It has been argued that the essence of banking may have changed during the 1980s with the explosive growth of securitisation'.

[3] A clear sign of the changing attitude of policy makers can be seen in the different views expressed by the former chairman of the FED, Alan Greenspan, who in a speech given at the American Banking Association Annual Convention on 5 October 2004, stated that 'these transactions represent a new paradigm of active credit management and are a major explanation of the banking system's strength during the most recent period of stress, by his follower, Ben Bernanke, who in a speech given on 31 October 2008 at the UC Berkely/UCLA Symposium on ìThe Mortgage Meltdown, the Economy, and Public Policy', remarked that 'the boom in subprime mortgage lending was only a part of a much broader boom characterized by an underpricing of risk, excessive leverage, and the creation of complex and opaque financial instruments that proved fragile under stress', and by former ECB President Jean Trichet, who observed, in a speech given on 19 January 2009 at the Coface Country Risk Conference in Paris, that 'as the turmoil has since shown, there was a tendency to overestimate the true degree of risk spreading and diversification, especially in credit markets'.

In the years before the financial crisis, securitisations gained a prominent role as a bank funding device, and their market's collapse is indeed one of the causes of the recent reduction in bank credit supply. This explains why in recent years the strong sentiment against securitisations has slowly faded away, and while commentators and policymakers are still sceptical about the working of the most sophisticated (and opaque) segments of securitisation markets, they now all seem to concur that CRT remains a fundamental tool for banks' activity. As was recognized by *The Financial Times*, in 2013 securitisations were already 'suddenly back in fashion among European policy makers scrambling for ways to finance an economic recovery'.[4] Stein (2010), argued that 'from the perspective of credit creation and impact on the rest of the economy, one of the most damaging aspects of the crisis was not just the problems of these big firms, but also the collapse of an entire market, namely the market for asset-backed securities'.

From a theoretical point of view this is not at all surprising. According to Diamond (1984), banks should hedge all risks for which they have no comparative advantage, a set that likely includes, for example, loans such as credit card receivables, which were among the most commonly securitised assets. DeMarzo (2005) shows that by pooling large sets of loans and tranching them into securities with different risk profiles it is possible to contain the lemon discount required by investors on the sale of informationally opaque bank assets (see also Fostel and Geanakoplos (2012) for the effect of tranching on the value of the underlying collateral). However, as was clear at least since the work of Gorton and Pennacchi (1995), CRT can at the same time reduce the incentives for banks to screen and monitor their borrowers, thereby potentially increasing individual as well as systemic risk.

As is clear from this debate, to avoid throwing the baby out with the bath water as happened in the aftermath of the financial crisis, it is of paramount importance to understand the effects of CRT on banks' performance. However, a number of crucial questions need to be addressed before policy actions to relaunch the securitisation market are decided. What are the costs and benefits that banks face when using CRT techniques? When do banks securitise their loans to reduce risk and diversify their lending portfolio, and when do they use CRT techniques merely to increase leverage, exploiting asymmetric information on the quality of the loans that are sold to outside investors? Is it true that securitisations help sustain bank credit supply? While a number of papers have tried to answer these questions, empirical analyses of the motivations of CRT and its effects on banks' performance have not reached any firm

[4] 'ECB's Draghi in drive to revive slicing and dicing' by Ralph Atkins, *The Financial Times*, 8 May 2013. See also the report published by the Financial Stability Board (FSB) in November 2010, where the G20 leaders claimed that 're-establishing securitisation on a sound basis remains a priority in order to support provision of credit to the real economy and improve banks' access to funding in many jurisdictions'; the report on asset securitisation incentives of the Joint Forum of the Basel Committee on Banking Supervision, recognizing 'the potential benefits of securitisation, including its positive effect on credit availability' and recommending authorities to encourage a greater degree of document standardisation and a reduction of product complexity, so as to improve market transparency (BCBS, 2011); the consultative documents on Revisions to the Basel Securitisation Framework (BCBS, 2012 and 2013); and the final report on Criteria for identifying simple, transparent and comparable securitisations (BCBS, 2015).

conclusions. In this paper we contribute to this literature by investigating the causes and consequences of CRT.

The extant analyses of why banks transfer credit risk have displayed three weaknesses. First, in most cases, previous papers have estimated contemporaneous correlations between bank characteristics and the use of CRT (see, for example, Bannier and Hänsel (2008)).[5] Clearly, this makes it impossible to distinguish the motives that induce banks to use CRT from the effects of CRT on a bank's performance. In order to address this problem, we review the competing theories of why banks use CRT. Each theory yields a list of factors that are likely to affect the decision to transfer credit risk (ex-ante analysis, based on the characteristics of the banks before using CRT for the first time) as well as the possible consequences of CRT (ex-post evidence, based on the performance of those same banks after using CRT). Thus, by analysing separately ex-ante determinants and ex-post consequences, in our empirical analysis we are able to reject some of the competing theories.

Second, previous studies have focused on specific aspects of the effects of securitisations. This may hinder a deep understanding of the motives behind why banks securitise their assets. For example, a common finding of the literature is that *before* the securitisation banks are riskier than average. This might be consistent with the fact that banks use CRT instruments to rebalance their loan portfolio in order to achieve a given (lower) level of risk. However, it is also consistent with the fact that the securitising banks are riskier than average because they deliberately follow a high-risk/high-return strategy. The policy implications of these two alternative views are very different, but without a *comprehensive* analysis of the characteristics of the securitising banks (such as their risk profile *after* the securitisation) it would be impossible to discriminate between them. In order to overcome these problems, we examine the evolution of a wide range of balance sheet indicators of the banks that decide to securitise their assets.

Third, the vast majority of the empirical analyses focus on individual countries (mainly the U.S., as in Bedendo and Bruno (2012), Casu *et al.* (2013), Han *et al.* (2015), Bord and Santos (2015)), thus making it impossible to examine whether the use of CRT techniques reflects country-specific characteristics. Unlike previous papers, we do not concentrate on any single country, but analyse banks from a large cross-section of countries. We supplement our bank-level data set with country-specific indicators, such as the degree of development of the credit and equity market or characteristics of the supervisory system. This permits us to examine how the structure of the domestic financial system affects banks' use of CRT.

We focus on one specific technique for the transfer of credit risk – securitisations. In fact, while a wide range of additional instruments can be used to transfer credit risk – from

[5] A recent exception is Casu *et al.* (2013), who study the impact of securitisations on banks' ex-post performance, controlling for possible endogeneity using propensity score matching; in our ex-post analysis, we also control for the potential self-selection bias created by banks' decision to securitise their assets using Heckman's (1979) two-step procedure.

syndicated loans to credit derivatives – previous analyses suggest that banks tend to use them as complements (Cebenoyan and Strahan (2004); Hirtle (2009); Minton *et al.* (2009)). Therefore we take the use of securitisation techniques such as asset backed securities (ABS), mortgage backed securities (MBS), collateralized loan obligations (CLO) and collateralized debt obligations (CDO), and, in the case of U.S. banks, the sale of loans to other institutions for subsequent securitisation, as a signal that the bank uses CRT techniques in general.

Our empirical analysis is based on a unique data set for well over 100 countries, assembled by merging information on bank securitisations obtained from Bondware, a commercial data set produced by Dealogic and reporting all major bond issues in the world, with bank balance sheet data from Bankscope, the well-known data base produced by Bureau van Dijk. For the U.S., where securitisations were most widespread, we further integrated our initial data with very detailed information from bank filings according to the Home Mortgage Disclosure Act (HMDA), and with the information collected by the Federal Reserve Board and published in the Call Reports. Our focus is on the period before 2008, when the market for securitisations was not disturbed by the uncertainties that emerged during the financial crisis, when the fears of contagion among banks and other financial intermediaries substantially changed the incentives to use CRT techniques. Our initial data set includes information for nearly 12,000 banks between 1991 and 2007, with over 1,000 securitisers. This detailed information allows us to analyse the bank-level motives of the decision to transfer credit risk, and their consequences.

From a first glance at our data it is clear that only some banks use CRT. For example, according to the Bankscope and Dealogic databases, less than 10 per cent of the banks with more than US$ 1 billion in total assets originated ABS, MBS, CLO or CDO in the period 1991-2007. Even among the 1,031 largest banks (those included in the first decile by size), only one fourth were active in CRT.[6] The fact that some intermediaries use CRT, while others do not, suggests that bank-specific characteristics affect the decision to transfer credit risk; for example, only large banks might afford the (potentially heavy) fixed costs of organizing complex securitisation deals. For these reasons we believe that to investigate the causes and effects of CRT it is important to have a large microeconomic data set.

Our results show that there are multiple reasons for why banks use CRT techniques. Large banks are more likely to securitise their assets, as they can spread the fixed costs of the deals (e.g., administrative expenses) over a larger base. More interestingly, securitisations are mainly used as a funding device and to contain the riskiness of the bank, by improving capital ratios, selling risky loans and reducing exposure to liquidity shocks. According to our ex-post evidence, securitising banks had a higher rate of growth of loans than non securitisers and they succeeded in increasing their capital ratios. Moreover, although our results show that on

[6] Minton *et al.* (2009) show that among the top 395 U.S banks in 2005, only 5.8 per cent were active in the CDS market. The number of banks that use more traditional ways of transferring credit risk (such as credit syndicates) is also small (Sufi (2007)).

average banks did not use securitisations to increase their riskiness, we do find some evidence that a number of banks actually followed this strategy.

Our analysis supports the view that there are potential benefits associated with securitisation, including its positive effects on credit availability, but it also makes clear that regulations need to be designed so as to limit the moral hazard associated with CRT.

The rest of the paper is organized as follows: Sections I and II describe the hypotheses under scrutiny and link them to the available empirical evidence. Section III describes the data used in the empirical analysis and presents some descriptive statistics. Sections IV and V present the results of the econometric analyses, respectively of the ex-ante characteristics of banks that make use of securitisations techniques and of the ex-post effects of securitisation. Section VI discusses the empirical results, setting them out within a single framework, and concludes.

1. Hypotheses and related research

A bank will transfer credit risk if the ex-ante risk-adjusted benefits (e.g., in terms of risk reduction, lower interest expenses or availability of the resources needed to exploit new investment opportunities), exceed the fixed and variable costs of the operation. In this section we review the potential costs and benefits of CRT, highlighting testable implications on both the ex-ante characteristic of the securitising banks and the ex-post effects of the operations. Table 1 reports the expected sign of the impact of bank and country-specific characteristics available in our data set, according to each hypothesis discussed below.

A. The costs of securitisation

A1. The fixed costs hypothesis

Securitisations involve substantial one-off costs. These include consultancy and organizational costs related to the bundling and tranching of loan portfolios, payments to the agencies responsible for assigning a rating to the different tranches, underwriting fees, and legal expenses. According to Davidson *et al.* (2003), for example, the upfront costs of a typical securitisation can easily exceed US$ 1 million, mainly from legal fees and consultancy and management expenses in structuring and arranging the operation. Many of these costs are relatively fixed, and so they bear more heavily on small banks, which should therefore be less likely to use CRT techniques.

A2. The lemon discount hypothesis

Because banks have private information on the quality of their loan portfolio, outside investors will require a lemon discount on the price of the assets that are sold (Gorton and Pennacchi (1995) and An *et al.* (2011)). The securitised assets are therefore likely to be underpriced relative to the book value of the loans.

According to this hypothesis, banks that pay a lower lemon discount should be more likely to

securitise their assets. The discount is likely lower if (i) the bank can credibly certify the quality of the assets it is selling (Gorton and Pennacchi (1995); Focarelli *et al.* (2008)); (ii) private information is less relevant because the loans are less opaque or more standardized; (iii) the loss given default is lower, for example because the loans are collateralized; (iv) the bank has less information on the characteristics of the borrowers and therefore can more credibly claim that it is not exploiting soft private information when choosing what loans to securitise (Frankel and Jin (2015)).

Thus, banks that in previous years had a lower level of charge-offs and problem loans – which are likely to enjoy a better reputation and hence can credibly advocate a superior ability in screening and monitoring borrowers – would be more likely to securitise their assets.[7] Also, larger banks, which are less likely to collect private soft information on their borrowers (Berger *et al.* (2005)), should pay a lower lemon discount and therefore be more likely to securitise their loans.

Listed banks might also pay a lower lemon discount, since their balance sheets are typically under close scrutiny by external analysts, although this effect may be counterbalanced by the lower transparency of large and complex financial institutions, as became extremely evident during the recent financial crisis.

A3. The asset opaqueness hypothesis

A bank that is securitising part of its assets has an incentive to retain a share of credit risk, in order to signal the quality of the assets that it is securitising (Pennacchi (1988); Gorton and Pennacchi (1995)). The impact of securitisations on bank risk therefore depends on the share of risk that it retains. However, for many investors information on the risk retained may be difficult and costly to obtain, leading to imprecise estimates of the bank's overall credit risk (Acharya *et al.* (2013)). As the financial crisis has made clear, such uncertainty about a bank's overall credit risk can lead to severe funding problems. These problems will be especially acute for banks with a larger share of short-term and wholesale liabilities, which are subject to frequent rollover on markets that tend to be highly sensitive to issuers' conditions (Ivashina and Scharfstein (2010); Gorton and Metrick (2012a)).

Hence, under this hypothesis, the impact of the higher opaqueness of the assets of securitising banks is stronger for banks with a larger share of (i) short-term liabilities and (ii) money market funding. Banks with these characteristics should be therefore less likely to securitise their assets. Conversely, the impact of asset opaqueness should be less relevant for banks that already have a large share of liquid assets over total assets.

[7] The probability of using CRT techniques should also be higher for banks with a larger proportion of credit card receivables, automobile loans and mortgages, which are less subject to asymmetric information (because of their high degree of standardization) and have lower loss given default (because of their high degree of collateralization). Unfortunately, we cannot test this additional implication of our hypothesis because only a few banks in our sample report information on loan categories.

Ex post, the higher opaqueness of the bank's assets after a securitisation should increase the cost of funding, especially in wholesale markets, thus inducing the securitising banks to reduce the weight of short-term liabilities and money market instruments over total liabilities.

A4. The external environment hypothesis

The costs and benefits that banks face in securitising their loans also depend on the institutional and economic environment in which they operate. For example, differences in the regulatory regimes can have a major impact on the costs and benefits for banks of securitisations , and the incentives to use securitisation techniques are stronger at times when the economy is buoyant, because credit is in higher demand and it is less risky.

While specific information on the regulatory treatment of securitisations is not available for a sufficiently wide set of countries, this hypothesis can still be tested using a set of proxies of the stringency of each country's regulatory framework, such as the type and number of bank supervisory authorities, the presence of regulations or guidelines on portfolio concentration and the degree of disclosure of off-balance sheet activities (Barth *et al.* (2004)). Banks operating in countries where regulation is more stringent are therefore expected to be less likely to securitise their assets.

Securitisations are also likely to be more common in countries with more developed non-banking financial markets. If banks securitise in reaction to the competition in their traditional lending activities coming from arm's length financing, those countries where financial markets are relatively more developed than credit markets should have a higher incidence of securitisation. In addition, in countries with more developed financial markets it should be easier for banks to find acquirers for their asset backed securities.

B. The benefits of securitisation

B1. The capital ratio hypothesis

Banks with a capital/asset ratio close to the regulatory minimum requirements may use securitisations to improve their capital ratios or, alternatively, to exploit the additional scope for taking on new lending opportunities. They should therefore be more likely to securitise their loans (Acharya *et al.* (2013)).

The evolution of the balance sheet of the securitising banks after securitisation helps discriminate between these two alternatives. If the reason for the securitisation is to exploit profitable lending opportunities, after the operation loans should increase (and the capital-asset ratio likely decrease) more than for non-securitising banks. If, instead, the bank's objective is to improve its ratios, then the capital-asset ratios should increase and loans should increase in line with or even less than in the control sample. Clearly, it is also possible that securitising banks try to achieve both results of increasing their credit supply and improving their capital ratios.

B2. The lower cost of funding hypothesis

The possibility of securitising part of its loan portfolio gives a bank an additional funding channel, an opportunity that will be easier to exploit for banks with a larger share of loans and with a higher rate of growth of loans.[8] On the liability side, since retail customer deposits are among the cheapest sources of funds, banks with a larger share of demand deposits over total liabilities should be less likely to securitise their assets.

Ex post, the possibility of raising funds through securitisation markets should induce banks to increase the rate of growth of loans and reduce the buffer of liquid assets. Moreover, if securitising banks are those with higher funding costs, they should also try to increase their share of demand deposits.

B3. The liquidity hypothesis

The possibility of securitising part of the loan portfolio reduces vulnerability to liquidity shocks.[9] Banks with a smaller share of liquid assets over total assets, and a larger share of illiquid loans, should therefore be more likely to securitise.

On the liability side, banks with a larger share of demand deposits as a proportion of total liabilities are usually thought to be highly vulnerable to liquidity shocks (see Diamond and Dybvig (1983)) and, according to this hypothesis (and to the asset opaqueness hypothesis above), they should therefore be more likely to securitise their assets. However, the radical changes in banking activities in the last decades and the diffusion of deposit insurance schemes have made traditional bank runs nearly obsolete (Brunnermeier (2009)), producing instead other sources of liquidity shocks. 'The financial crisis was a bank run, but in sectors of the money markets where financial institutions provided bank-like debt products to institutional investors' (Gorton and Metrick (2012b)). It was banks and money funds that took a run on some core financial institutions (Uhlig (2010); Gorton and Metrick (2012a)), and traditional retail deposits proved in most cases to be a highly stable source of funding, actually reducing banks' exposure to liquidity shocks (Ivashina and Scharfstein (2010)). Nowadays, banks with a larger share of demand deposits have a more stable source of liquidity, and should thus be less likely to securitise their assets.

Ex post, the possibility of raising funds through securitisation markets should induce banks to increase the proportion of assets represented by illiquid loans, increase the rate of growth of loans and reduce the buffer of liquid assets.

B4. The risk-removal hypothesis

[8] The impact of greater funding possibilities is studied by Jimenez *et al.* (2010), who show that the growth in the market for securitised assets allowed Spanish banks at the beginning of the last decade to reduce interest rates and expand loans to firms; at the aggregate level, this effect was balanced only in part by a reduction in the incidence of other sources of firm financing.

[9] Clearly, this is true for idiosyncratic shocks, not in the case of a systemic shock that, as in the recent crisis, dries up the interbank markets as well as the markets for securitisations (Heider *et al.* (2015)).

Banks that want to remove undesired risk from their balance sheets can securitise their riskiest loans and invest the proceeds in safer assets, thereby achieving a different combination of risk and return. This opportunity should be especially appealing to banks that (i) are riskier than average, (ii) in case of default would experience large losses, for example because they have a higher franchise value (see Gorton and Souleles (2006) and Jiangli *et al.* (2007)), and (iii) are increasing their lending and to do so may take on excessively risky activities.

Bank riskiness is typically measured by the incidence of net charge-offs, problem loans and loan loss reserves (common proxies of the probability of default), by the level of profitability (a proxy for the franchise value), and by the Z-score, which is commonly defined as the number of standard deviations that a bank's ROA has to drop below its expected value before equity is depleted (Laeven and Levine (2009)), and therefore is a negative function of the risk of default (i.e, banks with a higher Z-score are less likely to default). Under the risk-removal hypothesis, banks that make a larger use of securitisations should be those that have: (i) a higher incidence of net charge-offs, loan loss reserves and problem loans, and a lower Z-score, (ii) higher returns on equity and on assets, (iii) a higher share and rate of growth of loans.

Ex post, default risk should decrease, determining a reduction of charge-offs, problem loans and loan loss reserves, and an increase of the Z-score.

B5. The risk-taking hypothesis

Benveniste and Berger (1986) suggest that securitisations could instead aim to increase risk, if banks securitise low-risk credit and grant new loans to riskier borrowers. Under this hypothesis, securitisations should be mainly used by less risky banks, thus with a higher Z-score, and a lower incidence of net charge-offs, loan loss reserves and problem loans.

Berger and Udell (1993) also argue that banks have an incentive to take on risk to exploit the fact that the cost of deposit insurance does not fully reflect (or is nearly independent of) their risk attitude. Under this additional hypothesis, riskier banks should be more likely to securitise their assets in countries with more generous deposit insurance schemes.

Clearly, under the risk-taking hypothesis, the ex-post effect of securitisations should be to increase risk, the opposite of what is suggested by the risk-removal hypothesis.[10]

B6. The diversification hypothesis

[10] This implication is shared by another strand of literature, focusing on the possibility of using securitisations to distinguish between investors with different risk attitudes. Benveniste and Berger (1987) and James (1988) show that it is possible to reduce the overall costs of funding by letting banks issue senior debt claims to more risk-averse investors, while leaving out less risk-averse depositors with claims on the residual loan portfolio. In this setting, banks will securitise relatively safe assets, thereby increasing the overall risk of their loan portfolio. The same conclusion that banks securitise their safest assets is reached by Greenbaum and Thakor (1987) in a setting in which a pooling equilibrium is in any case prevented, because borrowers can signal their quality by acquiring insurance on their probability of default, for example by acquiring letters of credit.

Asset securitisation allows banks to reduce their exposure to specific sectors or geographic areas, thus diversifying their loan portfolio. This mechanism has been studied explicitly in the theoretical literature. Pennacchi (1988), for example, argues that standard incentive-efficient contracts give the bank a disproportionate share of loan credit risk with respect to what would be implied from the point of view of optimal risk management, but that such excessive credit risk taking can be diversified away through loan sales (see also Morrison, 2005).

If securitisation is driven by the diversification motive, banks with more concentrated loan portfolios should be more likely to securitise. To the extent that the size of commercial and industrial loans is on average larger than that of consumer and mortgage loans, banks with a lower share of consumer loans and especially of mortgages should be more likely to use securitisation techniques.[11]

The diversification hypothesis implies that after the securitisation banks should reduce the concentration of the loan portfolio (measured by a reduction in the share of C&I loans) and possibly credit risk (measured for example by the Z-score).

B7. The tax incentive hypothesis

In a recent paper, Han *et al.* (2015) build a model in which banks have an incentive to securitise their loans for tax reasons, since special purpose vehicles which purchase loans and issue ABS are exempt from corporate taxation. Under this hypothesis, securitisations are therefore more profitable for banks with large lending opportunities, limited deposit market power and facing high corporate income taxation.

2. Previous evidence

One of the issues that have been most widely analysed in the literature is the relationship between CRT and bank risk. The results are controversial, as they differ according to the country and time period analysed. Some authors find a positive relationship between bank risk and the use of CRT techniques: the securitising banks have high risk provisions (see Bannier and Hänsel (2008), who study European banks), and high charge-offs (see Pais (2005) on UK and Irish banks and Le *et al.* (2016) on US banks). Bedendo and Bruno (2012) show that banks that make intensive use of loan sales and securitisations are riskier overall, have a loan portfolio of lower quality, and experienced higher default rates during the recession. Cebenoyan and Strahan (2004) also find that U.S banks active in the loan sales market hold on average riskier C&I loans and real estate loans, and they also find that they operate at higher leverage. On similar grounds, Beccalli *et al.* (2015) find that the U.S. banks that are more involved in securitisation have a more pro-cyclical leverage. However, other papers find

[11] Clearly, this prediction contrasts with the lemon discount effect, suggesting that more standardized and transparent loans are more likely to be securitised. Which effect prevails is therefore an empirical issue. Unfortunately, our data do not allow us to test this additional hypothesis.

that banks that are more likely to securitise have *lower* leverage (see Gorton and Souleles (2006) and Minton *et al.* (2004), who analyse U.S. banks).

Berger and Udell (1993) find a positive and significant relationship between the risk of U.S. banks and securitisations with implicit or explicit recourse (i.e., that do not entirely remove the credit risk from the bank's balance sheet), but no relationship for securitisations with no recourse. One possible explanation for this is that riskier banks use securitisations with recourse to conceal their actual credit risk. On the other hand, Kara *et al.* (2016) show that in the years before the financial crisis banks that were more active in the securitisation business did not require lower interest rates on the loans that they syndicated, suggesting that they did not have a lower level of risk aversion than other banks. Finally, studying a sample of listed Italian banks between 2000 and 2009, Battaglia and Gallo (2013) find that securitisers have higher expected losses in case of extreme events (i.e., they have a higher expected shortfall, as defined by Acharya *et al.*, 2012).

Other studies measure risk based on the bank's funding costs, again obtaining controversial results. Jiangli and Pritsker (2008) and Jiangli *et al.* (2007) find that U.S. bank holding companies using securitisation techniques pay on average lower spreads on uninsured time deposits. This might signal that customers require a lower risk premium from securitisers, or that they can afford to offer low returns on deposits because they have a larger set of funding sources. In contrast with this result, Gorton and Souleles (2006) find that financial companies with worse bond ratings are more likely to securitise.

Focusing on liquidity risk, Farruggio and Uhde (2015) provide evidence that banks with less liquid assets are more likely to use CRT techniques, and Casu *et al.* (2013) find that a bank is more likely to securitise if it has high liquidity needs, as reflected in higher loan growth.[12] Furthermore, Loutskina and Strahan (2009) find that an increase in balance sheet liquidity increases the probability that a bank grant loans that are difficult to sell or securitise.[13]

A second aspect analysed in the literature is the relationship between securitisation and regulatory capital. In this case the results are less ambiguous, and seem to suggest that securitisations are mainly used by banks with lower capital ratios. For example, Calomiris and Mason (2004) find that banks securitise credit card receivables in order to set capital ratios at

[12] See also Cebenoyan and Strahan (2004), Bannier and Hänsel (2008), Jiangli *et al.* (2007), Minton *et al.* (2009), Affinito and Tagliaferri (2010).

[13] A strand of literature has also considered how stock markets react to the announcement of securitisation. Marsh (2006) shows that the announcement of a new bank loan has a less positive effect on the borrower's stock price when the lender is active in the CRT market, as if markets anticipated that banks will be less concerned about the quality of the loans that they will eventually securitise. Thomas (2001), Pais (2005), Hänsel and Krahnen (2007) and Nijskens and Wagner (2011) also show that the use of credit risk transfer techniques, such as CDO and CLO issuance or the trading of credit default swaps (CDS), raises the originators' systematic risk, measured by its stock market beta, the more so for financially weaker institutions. However, Wu *et al.* (2011) find the opposite result. Finally, Rosen (2011) shows that U.S banks had higher stock price returns when they sold mortgages used for refinancing, but this eventually led to higher losses during the crisis.

levels consistent with market standards.[14] In a recent paper, Acharya *et al.* (2013) show that commercial banks set up conduits to securitise their assets in order to reduce their capital requirements, while at the same time insuring the newly securitised assets using credit guarantees, leaving therefore their risk exposure unchanged. Remarkably, in most cases the guarantees offered by banks took the form of 'liquidity enhancements', which are subject to much lower regulatory capital requirements than full credit guarantees.[15]

The possibility of securitising also affects banks' lending policies. Goderis *et al.* (2006) and Hirtle (2009) find that banks using CRT techniques increase loan supply. Loutskina (2011) shows that banks with a loan portfolio that can be more easily securitised have lending policies that are less sensitive to monetary shocks. Similarly, Carbo-Valverde *et al.* (2015) show that, in normal periods, firms borrowing from banks that were making larger use of securitisations faced lower credit constraints, and Bonaccorsi di Patti and Sette (2016) show that banks that securitised a larger share of loans before the financial crisis tightened their credit supply by a larger extent in subsequent years.

Finally, a large number of studies examine the characteristics of the loans that are sold, and how the proceedings are used. Mian and Sufi (2009) and Dell'Ariccia *et al.* (2012) provide evidence that in the last decade U.S. banks securitised low-quality mortgage loans. In a series of papers exploiting the ad hoc threshold induced by the rule of thumb put forth initially by Fannie Mae and Freddie Mac that made loans to borrowers with a FICO score above 620 easier to securitise, Keys and co-authors provide evidence consistent with the hypothesis that securitisation practices adversely affected the screening incentives of subprime lenders (Keys *et al.*, 2010). Moreover, they show that deposit-taking institutions tend to securitise riskier loans than non-deposit taking institutions, but larger banks, with more deposits and with more liquid assets, tend to originate higher quality loans (Keys *et al.*, 2009), and that 'low-documentation non-agency loans with greater ease of securitisation defaults more than a similar-risk-profile group with lesser ease of securitisation, despite no differences in loan terms around the threshold' (Keys *et al.*, 2012). Similarly, Black *et al.* (2010) show that commercial mortgages originated by domestic conduit lenders, which have low capitalization and are not exposed to warehousing risks, had significantly higher delinquency rates than those originated by commercial banks and finance and insurance companies. Consistent evidence is provided by Bord and Santos (2015), who show that collateralized loan obligations (CLOs) underperform matched unsecuritised loans originated by the same bank. Similarly, Purnanandam (2008) finds that U.S banks making larger use of CRT techniques before the financial crisis had significantly higher mortgage charge-offs after the crisis, likely

[14] See also Pais (2005), Bannier and Hänsel (2008), Jiangli *et al.* (2007), Jiangli and Pritsker (2008), Casu *et al.* (2103) and Beccalli *et al*. (2015). Minton *et al.* (2009) find similar results for U.S banks that use credit default swaps (CDS) to buy protection.

[15] Studying the amount of highly rated securitisation tranches held by U.S. bank holding companies in their balance sheet, Erel *et al*. (2014) find, instead, no evidence that banks that engaged more in regulatory arbitrage activities had larger holdings of highly rated tranches on their balance sheet.

an indication that securitisations were associated with lending to customers with high default risk.

However, this evidence is also far from being unchallenged. Bubb and Kaufman (2014) argue that the evidence based on the results of Keys *et al.* (2009 and 2010) are based on the wrong identification assumption that the rule of thumb put forward by Fannie Mae and Freddie Mac impacts only on the probability of securitisation and not on that of loan origination.[16] Agarwal *et al.* (2012), studying a large sample of U.S. mortgage loans, find that before the financial crisis banks generally sold low-default-risk loans and retained higher-default-risk loans in their portfolios, with the only exception of those in the subprime market, where no clear pattern emerges, in any direction. Jiang *et al.* (2014), studying more than 700,000 mortgage loans, find that while loans with characteristics that make them ex-ante more likely to default have a higher probability of being sold, those actually sold by the bank have instead ex-post lower delinquency rates than those retained on the bank's balance sheet. Similarly, Albertazzi *et al.* (2015), using high quality data on mortgages granted by Italian banks, show that those that have been securitised had an ex-post lower probability of default.[17]

An additional aspect is that of taxation. In a recent paper, Han *et al.* (2015) show that banks located in U.S. states with higher corporate tax rates and with larger lending opportunities, measured by a lower share of securities over total assets, are more likely to securitise their loans, to benefit from the fact that conduits are subject to lower taxation. Gong *et al.* (2015) confirm this result using cross-country data from 29 OECD countries.

We are aware of only a few studies of the ex-post effects of securitisations. Michalak and Uhde (2010) find for a sample of European banks that securitisation has a negative impact on financial soundness as measured by the Z-score. On the contrary, Casu *et al.* (2013) find no evidence of significant causal effects of securitisation on the performance of U.S. banks.

From this review it appears that previous studies have focused on specific aspects of the effects of securitisation, but failed to perform a comprehensive analysis of the overall impact of CRT on banks' performance. To overcome this problem, in the following sections we use a large sample of banks from over 100 countries and examine the evolution of a wide range of balance sheet indicators of the banks that decide to securitise their assets. We estimate two separate empirical models, one for the ex-ante characteristics of the securitising banks and the other for the ex-post effects of the deals.

[16] As shown by the reply in footnote 4 of Keys *et al.* (2012), this debate is still well open.
[17] In addition to the evidence presented above, He *et al*. (2012) also show that in the years leading up to the crisis rating agencies granted a more favourable treatment to banks issuing large amounts of asset backed securities, most likely because they could generate more substantial revenues from fees, causing a bias in favour of securitisations originated by larger institutions.

3. Data and summary statistics

The sample of banks that securitised their assets was constructed based on two commercial databases, Dealogic and Bankscope, integrated for the U.S. with additional information from regulatory authorities. Information on banks that originated issues of asset backed securities (ABSs), mortgage backed securities (MBSs), collateralized loan obligations (CLOs) or collateralized debt obligations (CDOs) are obtained from Dealogic's Bondware database, which reports all types of securitisations performed by banks, including the operations realized indirectly, by initially transferring the loans to a Special Purpose Vehicle (SPV). For the U.S., since the data obtained from Bondware underestimate the extent of bank securitisations, we have supplemented our information from two public data sources, the U.S. Call Reports collected by the Federal Reserve and the bank's filings according to the Home Mortgage Disclosure Act. In particular, we have included in our list of banks using CRT techniques institutions that were servicing loans that they had securitised or that they had sold to another institution (according to information obtained from the Call Reports), and those that originated residential mortgage loans and sold them to other financial institutions (information provided by HMDA; see Han *et al.* (2015) for a similar assumption).

Our other source, Bankscope, reports bank balance sheet information for a large number of credit institutions around the world. Also in this case, for the U.S. banks, we integrate information from Bankscope using data from the Call Reports. In the absence of a common identification code across the databases, we painstakingly merged them using as a reference the name of the bank and the country of residence. Each pairing so obtained was checked by hand. Similarly, we matched data from HMDA and the Call Reports using as common identifiers the name of the bank and the zip code of the area where it is located.

Because coverage of small banks across countries is not uniform, we restricted our analysis to banks with at least one billion US$ of total assets. Moreover, in order to remove potential outliers, we trimmed our data at the 1st and 99th percentile of all variables used in the empirical analysis. We end up with an unbalanced panel of 11,903 banks in 143 countries from 1991 to 2007. Of these, 1,184 securitised or sold their assets for securitisation at least once during our sample period. Unfortunately, not all banks report the entire set of balance sheet information continuously. In particular, data on charge-offs, loan loss reserves and capital are missing for a large number of credit institutions.

Information on the characteristics of each country's banking and financial sector and on the regulatory framework are from the World Bank database, respectively the updated versions of Beck *et al.* (2000) and Barth *et al.* (2004). Our index of moral hazard of each country's deposit guarantee scheme is obtained as the first principal component of a matrix reporting for each country (rows) a set of scores (columns) defining whether the deposit insurance scheme: (i) was based or not on coinsurance, (ii) also covered foreign currency deposits, (iii) also covered interbank deposits, (iv) was funded or unfunded, (v) had government, private or joint

funding, (vi) had official, private or joint administration, (vii) had compulsory or voluntary membership. Original information are from Demirgüç-Kunt *et al.* (2005).

Table 2 presents summary statistics for our entire sample distinguishing between banks that used CRT techniques and banks that did not. The average size of the banks is US$ 36.8 billion. The size distribution is strongly skewed to the left, as confirmed by the fact that the median value is of only US$ 4.5 billion. Banks that directly or indirectly securitise their loans are larger than others, with average assets of US$ 87.0 billion and a median of US$ 10.1 billion. They differ from the control group also along other dimensions: they have on average higher returns on assets (0.97 versus 0.85) and higher risk (net charge-offs are 0.31 per cent of total assets, as against 0.27 per cent for the control group, and the Z-score is 0.32 versus 0.40).[18] Moreover, they are less capitalized (1.2 per cent of excess capital versus 4.3 per cent) and more liquid (18.9 per cent as opposed to 16.4 per cent). Finally, they have a smaller share of demand deposits over total liabilities and equity (12.6 per cent versus 17.6 per cent) and a smaller share of mortgages over total loans (0.47 per cent versus 0.52 per cent). Comparing other sample statistics, it turns out that the patterns found for the mean are also confirmed by the medians.

These differences between the characteristics of securitising banks and other credit institutions might be related to the decision to transfer credit risk. However, sample statistics are not informative about the causal link between bank characteristics and the use of CRT techniques, as they could simply reflect spurious correlations (driven, for example, by differences in the size or country distribution between the securitising banks and the control group). For all these reasons, we turn to the econometric analysis, estimating first a discrete choice model of the ex-ante characteristics of the securitising banks, and second a difference-in-difference, panel data model of the ex-post effects of securitisation on bank balance sheet characteristics.

4. Ex-ante characteristics of securitising banks

Our data allowed us to test most of the different implications of the hypotheses discussed in Section I. The last two rows of Table 1 report the sign of the coefficients most robustly estimated in our empirical exercise.

[18] Assuming that profits follow a normal distribution, a Z-score defined as $Z = (ROA+CAR)/\sigma(ROA)$ – where ROA are return on assets, $\sigma(ROA)$ their standard deviation and CAR the capital-asset ratio – measures the number of standard deviations that a bank's ROA has to drop below its expected value before equity is depleted (i.e., that *Prob.*(-ROA<CAR); see, Laeven and Levine (2009)). Having yearly data, we calculate the sample variance over the previous five years and run some robustness checks using variance calculated over three years.

A. Baseline specification

In this section we present the results of the econometric analysis on the ex-ante characteristics of banks that make use for the first time of securitisation techniques, in which all our hypotheses are tested within a unified regression framework.

Since our focus is on the ex-ante characteristics of banks deciding to start using securitisation techniques, we use a duration model to estimate the probability that at each point in time a bank begins to securitise its assets by issuing either an ABS, an MBS, a CLO or a CDO. The general specification we adopt is that of a survival-time data model estimated by the method of proportional hazards regression first proposed by Cox (1972):

$$\lambda\left(t_{ij}\right) = e^{-\beta' x_{ijt}} \lambda_0\left(t_{ij}\right) \qquad (1)$$

where λ_0 is the 'baseline' hazard and X_{ijt-1} is the set of explanatory variables affecting the hazard rate, which includes characteristics of bank i in country j at time t-1, and characteristics of country j at time t-1. Since we pool together banks from different countries, with different norms and market standards, and these differences could influence banks' behaviour and the decision to transfer credit risk, we also control for country characteristics that are time invariant through stratification. This choice imposes a very demanding control of our data. Reassuringly, when we replicate our regressions by expressing all bank-specific variables in deviation from the respective time and country medians, and adding back the country- and time-specific medians to all bank characteristics, the main results are unchanged. In addition, our estimates are conducted stratifying by year, bank specialization, balance sheet consolidation and whether the source of data is HMDA and the Call Reports, or Dealogic's Bondware. As already mentioned, we examine the factors that lead banks to securitise for the first time. Therefore, after the event, the securitising banks are dropped from the sample.

We estimate the empirical model using as controls the non-securitising banks. Since information on some bank characteristics that are likely to affect the probability that they securitise is not available for the entire sample, we present two different specifications trading off the number of regressors with the sample size (in all regressions we report robust standard errors corrected for clustering at the country level).

Panel 1 of Table 3 presents the results of our first specification, estimated on an unbalanced panel of 36,238 observations, including 5,988 banks from 98 countries over 15 years, with 411 instances of first-time securitisations.[19]

Banks that are more likely to securitise are larger (the coefficient of size is positive and highly statistically significant). This is consistent with the fixed costs hypothesis, suggesting that the

[19] The smaller number of securitisations with respect to what is reported in the descriptive statistics depends on: a) the fact that only the first instance of securitisation is used in the estimation; b) the trimming of extreme value observations; c) the unavailability for some banks of information on a subset of the explanatory variables.

legal and administrative costs of organizing the securitisation deals are indeed non negligible, and with the lemon discount hypothesis, since larger banks are less likely to be able to collect and exploit soft private information. The securitising banks are also characterized by a higher rate of growth of total loans and a larger share of loans over total assets than their competitors. These results are consistent with the liquidity hypothesis, suggesting that banks securitise their assets to increase the overall liquidity of their portfolio, and with the cost of funding hypothesis. Under the additional assumption that loans are among the riskiest assets held by banks, they also provide support to the risk-removal hypothesis. Although in this specification it is not statistically significant, the negative coefficient of the share of demand deposits over total liabilities is also consistent with: (i) the asset opaqueness hypothesis, suggesting that securitisations are less used by banks that might suffer from an increase in the costs of funding, as a consequence of an increase in the opacity of their assets, (ii) the cost of funding hypothesis, suggesting that banks with less access to cheap retail deposits use securitisations as a funding device, and (iii) the liquidity hypothesis (see Table 1).

In Panel 2 we report the results of a richer specification that includes a larger set of explanatory variables but with a much smaller sample (2,099 banks from 57 countries, with 126 instances of securitisation). The lack of information on some balance sheet characteristics is broadly similar across banks of different size. The median value of bank total assets in the larger sample of 5,988 banks used in the previous regression is US$ 3.4 billion, while in the smaller sample of 2,099 banks it is US$ 4.4 billion. Notably, the share of securitising banks decreases only by 0.8 per cent, from 6.9 per cent for the larger sample to 6.1 per cent.

The results confirm that even for this smaller sample and controlling for a wider set of bank characteristics, securitising banks are larger than average. The coefficients of the rate of growth of total loans and of the share of loans over total assets remain positive, but in this richer specification the latter loses statistical significance. On the contrary, the negative coefficient of the share of demand deposits over total liabilities becomes statistically significant at the 5 per cent level. In addition, we also find that the securitising banks have a lower capital ratio, higher liquidity, a larger share of net charge-offs over total assets and higher returns on equity. Moreover, listed banks and banks that have high growth potentials and at the same time face higher corporate taxation are more likely to be securitisers. The coefficient of the Z-score is also negative, but not statistically significant.

Clearly, these additional results are consistent with more than one of the hypotheses that we put forward above. The negative coefficient of excess bank capital provides support to the capital ratio hypothesis, suggesting that less capitalized banks have strong incentives to use securitisations as a way to improve their regulatory capital ratios. The positive coefficient of the share of liquid over total assets is also consistent with the asset opaqueness hypothesis, if liquid assets are perceived as less risky and opaque by external investors. Moreover, it might also signal that banks that are more likely to face liquidity shocks, and precisely for this reason hold a larger share of liquid assets, are more likely to use CRT techniques. The results

on charge-offs and on profitability are both consistent with the risk-removal hypothesis, suggesting that riskier banks sell their loans in order to reduce the overall risk of the credit portfolio. Whether they succeed or not in reducing overall risk clearly depends on the riskiness of the proceedings from the securitisation, an issue that we will analyse in more detail in the ex-post analysis below. The positive coefficient of charge-offs is also at odds with the predictions of the lemon discount hypothesis, as the securitising banks do not seem to have any particular advantage in certifying the quality of their loan portfolio, and hence are unlikely to face lower securitisation costs.[20]

The positive and statistically significant coefficient of the dummy variable for listed banks provides some support to the lemon discount hypothesis. While listed banks are the vast majority in this estimation sample, and this might reduce the relevance of our finding, we will show below that this result is confirmed also when including the smaller and unlisted U.S. banks with total assets below US$ 1 million.

Finally, the interaction term obtained as the product of a dummy for banks with high lending potentials (defined as those that have a share of loans over total assets above the median of that year in that country) with the country's average corporate tax rate is positive and statistically significant, showing that the tax incentive hypothesis of Han *et al.* (2015) is also supported across countries.[21]

While not all previous results have the same statistical robustness, the overall story that has emerged so far is in line with the view that securitisations are mainly used by large banks with valuable lending opportunities willing to increase their funding means and contain risk in three different ways: improving capital ratios, reducing credit risk and the exposure to liquidity shocks.

Interestingly, the probability that a bank securitises again its assets after a first instance of securitisation is a function of the same characteristics that explain its original choice. In unreported regressions, available upon request, we have found that the only exception is a higher rate of growth of loans, which has a negative effect on the probability that a bank makes use again of these CRT techniques.

As we have already argued above, banks of different size can have radically different reasons to securitise part of their assets. For example, in normal conditions larger banks have easier access to interbank and bond markets, and therefore should be less likely to face idiosyncratic

[20] The positive coefficient of charge-offs is also in line with the prediction of Leland (2007), who shows that banks with a riskier portfolio benefit the most from securitising their safer assets (the financial structure hypothesis). However, in unreported regressions, available upon request, we have verified that banks with a higher volatility of returns on assets, an indirect measure of the volatility of bank cash-flows, have a lower probability of securitising their assets, instead of a higher volatility as implied by Leland's (2007) model.

[21] In unreported regressions we also included an additional interaction term obtained as the product of a dummy for banks with a low share of demand deposits with the country's average corporate tax rate, consistent with the second prediction of the model of Han *et al.* (2015). While this additional channel has no statistically significant impact on the probability that a bank is a securitiser, the coefficient of the interaction term with the measure of lending potentials remains positive and statistically significant.

liquidity shocks than small banks. A potential additional problem with our results is that some intermediaries – in particular, small banks – sell their mortgages, typically without recourse, to larger banks that eventually securitise them. While we have information on these operations from HMDA and the Call Reports, in our data set they are not registered for banks operating in countries other than the U.S.; therefore, in these cases we cannot identify the banks that originated and initially sold the loans. This could impact on our results, because the performance of these banks would be affected by operations that may not be recorded in the left-hand side of equation (1). To address these issues we split our sample by bank size. Since our estimation sample changes depending on the specifications that we adopt, we decide to concentrate on the sample of banks for which all information included in the richer specification are available. We then choose to define very large banks as those with total assets above the 90th percentile, corresponding to a little more than US$ 30 billion, and large banks as those with total assets above the sample median (US$ 1.5 billion). In the sample of very large banks the incidence of securitisations is 11.1 per cent, among large banks it is 6.2 per cent.

The results reported in Panel 1 of Table 4 show that also for very large banks (that are all listed) most of the explanatory variables included in our specification have a statistically significant effect, with the only exceptions of the share of loans over total assets, of demand deposits over total liabilities and of the interaction term of the dummy for banks with high lending potentials with the country's average corporate tax. In addition to confirming the previous findings, these results also show that large banks with a higher risk-return profile are more likely to be first-time securitisers, consistent with the positive coefficient of returns on equity and the negative coefficient of the Z-score. We interpret this evidence as providing further support to the risk-removal hypothesis.

Including banks between the 50th and the 90th percentile of the distribution by total assets (Panel 2), the coefficients of the shares of loans over total assets, of demand deposits over total liabilities and of the growth-potential corporate-tax interaction term become statistically significant, while those of the rate of growth of loans and of the Z-score become insignificant. Interestingly, the coefficient of excess capital is negative and highly statistically significant in both specifications, providing strong support to the capital ratio hypothesis.

Overall, these findings provide additional support to the view that the choice to securitise is the result of a specific business model. In the next section we challenge our results by performing a number of robustness checks and including country-specific controls in our analysis.

B. Robustness checks

Other bank characteristics. In addition to the characteristics included in our baseline specification, we first used an alternative measure of profitability and then checked whether other bank features influence the probability that they securitise their assets.

Panel 1 of Table 5 shows that when profitability is measured by the level of returns on assets instead of returns on equity, the coefficient remains positive but becomes statistically insignificant. Panels 2 and 3 show that the share of mortgages over total loans, a measure of opaqueness related to the lemon discount hypothesis, and the share of problem loans, a measure of riskiness, have a statistically insignificant effect on the probability that a bank is a securitiser. The share of fee-based revenues, a measure of the specialization of banks towards more innovative banking activities, has instead a negative and statistically significant effect (Panel 4). Quite reassuringly, while the inclusion of this additional control variable reduces our sample, in some cases substantially, the signs of all other explanatory variables are unchanged, and only a few coefficients change the level of statistical significance (most noticeably, the negative coefficient of the Z-score tends to become statistically significant).

Cross-country differences. As already mentioned, to control for country-specific factors that could determine confounding effects on our results, our regressions are stratified by country. However, to appraise the impact of macroeconomic and institutional features, we also estimated some specifications including a number of country-specific characteristics. Due to the high persistence of these variables, some of which have no time dimension, these regressions are not stratified by country.

Table 6 presents the results controlling for macroeconomic and financial variables. We start by considering the impact of general economic conditions. According to the external environment hypothesis, the sale of banks' securitised assets is likely to be easier when the economy is buoyant. Panel 1 confirms this hypothesis, showing that lagged real GDP growth has a positive and significant effect.[22]

Next we consider the hypothesis that securitisations are more common in countries with more developed non-banking financial markets, proxied by the ratio of stock market capitalization to GDP. As expected, Panel 2 shows a positive and marginally statistically significant coefficient. However, Panel 3 shows that when both these additional controls are included in our specification, their impact becomes statistically insignificant.[23]

Table 7 analyses the effect of different institutional and regulatory regimes. Most of these measures are time invariant, due to data availability and to the typically low variability of countries' regulatory frameworks, limiting the possibilities of uncovering statistically significant effects. First, we study the effect of the moral hazard induced by the deposit insurance guarantee scheme. Panel 1 shows that the coefficient of our index of moral hazard

[22] Optimistic expectations and a stronger risk appetite are also typically associated with stock market appreciations. We checked whether securitisations are a positive function of the growth in stock market capitalization over GDP, but found no significant effect.

[23] In unreported regressions we also investigated the impact of the development of institutional investors and of life and non-life insurance companies, which are believed to play a primary role as buyers in the securitisation market, and of the weight of banks in the financial sector, measured by private credit over GDP and by the ratio of total bank credit over aggregate stock and bond markets capitalization. None of these additional controls showed a statistically significant effect.

of each country's deposit guarantee scheme is positive and statistically significant, supporting the view that banks are more likely to securitise in countries where deposit guarantee schemes are more permissive, as suggested by the risk-taking hypothesis. Second, in Panel 2 we consider an index of the power of bank supervisory agencies, measuring whether they have the right to meet with external auditors, to force a bank to change its internal organizational structure, and to oblige a bank to provision against potential losses (Caprio *et al.*, 2007). The coefficient is negative and statistically significant, suggesting that more powerful supervisors inhibit the use of CRT techniques. In Panel 3 we include both institutional characteristics, and in this case only the impact of the measure of the power of bank supervisory agencies remains statistically significant.[24] Finally, when we include all economic and institutional country characteristics (Panel 4), the only coefficient that is statistically significant is the measure of the power of bank supervisory agencies.

Overall, these results suggest that it is difficult to identify a pattern in country-specific economic and institutional characteristics capable of explaining bank securitisation activities. More reassuringly, the coefficients of bank specific characteristics such as size, share of demand deposits, share of liquid assets, incidence of charge-offs and capitalization remain statistically significant in all specifications.

Alternative estimation techniques. Table 8 presents the results obtained using different estimation techniques. Panel 1 shows the estimates obtained from a logistic model where observations on banks after securitisation are removed from the sample (consistent with the framework of the Cox model) and including country, year, consolidation type and specialization dummies. The results confirm the findings of our baseline specification (Panel 2 of Table 3). In Panel 2 we further report the estimates obtained from a logistic model with bank-fixed effects, thereby wiping out all cross-section variability from our data. Reassuringly, also in this case the size and the magnitude of the coefficients are in line with those of the baseline specification. The only noticeable difference is the sign of the coefficient for listed banks, which becomes negative and statistically significant. This may be due either to the fact that the listing increases bank complexity, and therefore causes a rise in the lemon discount, or that the higher accessibility of external funds reduces the incentives to securitise. The coefficients of demand deposits over total liabilities and of profitability have the same sign as the baseline regression, but they lose statistical significance. Most interestingly, the coefficients of size, capital ratio and the share of liquid assets over total assets are all statistically significant at the 1 per cent level.

At the end of our ex-ante analysis, we are still left with a number of different explanations as to why banks securitise their assets, some of which alternative and others complementary. Essentially, our evidence is consistent with the fixed cost, capital ratio, asset opaqueness, risk

[24] In unreported regressions we found that many other institutional characteristics, ranging from the number of authorities responsible for bank supervision, to more specific measures of the pervasiveness of regulation, such as whether banks are required to disclose their off-balance sheet activities, have no statistically significant effect.

removal, tax incentive and external environment hypotheses. Evidence in favour of the cost of funding and of the liquidity hypotheses is less compelling. Interestingly, we find convincing evidence against the risk-taking hypothesis. In the following, we analyse the ex-post impact of securitisations.

5. Ex-post effects of securitisation

Our ex-ante findings on the characteristics of banks making use of securitisation techniques is only half of the story. The next question is what the ex-post consequences of these operations on banks' balance sheet characteristics and behaviour are.

To estimate the ex-post effects we specify a difference-in-difference model around the event of the first securitisation. Following Focarelli and Panetta (2004), we adopt a flexible specification that allows us to distinguish the impact across time of securitisations on bank balance sheets:

$$BANK\ CHAR_{it} = \alpha + \gamma_0\, SEC_{it}^{0} + \gamma_{1-2}\, SEC_{it}^{1-2} + \gamma_{3+}\, SEC_{it}^{3+} + \delta_1\, X_{it-1} + \delta_2\, d_i + \delta_3\, d_t + \varepsilon_{it} \quad (2)$$

where $BANK\ CHAR_{it}$ is a measure of a balance sheet characteristic of bank *i* at time *t*; SEC_{it}^{0} is a dummy that is equal to 1 if in year *t* bank *i* securitised its assets (the impact effect); SEC_{it}^{1-2} is a dummy that is equal to 1 if a securitisation took place in the previous two years (the transition period); SEC_{it}^{3+} is a dummy for securitisations that took place three or more years before (the completion period); X_{it-1} is a set of bank-specific characteristics at time *t-1* (typically total assets), d_i is a bank-specific fixed effect, d_t is a time dummy, and ε_{it} is a random error term. In this setting, non-securitising banks are used as controls for the behaviour of securitisers.

The previous specification permits us to distinguish between the effect of a securitisation at impact (measured by the coefficient γ_0), in the transition period (measured by γ_{1-2}), and in the longer-run completion period (measured by γ_{3+}). The distinction between the impact and transition effects is motivated by the fact that securitisations can have direct, accounting effects on some bank characteristics. For example, if a bank organizes a securitisation during a given year, *ceteris paribus* this will automatically reduce its share of loans over total assets in that year's balance sheet. However, this is not necessarily going to be the case in practice, since a bank that had planned to securitise its assets from a given year is also likely to change its policy accordingly, increasing loan supply. In this case, its share of loans over total assets would have increased if the securitisation had not taken place, but instead remains fairly stable precisely because a securitisation was organized to offset the increase in lending. If this were the case, the impact and transition effects would be similar.

Entering a highly information sensitive market such as that for securitisations typically entails some learning costs. A bank that has already securitised its assets at least once in the past is therefore more likely to consider this as one of the asset management techniques available to it, because it has learned how to operate in this market and it is better known to underwriters and investors. In the long run, these banks might therefore pursue different strategies from those that have never securitised their assets, simply because they have a larger set of asset and liability tools that can be used to deal with specific contingencies. This longer-run effect is what we intend to measure with the completion period coefficient, γ_{3+}.[25]

One problem with our approach is that it could suffer from a potential endogeneity bias, if intermediaries with specific characteristics self-selected into the pool of securitisers. Indeed, our specification already controls very robustly for the effects of bank-specific features with the inclusion of bank fixed effects, but this could be insufficient if the relevant determinants were time varying. To account for this possibility, we follow Heckman's (1979) two-step procedure and control for the potential self-selection bias created by banks' decision to securitise their assets by modelling it formally into the econometric estimation. The first step involves a probit estimation of the probability that a bank is a first-time securitiser. Trading off the richness of our previous specifications of the ex-ante determinants of securitisations with the opportunity of retaining a large number of observations for the ex-post analysis, we choose to include as explanatory variables only the logarithm of the total assets, the number of other securitisers in the same country and in the same year, specialization, country and time dummies. In the second step, the inverse Mill's ratio obtained from the probit estimation is then included among the regressors in model (2). Since the inverse Mill's ratio is a generated regressor, we bootstrap the standard errors using 100 replications.

A negative coefficient of the inverse Mill's ratio implies that banks whose characteristics make them at a given point in time more likely to securitise have an ex-post lower level of the dependent variable, independent of whether they indeed securitised or not. In other words, these are banks that in any case would have had a lower level of the dependent variable, and the same characteristics that makes them so also make it more likely that they do securitise. In this case, a change in the dependent variable that is only statistically significant without controlling for self-selection should not be attributed to the securitisation. With the inclusion of the inverse Mill's ratio this effect is instead controlled for, and the change in the dependent variable can be read as the effect of the securitisation.

In line with the hypothesis put forward in Section I, we analyse the effects of securitisations on twelve balance sheet characteristics. First, we consider measures related to the cost of funding and liquidity hypotheses: (1) the ratio of demand deposits to total liabilities, (2) the share of liquid over total assets, (3) the rate of growth of loans, (4) the share of loans over total assets, and (5) the rate of growth of total assets. Second, we consider measures related to

[25] In unreported regressions we have also tested the hypothesis that the transition periods lasted 3 years instead of 2, finding qualitatively similar results.

the risk taking, risk removal and diversification hypotheses: (6) the ratio of net charge-offs to total assets, (7) the ratio of loan loss reserves to total assets, (8) the Z-score. We then test the capital ratio hypothesis and the financial structure hypothesis, analysing the effects of securitisations on (9) the ratio of capital to total assets and on (10) the level of leverage. Finally, we control the impact of securitisations on bank profitability, measured by (11) returns on assets and (12) returns on equities.

Table 9 presents the results of the estimates on the full sample of banks with a value of total assets exceeding US$ 1 billion. The coefficients represent the change in the dependent variable experienced by banks that have securitised their assets in the same year (impact), in the previous two years (excluding the same year, the transition period), and in any previous year (excluding the last two, the completion period). In unreported regressions we have verified that the effect of securitisation is constant during the two years of the transition period, by estimating separately the two dummies for the effects on the first year and second year after the securitisation, and testing the linear restrictions of imposing the equality of the coefficients. The values of the F-tests confirm that in all our specifications these restrictions cannot be rejected at very high levels of confidence. Only in the case of the Z-score, the evidence suggests that the transition period only lasts one year.

Panel 1 shows that securitisations cause a long-run increase in the ratio of deposits to total liabilities. The negative impact of a larger share of demand deposits on the ex-ante probability that a bank securitises was consistent with both the higher cost of funding due to the opaqueness of securitisations, and the lower cost of funding for banks with a smaller share of demand deposits. However, the ex-post increase in the share of demand deposits over total liabilities is inconsistent with the asset opaqueness hypothesis, thereby supporting the view that banks used securitisation techniques to gain access to cheaper funds, which were subsequently used to grant new loans. Indeed, Panels 2 and 3 provide additional evidence in this direction, showing that first-time securitisers reduce their share of liquid over total assets and increase the rate of growth of total loans with respect to non-securitisers. However, this does not lead to a significant increase in their share of loans to total assets (Panel 4), because securitising banks also increase the overall value of total assets (Panel 5). Banks thus use securitisations as a funding technique that allows them to achieve higher rates of growth in lending and total assets. The reduction in the share of liquid over total assets in the completion period (Panel 2) also provides some support to the liquidity hypothesis.

Panels 6-8 present the evidence on the risk-related hypotheses. First-time securitisations have no effects on the share of net charge-offs over total assets (Panel 6) and on the Z-score (Panel 8), while they determine a reduction in the value of loan loss reserves, both in the short and in the long run (Panel 7). This evidence does not provide a neat picture of the risk-related hypotheses, but we can take it as weakly supportive of the risk-removal hypothesis. We will analyse this issue more carefully below.

The ratio of capital to total assets shows a significant increase after a securitisation, both in

the transition and in the completion periods (Panel 9). This is strong evidence in favour of the hypothesis that banks also use securitisation techniques to improve their regulatory capital requirements. Further evidence in this direction is indirectly provided by the strong increase in leverage (Panel 10).[26]

Finally, Panels 11 and 12 show an increase in returns on equity and on assets, especially in the completion period.

Overall, these results allow us to qualify better the findings of the ex-ante analysis, providing support especially to the view that banks used securitisation techniques to increase their capital ratios, augment the sources of funding and reduce liquidity needs. As a result, they also have a higher rate of growth of loan supply and of total assets. The evidence on risk is less neat, although it seems consistent with a risk-removal attitude, with banks increasing the rate of growth of possibly riskier loans, but removing them from their balance sheet, so that this has no impact on average bank risk.

However, the anecdotal evidence on the financial crisis suggests that some banks may have indeed exploited the possibilities offered by the securitisations far too aggressively, leading to an increase in risk. One possibility is therefore that the results that securitisations have no impact on bank risk holds only on average, with some banks that used securitisations to reduce their risk and others that used them with the opposite objective of increasing their risk.

To further investigate this issue, we have split our sample into three terciles, depending on each bank's rate of change of the Z-score. Banks that are in the first tercile of the distribution registered on average a reduction of their Z-score of 18.9 per cent, therefore increasing significantly their overall riskiness. Those in the second tercile registered instead only a slight decrease in the Z-score, of 1.6 per cent. Finally, those in the third tercile experienced an increase in the Z-score (a reduction in risk) of 2.6 per cent.

If securitisations are used as a tool to increase risk by banks willing to pursue a risky strategy and as a tool to reduce risk by banks pursuing a safe strategy, we would therefore expect a negative effect of securitisations on the Z-score in the sample of banks in the first tercile of the distribution by risk growth, and a positive effect in the sample of banks in the third tercile. To test this hypothesis, we then have to estimate a modified version of equation (2) in which the dummies measuring the impact, transition and completion effect of securitisations are interacted with the three dummies for banks with a low, medium and high rate of change of risk.[27]

[26] This result is also consistent with Leland's analysis (2007), who shows that, in the presence of tax incentives and costly default, 'separate capital structures and separate limited liabilities may allow for greater leverage', implying that a bank can increase its overall leverage (and value) by securitising the less risky assets.

[27] This approach, which is similar to estimating three separate regressions for each sample of banks, allows a direct comparison of the estimated coefficients and a straightforward analysis of the statistical significance of the differences among them.

The results presented in Table 10 strongly support the hypothesis that securitisations have been used by some banks to increase their risk and by other banks to reduce it. Securitisations determine a reduction in the Z-score (higher riskiness) for high risk-taking banks, and an increase in the Z-score (lower riskiness) for low risk-taking banks (Panel 1). In all three cases measuring the effect at impact and during the transition and completion periods, the coefficient of the dummy for securitisers is negative for the banks in the first tercile of the distribution of the rate of growth of risk, and positive for those in the third tercile; moreover, in all cases the differences are statistically significant at the 1 per cent level. In addition to this result, Table 10 shows that the impact of securitisations on the rate of growth of loans (Panel 1) and total assets (Panel 2) is also significantly higher for banks that registered a strong increase in risk than for those that experienced a reduction. Interestingly, in unreported regressions we also verified that very similar results on the differential effect of securitisations on bank risk are obtained by splitting the sample according to banks' return on equity: the least profitable banks use securitisations to increase risk, while the most profitable banks use them to reduce risk. Overall, this additional evidence shows that banks have used securitisations pursuing two opposite strategies: some to increase their risk, others to reduce it.

Finally, since banks of different size can have different reasons for securitising their assets, as we argued extensively above, we have refined the overall picture by splitting the sample by bank size. Tables 11 and 12 report the results obtained from the subsamples of very large and large banks. Though with some differences in the statistical significance of the estimated coefficients, most noticeably in the case of the reduction in liquid over total assets, the overall picture that emerges from these estimates confirms the results obtained from the full sample.

6. Discussion and conclusions

The recent crisis has put under severe attack the use of credit risk transfer techniques, and their opaqueness has been seen as the major cause of the financial turmoil. Banks have been accused of using these instruments carelessly, if not cunningly, to remove risky assets from their balance sheets, increase leverage and boost profits.

In this paper we analysed the ex-ante determinants of banks' securitisations and their ex-post effects, using a large sample of intermediaries from over 100 countries. As might have been expected, our evidence shows a much more multifaceted, and possibly less negative, scenario. Consistent with the findings of Acharya *et al.* (2013), for U.S. banks, securitisations were mainly used by large and profitable banks willing to improve their capital ratios and reduce their cost of funding. At the same time, to some extent they allowed credit and liquidity risk to be contained. Interestingly, the ex-post evidence shows that these goals were partly achieved. In the years following the first securitisation, banks showed an improvement of their capital ratios and a steady increase in their rate of growth of total loans, confirming the

positive impact on credit availability, and of total assets. While on average banks did not experience an increase of their overall riskiness, we also show that some financial intermediaries used securitisations to increase their overall risk, while others used them with the opposite objective.

The crisis has made it abundantly clear that some banks ended up exploiting far too aggressively the possibilities offered by the new techniques for removing risks from their balance sheets. Obviously, the question remains about what then caused the collapse in the banking markets and the large number of defaults in recent years. Our paper shows that on average securitisations were not used to dispose of less risky loans and take on more profitable but riskier lending opportunities, although some banks might have indeed pursued this strategy. More importantly, a problem arose for those financial intermediaries that bought the securitised assets, or kept the risk of their default in their balance sheets. Possibly, these were the banks themselves. Indeed, a correct functioning of the markets for securitised assets requires much more transparency about who is the final risk bearer. But there should be no doubt that, if properly used, CRT techniques can indeed have positive effects on banking activities and risk, and on credit availability.

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Table 1

Determinants of credit risk transfer: hypotheses under scrutiny and implied signs of bank characteristics

For each one of the hypotheses described in Section I of the text, the table reports the expected sign of the most relevant explanatory variables that are available in our data set and, in the last rows, the sign of the estimated coefficients.

	Hypothesis		Total assets	Loan sh. / total assets	Loan growth	Demand deposits / liabilities	Liquid / total assets	Returns on equity	Returns on assets	Net ch. offs / tot. assets	Z-score	Capital ratio	Leverage	Corp. tax. * loan gr.	Bank reg. stringen-cy	GDP growth	Stock mkt. cap. / GDP	Deposit insurance premium	Listed banks
A 1	Fixed cost	*Ex ante*	+																
		Ex post																	
A 2	Lemon discount	*Ex ante*	+							–									+
		Ex post																	
A 3	Asset opaqueness	*Ex ante*				–	+												
		Ex post				–													
A 4	External environment	*Ex ante*													–	+	+		
		Ex post																	
B1	Capital ratio	*Ex ante*										–							
		Ex post		+	+							+							
B2	Cost of funding	*Ex ante*		+	+	–													
		Ex post			+	+	–												
B3	Liquidity	*Ex ante*			+	–	–												
		Ex post		+	+		–												
B4	Risk removal	*Ex ante*		+	+			+	+	+	–								
		Ex post								–	+								
B5	Risk taking	*Ex ante*								–	+							+	
		Ex post								+	–								
B6	Diversification	*Ex ante*																	
		Ex post									+								
B7	Tax incentive	*Ex ante*												+					
		Ex post																	
	Empirical evidence	***Ex ante***	+	+	+	–	+	+		+	–	–		+	+	+	+	+	+
		Ex post			+	+	–	+	+			+	+						

Table 2

Summary statistics – Baseline sample

Securitisers are banks that originated issues of asset backed securities (ABSs), mortgage backed securities (MBSs), collateralized loan obligations (CLOs) or collateralized debt obligations (CDOs). Excess capital is the difference between regulatory capital ratio and the legal requirement in the country; Z-score is defined as (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) its standard deviation and CAR the capital-asset ratio. The source of data is Bankscope and US Call Reports for balance sheet information; Dealogic, US Call Reports and filings with the Home Mortgage Disclosure Act for securitisations.

Variable	Obs.	Mean	Coeff. of var.	Median	1st percentile	99th percentile
			Panel A: full sample			
Total assets	11,903	36.830	3.451	4.509	1.019	627.943
Returns on assets	9,148	0.866	0.946	0.735	-0.503	3.870
Returns on equity	9,134	10.631	0.716	10.201	-7.985	33.688
Net interest margin	10,045	2.892	0.653	2.644	0.000	9.816
Net charge-offs / total assets	5,095	0.277	1.443	0.157	-0.054	2.211
Z-score	5,454	0.392	0.556	0.319	0.110	1.270
Excess capital	3,005	4.067	4.235	2.246	-17.533	61.500
Liquid / total assets	8,007	16.712	0.995	12.128	0.006	82.790
Deposits/ total liabilities	7,345	16.974	1.010	11.870	0.000	83.351
Money mkt. fund. /tot. liab. and eq	7,730	11.553	1.909	4.257	0.008	107.708
Mortgages / total loans	3,350	0.514	0.562	0.497	0.000	1.000
Loans / total assets	8,606	54.575	0.431	59.254	0.182	96.392
Loan growth	8,277	0.133	1.168	0.113	-0.213	0.659
Problem loans / total loans	4,847	7.503	2.109	2.549	0.015	100.000
Capital / total assets	9,720	0.162	0.936	0.114	0.001	0.749
Leverage	9,171	8.299	0.731	7.221	1.151	36.402
			Panel B: securitisers			
Total assets	1,184	86.983	2.667	10.063	1.027	1275.055
Returns on assets	1,012	0.968	0.705	0.916	-0.194	3.596
Returns on equity	1,010	12.096	0.543	11.919	-4.084	30.587
Net interest margin	1,023	3.177	0.526	3.209	0.183	9.469
Net charge-offs / total assets	812	0.308	1.398	0.178	-0.017	2.372
Z-score	616	0.322	0.451	0.280	0.119	0.903
Excess capital	252	1.171	12.965	0.160	-71.122	22.026
Liquid / total assets	905	18.929	0.689	18.484	0.127	60.895
Deposits/ total liabilities	871	12.595	0.970	9.205	0.007	56.107
Money mkt. fund. /tot. liab. and eq	532	9.619	1.517	5.013	0.011	67.741
Mortgages / total loans	242	0.465	0.606	0.427	0.000	1.000
Loans / total assets	945	60.962	0.312	64.353	0.275	94.313
Loan growth	924	0.142	0.895	0.128	-0.160	0.530
Problem loans / total loans	313	6.508	2.195	2.598	0.003	91.399
Capital / total assets	1,048	0.120	0.841	0.092	0.001	0.563
Leverage	1,015	8.154	0.575	7.850	1.557	27.506

Table 1 (continues)

Variable	Obs.	Mean	Coeff. of var.	Median	1st percentile	99th percentile
			Panel C: non securitisers			
Total assets	10,719	31.290	3.455	4.247	1.018	540.360
Returns on assets	8,136	0.853	0.977	0.711	-0.535	3.884
Returns on equity	8,124	10.449	0.738	9.924	-8.566	33.829
Net interest margin	9,022	2.860	0.668	2.577	0.000	9.820
Net charge-offs / total assets	4,283	0.271	1.451	0.152	-0.063	2.105
Z-score	4,838	0.401	0.559	0.326	0.103	1.306
Excess capital	2,753	4.332	4.011	2.367	-16.854	61.590
Liquid / total assets	7,102	16.429	1.035	11.174	0.005	83.691
Deposits/ total liabilities	6,474	17.563	1.003	12.626	0.000	85.384
Money mkt. fund. /tot. liab. and eq	7,198	11.696	1.924	4.184	0.007	111.280
Mortgages / total loans	3,108	0.518	0.558	0.503	0.000	1.000
Loans / total assets	7,661	53.787	0.445	58.422	0.165	96.582
Loan growth	7,353	0.131	1.202	0.111	-0.221	0.671
Problem loans / total loans	4,534	7.571	2.103	2.544	0.016	100.000
Capital / total assets	8,672	0.167	0.933	0.122	0.001	0.768
Leverage	8,156	8.317	0.748	7.117	1.125	37.297

Table 3

Determinants of the use of securitisation

The event analysed is the first time a bank was a securitiser (issued either ABSs, MBSs, CLOs or CDOs). The model is estimated using the proportional hazards regression specification proposed by Cox (1972), with stratification by year, country, balance sheet consolidation type and specialization. Profitability is measured by Returns on equity. All independent variables are lagged one period. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The dummy for high lending opportunities is takes the value of one for banks that have a share of loans over total assets above the median of the year; corporate taxation is from Djankov et al. (2008). The source of data is Bankscope and US Call Reports for balance sheet information; Dealogic, US Call Reports and filings with the Home Mortgage Disclosure Act for securitisations. Robust standard errors adjusted for clustering at the country level are reported in parenthesis. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

Variables	Full sample (1)		Detailed sample (2)	
	Coef. *(St.err.)*	Significance	Coef. *(St.err.)*	Significance
Total assets (log)	0.452	***	0.563	***
	0.039		*0.028*	
Loans / total assets	0.006	**	0.010	*
	0.003		*0.006*	
Loan growth	0.362	**	0.108	
	0.168		*0.226*	
Demand deposits / liabilities	-0.007		-0.021	**
	0.006		*0.008*	
Liquid / total assets			0.022	***
			0.006	
Profitability (RoE)			0.014	*
			0.008	
Net charge offs / total assests			0.725	***
			0.116	
Capital ratio (3 years average)			-0.055	***
			0.017	
Z-score (over 5 years) (log)			-0.183	
			0.306	
Listed banks			0.698	***
			0.094	
Corp. tax rate * High lending potential (dummy)			0.005	**
			0.002	
Observations	36,238		9,198	
No. of securitisers	411		126	

Table 4

Determinants of the use of securitisation: large banks

The event analysed is the first time a bank was a securitiser (issued either ABSs, MBSs, CLOs or CDOs). The model is estimated using the proportional hazards regression specification proposed by Cox (1972), with stratification by year, country, balance sheet consolidation type and specialization. Very large banks are defined as those with total assets above US$ 7 billion; large banks as those with total assets above US$ 2 billion; small banks as those with total assets below 2 billion. Profitability is measured by Returns on equity. All independent variables are lagged one period. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The dummy for high lending opportunities is takes the value of one for banks that have a share of loans over total assets above the median of the year; corporate taxation is from Djankov et al. (2008). The source of data is Bankscope and US Call Reports for balance sheet information; Dealogic, US Call Reports and filings with the Home Mortgage Disclosure Act for securitisations. Robust standard errors adjusted for clustering at the country level are reported in parenthesis. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

Variables	Very large banks (1)		Large banks (2)	
	Coef. *(St.err.)*	Significance	Coef. *(St.err.)*	Significance
Total assets (log)	0.922	**	0.636	***
	0.379		*0.049*	
Loans / total assets	0.035		0.016	**
	0.030		*0.007*	
Loan growth	1.528	***	0.446	
	0.489		*0.328*	
Demand deposits / liabilities	-0.014		-0.027	**
	0.018		*0.013*	
Liquid / total assets	0.062	**	0.026	***
	0.027		*0.010*	
Profitability (RoE)	0.074	**	0.025	**
	0.031		*0.011*	
Net charge offs / total assests	1.121	***	0.675	***
	0.222		*0.125*	
Capital ratio (3 years average)	-0.110	*	-0.050	***
	0.058		0.018	
Z-score (over 5 years) (log)	-1.352	**	-0.264	
	0.622		*0.364*	
Listed banks (dummy)			2.305	***
			0.451	
Corp. tax rate * High lending potential (dummy)	0.002		0.005	*
	0.008		*0.003*	
Observations	1,534		7,687	
No. of securitisers	40		105	

Table 5

Determinants of the use of securitisation: additional bank characteristics

The event analysed is the first time a bank was a securitiser (issued either ABSs, MBSs, CLOs or CDOs). The model is estimated using the proportional hazards regression specification proposed by Cox (1972), with stratification by year, balance sheet consolidation type and specialization. Very large banks are defined as those with total assets above US$ 7 billion; large banks as those with total assets above US$ 2 billion; small banks as those with total assets below US$ 2 billion. Profitability is measured by Returns on equity. Problem loans is the share of problem loans over total loans. All independent variables are lagged one period. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The dummy for high lending opportunities is takes the value of one for banks that have a share of loans over total assets above the median of the year; corporate taxation is from Djankov et al. (2008). The source of data is Bankscope and US Call Reports for balance sheet information; Dealogic, US Call Reports and filings with the Home Mortgage Disclosure Act for securitisations. Robust standard errors adjusted for clustering at the country level are reported in parenthesis. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

Variables	ROA instead of ROE (1)		Share of mortgages (2)		Share of problem loans (3)		Share of non-interest income (4)	
	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance
Total assets (log)	0.561	***	0.935	***	0.911	***	0.865	***
	0.028		*0.049*		*0.108*		*0.110*	
Loans / total assets	0.011	**	0.010		0.023		0.027	**
	0.006		*0.013*		*0.016*		*0.013*	
Loan growth	0.066		-0.398		0.774	**	0.362	
	0.220		*0.793*		*0.359*		*0.378*	
Demand deposits / liabilities	-0.021	***	-0.035	**	-0.042	***	-0.025	**
	0.008		*0.014*		*0.012*		*0.012*	
Liquid / total assets	0.023	***	0.036	***	0.051	***	0.043	**
	0.007		*0.010*		*0.012*		*0.018*	
Profitability (RoE)			0.084	***	0.089	***	0.056	*
			0.019		*0.024*		*0.031*	
Net charge offs / total assests	0.730	***	0.656	***	0.955	***	0.665	***
	0.153		*0.125*		*0.174*		*0.218*	
Capital ratio (3 years average)	-0.057	***	-0.077	***	-0.074	***	-0.060	**
	0.017		0.006		0.035		0.026	
Z-score (over 5 years) (log)	-0.144		-0.361	*	-1.704	***	-1.094	***
	0.303		*0.197*		*0.459*		*0.415*	
Listed banks	0.651	***	0.000		0.000		0.000	
	0.096							
Corporate tax rate * High lending potential (dummy)	0.005	**	0,005		0,011	**	0,005	
	0.002		*0.005*		*0.005*		*0.006*	
Profitability (ROA)	0.043							
	0.142							
Share of mortgages			-0.286					
			0.179					
Problem loans					-0.041			
					0.041			
Non-interest income / total income (share)							-0.009	**
							0.004	
Observations	9,203		5,230		7,885		8,714	
No. of securitisers	126		28		47		65	

Table 6

Determinants of the use of securitisation: economic country characteristics

The event analysed is the first time a bank was a securitiser (issued either ABSs, MBSs, CLOs or CDOs). The model is estimated using the proportional hazards regression specification proposed by Cox (1972), with stratification by year, balance sheet consolidation type and specialization. Profitability is measured by Returns on equity. Problem loans is the share of problem loans over total loans. All independent variables are lagged one period. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The dummy for high lending opportunities is takes the value of one for banks that have a share of loans over total assets above the median of the year; corporate taxation is from Djankov et al. (2008). Data on the characteristics of each country's banking and financial sector and on the regulatory framework are from the World Bank database, respectively the updated versions of Beck et al. (2000) and Barth et al. (2004). Regulatory power is an index of how powerful are commercial bank supervisory agencies, because they have right to meet with auditors, force a bank to change its internal organizational structure, and oblige it to provision against potential losses (Caprio et al., 2007). GDP if from IMF's World economic outlook. The number of securitisers in each country is obtained aggregating the individual level data. The source of data is Bankscope and US Call Reports for balance sheet information; Dealogic, US Call Reports and filings with the Home Mortgage Disclosure Act for securitisations. Robust standard errors adjusted for clustering at the country level are reported in parenthesis. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

Variables	GDP growth (1)		Stock market capitalization (2)		Both economic characteristics (3)	
	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance
Total assets (log)	0.560	***	0.561	***	0.566	***
	0.040		*0.042*		*0.037*	
Loans / total assets	0.010	*	0.011	**	0.011	*
	0.006		*0.006*		*0.006*	
Loan growth	0.144		0.232		0.105	
	0.229		*0.202*		*0.232*	
Demand deposits / liabilities	-0.021	***	-0.017	**	-0.018	***
	0.007		*0.007*		*0.007*	
Liquid / total assets	0.021	***	0.027	***	0.026	***
	0.006		*0.005*		*0.005*	
Profitability (RoE)	0.008		0.010		0.008	
	0.011		*0.010*		*0.012*	
Net charge offs / total assests	0.718	***	0.713	***	0.723	***
	0.115		*0.106*		*0.105*	
Capital ratio (3 years average)	-0.068	***	-0.062	***	-0.061	***
	0.014		0.016		0.015	
Z-score (over 5 years) (log)	0.027		-0.123		-0.102	
	0.205		*0.227*		*0.227*	
Listed banks	0.868	***	0.904	***	0.896	***
	0.220		*0.248*		*0.235*	
Corporate taxation * high lending potential (dummy)	0.003		0.002		0.003	
	0.003		*0.003*		*0.003*	
GDP growth	0.137	***			0.094	
	0.050				*0.064*	
Stock market capitalization			2.657	*	1.495	
			1.382		*1.609*	
Observations	9,167		8,861		8,861	
No. of securitisers	126		123		123	

Table 7

Determinants of the use of securitisation: institutional country characteristics

The event analysed is the first time a bank was a securitiser (issued either ABSs, MBSs, CLOs or CDOs). The model is estimated using the proportional hazards regression specification proposed by Cox (1972), with stratification by year, balance sheet consolidation type and specialization. Large banks are defined as those with total assets above 7 billion of US dollars. Profitability is measured by Returns on equity. Problem loans is the share of problem loans over total loans. All independent variables are lagged one period. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The dummy for high lending opportunities is takes the value of one for banks that have a share of loans over total assets above the median of the year; corporate taxation is from Djankov et al. (2008). Data on the characteristics of each country's banking and financial sector and on the regulatory framework are from the World Bank database, respectively the updated versions of Beck et al. (2000) and Barth et al. (2004). Regulatory power is an index of how powerful are commercial bank supervisory agencies, because they have right to meet with auditors, force a bank to change its internal organizational structure, and oblige it to provision against potential losses (Caprio et al., 2007). GDP if from IMF's World economic outlook. The number of securitisers in each country is obtained aggregating the individual level data. The source of data is Bankscope and US Call Reports for balance sheet information; Dealogic, US Call Reports and filings with the Home Mortgage Disclosure Act for securitisations. Robust standard errors adjusted for clustering at the country level are reported in parenthesis. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

Variables	Deposit insurance premium (1)		Regulatory power (2)		Both institutional characteristics (3)		All country characteristics (4)	
	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance
Total assets (log)	0.545	***	0.523	***	0.543	***	0.550	***
	0.050		*0.059*		*0.049*		*0.042*	
Loans / total assets	0.011	**	0.007		0.008	*	0.008	*
	0.005		*0.005*		*0.005*		*0.005*	
Loan growth	0.084		0.255		0.054		-0.013	
	0.260		*0.205*		*0.268*		*0.317*	
Demand deposits / liabilities	-0.023	***	-0.017	**	-0.023	***	-0.022	***
	0.006		*0.009*		*0.006*		*0.007*	
Liquid / total assets	0.024	***	0.023	***	0.019	***	0.018	**
	0.004		*0.006*		*0.006*		*0.007*	
Profitability (RoE)	0.011		0.012		0.012		0.011	
	0.009		*0.009*		*0.008*		*0.010*	
Net charge offs / total assests	0.705	***	0.796	***	0.696	***	0.692	***
	0.122		*0.115*		*0.139*		*0.150*	
Capital ratio (3 years average)	-0.065	***	-0.059	***	-0.062	***	-0.062	***
	0.014		0.015		*0.015*		*0.016*	
Z-score (over 5 years) (log)	-0.104		-0.006		-0.145		-0.144	
	0.237		*0.223*		*0.251*		*0.266*	
Listed banks	0.913	***	1.075	***	1.283	***	1.226	***
	0.253		*0.356*		*0.462*		*0.445*	
Corp. tax rate * High lending	0.002		0.001		0.002		0.002	
potential (dummy)	*0.004*		*0.004*		*0.003*		*0.003*	
Deposit insurance premium	0.407	*			0.268		0.328	
	0.228				*0.224*		*0.214*	
Regulatory power			-0.133	*	-0.216	**	-0.168	*
			0.077		*0.093*		*0.092*	
GDP growth							0.063	
							0.101	
Stock market capitalization							1.645	
							2.169	
Observations	8,520		8,627		8,398		8,393	
No. of securitisers	120		122		120		120	

Determinants of the use of securitisation: alternative econometric specifications

The event analysed is the first time a bank was a securitiser (issued either ABSs, MBSs, CLOs or CDOs). Estimates in panel (1) are obtained using a logistic model, including country, year, consolidation type and specialization dummies. Estimates on panel (2) are obtained using a logistic model with fixed effects at the bank level. All independent variables are lagged one period. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The dummy for high lending opportunities is takes the value of one for banks that have a share of loans over total assets above the median of the year; corporate taxation is from Djankov et al. (2008). The source of data is Bankscope for balance sheet information, Dealogic for bond issues. Robust standard errors adjusted for clustering at the country level are reported in parenthesis. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

Variables	Logit (1)		Fixed effects logit (2)	
	Coef. *St.err.*	Significance	Coef. *St.err.*	Significance
Total assets (log)	0.589	***	0.516	***
	0.063		*0.075*	
Loans / total assets	0.016	**	0.034	***
	0.007		*0.011*	
Loan growth	0.150		0.530	
	0.287		*0.575*	
Demand deposits / liabilities	-0.017	*	-0.011	
	0.009		*0.008*	
Liquid / total assets	0.027	***	0.060	***
	0.008		*0.011*	
Profitability (RoE)	0.015	**	0.010	
	0.007		*0.016*	
Net charge offs / total assests	0.735	***	0.542	**
	0.177		*0.261*	
Capital ratio (3 years average)	-0.051	*	-0.104	***
	0.028		0.041	
Z-score (over 5 years) (log)	-0.224		-0.205	
	0.283		*0.295*	
Listed banks	0.547	***	-2.626	***
	0.108		*0.375*	
Corp. tax rate * High lending potential (dummy)	0.005	*	0.002	
	0.003		*0.005*	
	0.589		0.516	
Observations	8,376		9,198	
No. of securitisers	126		126	

Table 9

Effects of securitisations on bank balance sheet – Full sample

The dependent variable is the level of the variable reported in each column of the first row. Transition period is a dummy variable taking the value of one in the year of the first securitisation made by the bank (issue either of ABSs, MBSs, CLOs or CDOs) and in the following two years; Completion period takes the value of one from the third year after the first securitisation onwards. In the case of the Z-score, the Completion period starts instead from the second year. The inverse Mill's ratio is obtained from a probit model regression of the probability that a bank is a first time securitiser in a given year, as a function of its total assets, the number of other securitisers in the same country and in the same year, and specialization, country and time dummies. Total assets are lagged one period. All regressions include bank specific fixed effects. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The source of data is Bankscope for balance sheet information, Dealogic for bond issues. Bootstrapped standard errors with 100 replications are reported in italic. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

Variables	Demand deposits / liabilities	Liquid / total assets	Loan growth	Loans share / tot. assets	Total assets growth	Net ch. offs / tot. assets	Loan loss res. /tot. ass	Z-score	Capital ratio	Leverage	Returns on equity	Returns on assets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Impact effect	1.665 ***	-0.395	0.054 ***	0.047	0.046 ***	-0.007	-0.247 **	-0.035	0.178	0.254	0.704	0.072 **
year 0	*0.536*	*0.518*	*0.016*	*0.508*	*0.008*	*0.025*	*0.123*	*0.029*	*0.158*	*0.186*	*0.506*	*0.036*
Transition period	2.234 ***	-1.186 *	0.092 ***	0.614	0.069 ***	-0.013	-0.356 ***	0.017	0.526 **	0.413 **	0.337	0.035
years 1-2	*0.584*	*0.663*	*0.012*	*0.644*	*0.008*	*0.026*	*0.143*	*0.041*	*0.247*	*0.179*	*0.659*	*0.039*
Completion period	1.655 **	-1.818 *	0.121 ***	0.330	0.088 ***	-0.068	-0.396 **	0.066	1.215 ***	0.835 ***	1.888 **	0.144 ***
years 3+	*0.765*	*0.968*	*0.013*	*1.045*	*0.010*	*0.045*	*0.176*	*0.045*	*0.378*	*0.266*	*0.852*	*0.049*
Total assets log.	-2.253 ***	-0.878 ***	-0.102 ***	1.336 ***	-0.117 ***	-0.023 ***	-0.357 ***	0.047 ***	-0.668 ***	-0.467 ***	-0.388 **	-0.045 ***
	0.239	*0.215*	*0.004*	*0.291*	*0.004*	*0.008*	*0.062*	*0.014*	*0.097*	*0.095*	*0.166*	*0.015*
Inverse Mill's ratio	-5.556 ***	1.657 ***	-0.045 ***	-1.088 ***	-0.065 ***	-0.044 ***	0.220 **	0.104 ***	-0.076	-1.017 ***	0.656 ***	-0.034 **
	0.327	*0.344*	*0.004*	*0.329*	*0.003*	*0.012*	*0.109*	*0.020*	*0.140*	*0.106*	*0.183*	*0.016*
Observations	42,069	42,291	44,341	45,664	58,562	24,598	29,075	34,266	34,808	48,029	47,264	47,527
No. of securitisers	311	312	334	342	482	215	252	256	375	388	380	381

Effects of securitisations on bank balance sheet and bank risk taking behaviour

The dependent variable is the level of the variable reported in each column of the first row. Transition period is a dummy variable taking the value of one in the year of the first securitisation made by the bank (issue either of ABSs, MBSs, CLOs or CDOs) and in the following two years; Completion period takes the value of one from the third year after the first securitisation onwards. In the case of the Z-score, the Completion period starts instead from the second year. High risk growth banks are banks in the first tercile of the distribution by the rate of change of the Z-score; medium risk banks are those in the second tercile; low risk banks are those in the third tercile. The inverse Mill's ratio is obtained from a probit model regression of the probability that a bank is a first time securitiser in a given year, as a function of its total assets, the number of other securitisers in the same country and in the same year, and specialization, country and time dummies. Total assets are lagged one period. All regressions include bank specific fixed effects. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The source of data is Bankscope for balance sheet information, Dealogic for bond issues. Bootstrapped standard errors with 100 replications are reported in italic. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent; the symbols (a) and (b) indicate that the coefficient is significantly different from that of low risk growth banks, respectively at the 1 per cent and at the 5 per cent level.

Variables	Loan growth (1)	Total assets growth (2)	Z-score (3)
Impact effect * high risk growth banks	0.051 **	0.045 **	-0.367 ** (a)
(year 0)	*0.026*	*0.018*	*0.048*
Impact effect * medium risk growth banks	0.020	0.024	0.064 *
(year 0)	*0.024*	*0.020*	*0.036*
Impact effect * low growth banks	0.066 ***	0.051 ***	0.146 ***
(year 0)	*0.022*	*0.010*	*0.040*
Transition period * high risk growth banks	0.132 *** (a)	0.102 *** (b)	-0.236 *** (a)
(years 1-2)	*0.017*	*0.019*	*0.055*
Transition period * medium risk growth banks	0.132 ***	0.102 ***	-0.236 ***
(years 1-2)	*0.017*	*0.019*	*0.055*
Transition period * low growth banks	0.069 ***	0.054 ***	0.224 ***
(years 1-2)	*0.015*	*0.008*	*0.058*
Completion period * high risk growth banks	0.135 *** (b)	0.106 *** (a)	-0.110 *** (a)
(years 3+)	*0.015*	*0.012*	*0.047*
Completion period * medium risk growth banks	0.104 ***	0.078 ***	0.130 ***
(years 3+)	*0.016*	*0.011*	*0.043*
Completion period * low growth banks	0.110 ***	0.080 ***	0.222 ***
(years 3+)	*0.013*	*0.010*	*0.045*
Total assets log.	-0.102 ***	-0.117 ***	0.047 ***
	0.004	*0.004*	*0.015*
Inverse Mill's ratio	-0.045 ***	-0.065 ***	0.091 ***
	0.004	*0.003*	*0.020*
Observations	44,341	58,562	34,266
No. of securitisers	334	482	256

Table 11

Effects of securitisations on bank balance sheet – Very large banks

The dependent variable is the level of the variable reported in each column of the first row. Transition period is a dummy variable taking the value of one in the year of the first securitisation made by the bank (issue either of ABSs, MBSs, CLOs or CDOs) and in the following two years; Completion period takes the value of one from the third year after the first securitisation onwards. In the case of the Z-score, the Completion period starts instead from the second year. The inverse Mill's ratio is obtained from a probit model regression of the probability that a bank is a first time securitiser in a given year, as a function of its total assets, the number of other securitisers in the same country and in the same year, and specialization, country and time dummies. Total assets are lagged one period. All regressions include bank specific fixed effects. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The source of data is Bankscope for balance sheet information, Dealogic for bond issues. Bootstrapped standard errors with 100 replications are reported in italic. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

Variables	Demand deposits / liabilities	Liquid / total assets	Loan growth	Loans share / tot. assets	Total assets growth	Net ch. offs / tot. assets	Loan loss res. /tot. ass	Z-score	Capital ratio	Leverage	Returns on equity	Returns on assets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Impact effect	1.685 **	0.019	0.062 **	0.211	0.0366 ***	-0.009	-0.139	-0.008	0.415 **	0.127	0.266	0.038
(year 0)	*0.838*	*0.790*	*0.026*	*0.773*	*0.012*	*0.034*	*0.156*	*0.052*	*0.184*	*0.184*	*0.874*	*0.047*
Transition period	2.528 ***	-0.552	0.079 ***	0.323	0.045 ***	-0.003	-0.324	0.058	1.151 ***	0.295	0.650	0.016
(years 1-2)	*1.015*	*1.106*	*0.019*	*0.908*	*0.011*	*0.049*	*0.220*	*0.068*	*0.345*	*0.239*	*0.817*	*0.052*
Completion period	2.116 **	0.707	0.122 ***	-0.076	0.084 ***	-0.009	-0.619 **	0.131	2.076 ***	0.454 *	4.001 ***	0.219 ***
(years 3+)	*0.955*	*1.685*	*0.029*	*1.595*	*0.016*	*0.044*	*0.265*	*0.083*	*0.526*	*0.256*	*1.015*	*0.072*
Total assets (log.)	-4.561 ***	-0.958	-0.156 ***	2.111 ***	-0.187 ***	-0.005	-0.150	0.018	-0.741 ***	-0.365 **	-3.121 ***	-0.153 ***
	0.722	*0.675*	*0.014*	*0.580*	*0.010*	*0.016*	*0.128*	*0.037*	*0.229*	*0.175*	*0.414*	*0.024*
Inverse Mill's ratio	-6.876 ***	-0.495	-0.080 ***	3.615 ***	-0.094 ***	0.006	0.492 ***	0.038	-0.722 ***	-1.048 ***	-3.823 ***	-0.248 ***
	0.824	*0.734*	*0.012*	*0.881*	*0006*	*0.025*	*0.168*	*0.054*	*0.256*	*0.185*	*0.541*	*0.031*
Observations	5,366	5,401	5,553	5,787	10,630	4,919	4,167	4,108	7,129	8,468	8,178	8,376
No. of securitisers	121	135	133	137	232	113	113	99	183	190	183	184

Table 12

Effects of securitisations on bank balance sheet – Large banks

The dependent variable is the level of the variable reported in each column of the first row. Transition period is a dummy variable taking the value of one in the year of the first securitisation made by the bank (issue either of ABSs, MBSs, CLOs or CDOs) and in the following two years; Completion period takes the value of one from the third year after the first securitisation onwards. In the case of the Z-score, the Completion period starts instead from the second year. The inverse Mill's ratio is obtained from a probit model regression of the probability that a bank is a first time securitiser in a given year, as a function of its total assets, the number of other securitisers in the same country and in the same year, and specialization, country and time dummies. Total assets are lagged one period. All regressions include bank specific fixed effects. Z-score is defined (ROA+CAR)/σ(ROA), where ROA are return on assets, σ(ROA) their standard deviation and CAR the capital-asset ratio. The source of data is Bankscope for balance sheet information, Dealogic for bond issues. Bootstrapped standard errors with 100 replications are reported in italic. The symbol *** indicates a significance level of 1 per cent or less; ** between 1 and 5 per cent; * between 5 and 10 per cent.

	Demand deposits / liabilities	Liquid / total assets	Loan growth	Loans share / tot. assets	Total assets growth	Net ch. offs / tot. assets	Loan loss res. /tot. ass	Z-score	Capital ratio	Leverage	Returns on equity	Returns on assets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Impact effect	1.567 ***	-0.373	0.043 ***	0.020	0.040 ***	-0.014	-0.168 *	-0.031	0.199	0.237	0.683	0.072 **
(year 0)	*0.533*	*0.548*	*0.014*	*0.472*	*0.008*	*0.025*	*0.103*	*0.034*	*0.157*	*0.192*	*0.504*	*0.037*
Transition period	2.110 ***	-1.010	0.092 ***	0.495	0.070 ***	-0.014	-0.267 *	0.011	0.595 ***	0.396 *	0.313	0.026
(years 1-2)	*0.606*	*0.735*	*0.013*	*0.616*	*0.008*	*0.026*	*0.144*	*0.052*	*0.236*	*0.220*	*0.577*	*0.039*
Completion period	1.423 *	-1.226	0.122 ***	0.054	0.092 ***	-0.062	-0.311 *	0.066	1.331 ***	0.736 ***	2.102 ***	0.152 ***
(years 3+)	*0.831*	*0.959*	*0.014*	*1.133*	*0.009*	*0.045*	*0.167*	*0.049*	*0.353*	*0.272*	*0.831*	*0.046*
Total assets (log.)	-2.331 ***	-0.806 ***	-0.106 ***	1.493 ***	-0.124 ***	-0.027 ***	-0.318 ***	0.059 ***	-0.641 ***	-0.357 ***	-0.633 ***	-0.051 ***
	0.251	*0.292*	*0.006*	*0.307*	*0.004*	*0.011*	*0.078*	*0.016*	*0.091*	*0.093*	*0.156*	*0.015*
Inverse Mill's ratio	-5.938 ***	1.729 ***	-0.052 ***	-0.726 ***	-0.071 ***	-0.046 ***	0.319 ***	0.087 ***	-0.118	-0.988 ***	0.195	-0.063 ***
	0.336	*0.400*	*0.005*	*0.442*	*0.003*	*0.017*	*0.129*	*0.022*	*0.138*	*0.096*	*0.211*	*0.017*
Observations	33,484	33,124	34,979	36,075	48,618	19,847	23,414	26,709	29,707	38,633	37,944	38,256
No. of securitisers	287	291	310	318	459	197	243	236	353	364	356	357

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