Securitization, bank behaviour and financial stability:
A systematic review of the recent empirical literature

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Abstract

We systematically review the recent empirical literature to investigate whether and how securitization influences bank behaviour and its implication on financial stability. We find that, in the years preceding the 2007-2009 financial crisis, banks with higher credit and market risk were more likely to securitize assets. Banks became riskier and increased systemic risk as they took advantage of securitization in order to obtain capital relief. There is robust evidence indicating that mortgage securitization led to a deterioration in bank lending standards via weaker screening, lower denial rates, and misreporting of credit quality. For corporate loans securitization, literature's findings on lax bank lending are inconclusive. However, it is evident that securitization resulted in poorer ex-post bank monitoring of corporate borrowers. Even though Europe is the second largest securitization market, there is a dearth of evidence on the impact of securitization on European banks' lending behaviour. Research is also very limited on the post-crisis regulatory incentive aligning mechanisms such as the risk retention requirements and the credit ratings reform. Finally, evidence on securitisation activity in emerging markets, such as Latin America and China, where securitization volumes have been increasing recently, is relatively non-existent.

Keywords: Securitization; Financial Stability; Bank Behaviour

JEL classification: G21; G28

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1 Introduction

Bank securitization was once regarded as a mechanism that enhanced the resilience and stability of the financial system by redistributing risk efficiently.[1] Through securitization, banks off-loaded credit risk, transformed illiquid assets into saleable securities, reduced their reliance on customer deposits and expanded their lending capacity. This process provided an opportunity for banks to change their role from traditional lenders to originators and distributors of loans, where credit was issued for the sole purpose of securitization. However, the transformation of the banking landscape precipitated by securitization had undesirable effects on bank behaviour. At the end of 2008, the total stock of private label securitized assets in US and Europe reached USD 14.3 trillion. Of that total, mortgage-backed securities (MBS) accounted for approximately 65% while securitised corporate loans and other asset-backed securities (ABS) made up 18% and 17%, respectively. As of 2017 securitised corporate loans comprised 26% of outstanding issues.

Securitization is now regarded as one of the main causes of the 2007-2009 financial crisis. Securitization active banks displayed opportunistic behaviour by lowering lending standards and selling lower quality collateralised assets to unsuspecting third parties. During the crisis, asset-backed securities (ABS), especially those collateralized by mortgages, failed catastrophically leading to large losses and the demise of the US and European securitization markets. Consequently, it is commonly argued that securitization – by generating subpar assets and transferring credit risk to third parties who were not well positioned to manage it – increased the fragility of the financial system. However, this is not a unanimous conclusion as some studies have come to opposite conclusions.

In this paper, we survey the burgeoning empirical literature on securitization to examine how this innovation influences bank behaviour and its implication on financial stability. We contribute to the literature by reviewing the recent empirical evidence in a systematic manner to provide a detailed analysis of the findings of the literature about the implications of securitization on bank behaviour and financial stability. We follow a systematic literature

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[1] Securitization is a process where cash-generating financial assets (such as mortgages, corporate loans, auto loans or credit card receivables) – are packaged and sold to third parties as securities which have different risk profiles from the original underlying assets. Cash flows of these underlying assets are directed to support the payments on the created securities.

review (SLR) approach which adopts a structured process to survey the literature. In our analysis, we identify three themes and classify the literature accordingly. First, we investigate the drivers of securitization to explore the ex-ante determinants of banks' motivation to securitize assets. Second, we examine the ex-post effects of securitization on banks' financial performance and risk. Thirdly, we review the impact of securitization on bank lending behaviour and moral hazard. We highlight the implications for financial stability throughout our review.

By providing a systematic review of the empirical evidence on how securitization may affect bank behaviour and financial stability, we also aim to contribute by informing policy debate. Today, ten years after the crisis, policy makers are keen to reform and revive the securitization market, for its potential benefits to the financial system (see for example ECB, 2014). New securitisation regulatory frameworks have been introduced in the US and Europe to ensure adequate risk retention and information disclosure, increase capital requirements for securitizations, and enhance investor due diligence. Regulators are also promoting the issuance of simple, transparent and standardised securitizations, which are unlikely to endanger financial stability.

We find that in the pre-financial crisis period, banks that had higher market and credit risks were more likely to securitize. Under previous capital adequacy frameworks, banks exploited the benefits of securitization to obtain capital relief. Using bank level data, a number of studies show that after securitization, banks had higher exposure to market risk and systemic risk. Securitization also increased banks' lending capacity thereby compromising the efficacy of the bank-lending channel as a conduit for monetary policy. In the US mortgage markets, securitization eroded lending standards via weaker screening of borrowers, lower credit denial rates, the sale of poorer quality loans, and the misreporting of borrowers' creditworthiness. The evidence on European mortgage securitization is relatively too limited and underdeveloped to draw substantive conclusions. Concerning the securitization of corporate loans, the evidence of lax lending is inconclusive; however, it is evident that securitization resulted in poorer ex-post bank monitoring of corporate borrowers. Overall, in comparison with the European evidence, we observe that empirical evidence from the US is more likely to support the undesirable effects of securitization on bank behaviour.

Our survey also highlights the gaps in the empirical literature. Firstly, the literature on the post-crisis evolution of securitization pricing and structures is extremely limited. It is unclear whether the prices reflect investor due diligence or investors are still overly reliant on credit ratings. Secondly, additional empirical evidence is needed on agency conflicts[2] and the misalignment of incentives along the securitization chain in the European market. The paucity of evidence on these conflicts obscures our understanding on why securitization's impact on bank behaviour and financial stability may have differed between the US and the European markets. Research on this theme may have important implications on enacting relevant and well-informed regulation. Thirdly, empirical evidence is almost non-existent on emerging markets, such as Latin America and China, where securitization volumes are increasing. Securitisation in these markets are quite different from the European and US markets. In China, Securitisation was initially permitted on a pilot basis in April 2005, ceased during the 2008 financial crisis, was revived in 2012 and has experienced significant rapid growth since 2014. The market is heavily policy driven as each transaction has to be sanctioned by a designated government body. Issuances by financial institutions are traded on the interbank market only, resulting in an overlap between issuers and investors and overconcentration of risk in the banking sector.[3] In Latin America, the securitization markets are dominated by transactions from Brazil, Mexico, Columbia and Argentina. As a result of exchange rate fluctuations, most issuances are denominated in foreign currencies and are limited to largest and reputable originators. Unlike US and European securitisations, transactions in this region rarely secure participation of swap counterparties and liquidity providers. [4]

The rest of the paper is organised as follows. In Section 2 we explain the systematic literature review methodology we follow to conduct our survey. Section 3 presents the literature on the ex-ante drivers of banks' securitization decision. In Section 4 we review the empirical evidence

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[2] The failure of the housing market has been largely attributed to information-based agency conflicts in the securitization chain. These conflicts arise from the asymmetry of information available to each party in the securitization process. This may be evident in the relationship between originators and investors with respect to loan quality, and the relationship between appointed servicers and investors with respect to loan modification. A series of theoretical works explain how securitization can be incentive compatible by creating information insensitive senior tranches for investors and informationally sensitive junior tranches which are retained by the originator to ensure first best monitoring efforts. Retention of the riskier tranches can also be interpreted as a signal of asset quality. See Frame (2017) for a review of securitization related agency conflicts. This literature explains the supervisory efforts to make retention mandatory with the intention of promoting responsible securitization.

[3] With respect to asset classes, the Chinese market is dominated by CLOs –corporate loans/assets – which comprised 55% of issuance volumes in 2017. Commercial mortgages securitization do not currently exist and the first residential mortgage backed securitization was closed in 2015 (Thomson Reuters, 2018).

[4] The development of securitisation market in Latin America has been restrained by deficiencies in legal frameworks, constraints on collateral data availability, narrow investor base, political and investor uncertainty, macroeconomic stresses and financial instability. (See Tovar & Scatigna, 2007 and Torre et al., 2018 for more details).
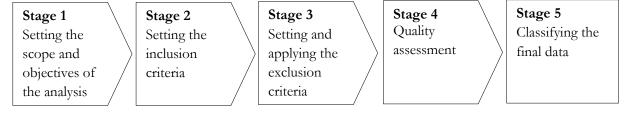
presented on the ex-post effects of securitization on bank performance and risk. Subsequently, in Section 5, we review studies on the impact of securitization on bank lending behaviour and moral hazard. Section 6 concludes and proposes suggestions for further research.

2 Methodology

We adopt an SLR approach, defined by Macpherson and Jones (2010) and Tranfield et al. (2003), to conduct our research. Compared to traditional unstructured reviews, SLR adopts a replicable, scientific and transparent process by minimizing bias and errors (Tranfield et al., 2003), improving the quality of the review process, and providing clear steps for replication (Wang and Chugh, 2014). Following studies conducting systematic reviews in other subject areas (such as Nolan and Garavan, 2016; Danese et al., 2017), we adopt a structured process as illustrated in Figure 1 below.

In stage 1, we identify the research objectives of our analysis. The primary objective here is to investigate the impact of securitization on financial stability through its effect on bank behaviour by reviewing the recent empirical research. Our secondary objective is to classify the research examining the link between securitization, bank behaviour and financial stability. The third objective is to provide suggestions for further research.

Figure 1: Stages followed in the systematic literature review

Stage 1 Setting the scope and objectives of the analysis	Stage 2 Setting the inclusion criteria	Stage 3 Setting and applying the exclusion criteria	Stage 4 Quality assessment	Stage 5 Classifying the final data

In stage 2, we set three inclusion criteria: i) We focus on top peer reviewed academic journals in the areas of Finance, Economics and Accounting listed in the Journal Quality List, Sixtieth Edition (Harzing, 2018). This comprehensive list provides journal rankings based on fourteen widely used lists in academia. ii) We only include articles published between 2004 and 2017 to capture research findings that were published around the period of 2007-2009 financial crisis, iii) We use the following combination of keywords for searching titles, keywords and/or abstracts: 'securitization', 'securitisation', AND 'bank'. We purposefully use general

keywords to capture as many articles as possible. Our initial search yielded the following number of articles published in peer-reviewed journals: 1) ABI/INFORM – 250, 2) ScienceDirect – 77, 3) Wiley Online Library – 86 and 4) Emerald Insight – 26. It is worth noting that ABI/INFORM covers the other three sources of publishers and therefore most of the papers shown in ABI/INFORM are duplicates.

In stage 3, we apply the exclusion criteria. Firstly, we eliminate any research that is not examining bank securitization (i.e. non-financial firms' securitization). Secondly, we are interested in empirical studies based on numerical data and quantitative analysis techniques; therefore, we exclude pure theoretical research outputs from the data.[5] These exclusion criteria yield a final sample of 53 peer-reviewed journal articles.

In stage 4, the quality of the final set of studies is scrutinised by the three researchers independently based on publication outlet and content relevance. We present the publication outlets for the articles in Table 1.

Table 2 presents the descriptive statistics regarding the publication year, region, loan type and analysis type are presented in. We observe that 68% of the articles we identified have a US focus and a majority of them are published after the crises period of 2007-2009 (73.5%).

At the last stage, articles in the sample are classified into themes based on the research questions, analysis and focus of our paper. This process is first undertaken independently by each researcher and then results are compared and a final classification is achieved resolving any differences by discussion. We identify three themes as shown in Table 3. We group the first strand of literature under the heading of "Ex-ante determinants of bank securitization". These studies examine banks' motivation to undertake securitization. This is a key and relevant question in understanding the impact of securitization on bank behaviour and financial stability especially in understanding whether riskier banks are more likely to securitise.

Table 1: Publication outlet

Journal title	Count	Share
Journal of Financial Services Research	9	16.98%
Journal of Financial Economics	6	11.32%
Review of Financial Studies	6	11.32%
Journal of Banking and Finance	4	7.55%

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[5] Even though the theoretical literature is not included in our data, we utilise this literature in our discussions of findings.

	Count	Share
Journal of Money, Credit and Banking	3	5.66%
Journal of Finance	3	5.66%
European Journal of Finance	3	5.66%
Journal of Financial Intermediation	2	3.77%
Journal of Financial Stability	2	3.77%
Journal of International Money and Finance	2	3.77%
Journal of Monetary Economics	2	3.77%
Quarterly Journal of Economics	2	3.77%
European Economic Review	1	1.89%
European Financial Management	1	1.89%
Insurance and Risk Management	1	1.89%
International Review of Financial Analysis	1	1.89%
Journal of Business Economics and Management	1	1.89%
Journal of Real Estate Research	1	1.89%
Journal of Risk Finance	1	1.89%
Quarterly Review of Economics and Finance	1	1.89%
Review of Finance	1	1.89%
Total	53	100%

Table 2: Descriptive statistics

	Count	Share		Count	Share
Region			*Publication year*		
US	36	67.92%	2004	2	3.77%
Europe (multi-country)	6	11.32%	2005	1	1.89%
Italy	5	9.43%	2006	1	1.89%
Spain	4	7.55%	2007	2	3.77%
Canada	1	1.89%	2008	2	3.77%
Global	1	1.89%	2009	6	11.32%
			2010	3	5.66%
Level of analysis			2011	4	7.55%
Loan	30	56.60%	2012	7	13.21%
Bank	23	43.40%	2013	4	7.55%
			2014	2	3.77%
Type of loans			2015	10	18.87%
All	23	43.40%	2016	6	11.32%
Mortgages	20	37.74%	2017	3	5.66%
Corporate	8	15.09%	Total	53	100.0%
Credit card	1	1.89%			
SME loans	1	1.89%			

The second category includes studies that examine the "Ex-post effects of securitization on banks". This strand of the literature particularly looks at how banks' idiosyncratic risk changes after securitization and the impact of this change on the systemic risk of the overall financial system. The final category includes studies that investigate the impact of securitization on bank lending behaviour. This literature primarily examines how the lending decision changes due to the information frictions induced by securitisation. Given that asset-backed securities are sold to third parties situated in various segments of the financial system, the adverse selection and moral hazard problems associated with the disconnect between the originator and the ultimate investor may leading to weaker bank lending standards and, therefore, securitizations would consequently impact financial stability.

Table 3: Identified themes

Theme	Number of papers[*]
Ex-ante determinants of bank securitization	9
Ex-post effects of securitization on banks	24
The effect of securitization on bank lending behaviour	24

[*]4 papers are categorised in two groups, leading to a total of 55 observations in this table.

3   Ex-ante determinants of bank securitization

In Table 4 we present a summary of the findings of the studies in the literature that examines the ex-ante determinants of bank securitization. This literature highlights funding costs, liquidity, capital levels, bank size and profitability as the main financial factors for bank securitization.

Theoretical studies highlight cost of funding as a common motivating factor as securitization can be used to fund loan portfolios at lower costs relative to funding via deposits, debt or equity (Benveniste and Berger, 1987; Pennacchi, 1988; Jones, 2000; Shin, 2009). Also, empirical studies confirm that banks can effectively decrease the cost of funding through the diversification of funding sources through securitization (Agostino and Mazzuca, 2008; Cardone-Riportella et al., 2010; Loutskina, 2011), and by circumventing costs arising from deposit insurance and reserve requirements (Affinito and Tagliaferri, 2010; Casu et al., 2013).

Banks can also use securitization as an additional funding channel to address their liquidity needs. Banks may sell loans in order to fund their assets in response to shocks to the supply or costs of deposits (Affinito and Tagliaferri, 2010). Multiple empirical studies consistently find that banks engage in securitization to improve their liquidity positions (Cardone-Riportella et al., 2010; Affinito and Tagliaferri, 2010; Casu et al., 2013; Farruggio and Uhde, 2015).

Table 4: Ex-ante determinants of banks' securitization decision

This table summarises the main findings of the literature that examines the determinants of bank securitization decision. Determinants of securitization are sub-categorized as funding costs, liquidity, capital level, size, credit risk and profitability. These measures may have been proxied by different variables in each of the studies. Arrows indicate the direction of the relationship between the measures and the probability, or volume, of securitization activity. For example, a ↓ for liquidity indicates that a bank with lower liquidity is more likely to be active in the securitization market.

Authors, date	Data				Funding costs	Liquidity	Capital level	Credit Risk	Size	Profitability
	Period	Region	Level	Loans						
Calomiris and Mason, 2004	1996-2000	US	Bank	Credit card			↑			
Uzun and Webb, 2007	2001-2005	US	Bank	All			↓		↑	
Agostino and Mazzuca, 2008	1999-2006	Italy	Bank	All	↑	↓			↑	
Loutskina and Strahan, 2009	1992-2004	US	Loan	Mortgages	↑				↑	
Minton et al., 2009	2000-2003	US	Bank	All					↑	↑
Cardone-Riportella et al., 2010	2000-2007	Spain	Bank	All		↓				
Affinito and Tagliaferri, 2010	2000-2006	Italy	Bank	All		↓	↓	↑		↓
Casu et al., 2013	2001-2008	US	Bank	All	↑	↓	↓	↑		↑
Farruggio and Uhde, 2015	1997-2010	Europe	Bank	All		↓		↓	↑	↑

Furthermore, prior to the Basel III regime, banks have often used securitization to circumvent minimum capital requirements through regulatory capital arbitrage, thereby reducing cost of financing (Pennacchi, 1988; Jones, 2000; Calomiris and Mason, 2004; Ambrose et al., 2005; Watson and Carter, 2006; Uzun and Webb, 2007).[7] This practice was quite commonplace under the Basel I regime, where it was more expensive to hold less risky assets (Cardone-Riportella et al., 2010). Evidently, banks used securitization with recourse to determine optimal capital ratios that matched markets' risk perception as opposed to regulatory capital requirements (Calomiris and Mason, 2004). However, Affinito and Tagliaferri (2010), based on the European data, find a negative relationship between capital levels and the probability of securitization. Nevertheless, they argue that their analysis does not necessarily imply regulatory capital arbitrage where capital levels are reduced without corresponding reduction in risks. They highlight that securitization was mostly used to satisfy funding and liquidity needs, and to diversify funding sources. On the other hand, studies based on US data uniformly report a negative relationship between capital levels and probability of securitization (Calomiris and Mason, 2004; Uzun and Webb, 2007; Casu et al., 2013), indicating that regulatory arbitrage was a key motivation for US banks.

Securitization was effectively a channel for riskier banks to offload risk to third parties. They obtained easier access to the capital markets via securitization because asset-backed securities usually carried higher ratings than the issuing bank (Choudhry et al., 2014). Banks were also more likely to securitize loans when bearing the associated risk of an asset was considered to

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[7] See Jones (2000), Minton et al. (2004) and Acharya and Richardson (2009) for an extended discussion of how pre-Basel III capital regulations allowed bank to maintain less capital through regulatory capital arbitrage.

be undesirable (Parlour and Plantin, 2008); hence, they may use securitization to channel risk onto third parties at fair value (Jobst, 2006; Martín-Oliver and Saurina, 2007; Hansel and Bannier, 2008). Empirical evidence consistently shows that banks holding loan portfolios with higher credit risk are more likely to engage in securitization activity regardless of the country or region (Affinito and Tagliaferri, 2010; Casu et al., 2013). An exception to these conclusions is Faruggio and Uhde (2015) who report a negative relationship between credit risk and securitization volume. It is worth noting that these papers use different indicators to measure credit risk.[8] The apparent distinction between the results of Faruggio and Uhde (2015) and other studies seem to be sample size and context. Faruggio and Uhde (2015) evaluates a sample of collateralised debt obligations (CDOs) issued by 75 listed European Banks from 1997 – 2010. The closest work to Farrugio and Uhde (2015) is Hansel and Bannier (2008) who examine a larger sample of 243 European banks from 1997 – 2004. A notable difference between these two studies is the inclusion of the post-crisis period by Faruggio and Uhde (2015). The motivation for securitisation may have changed after the crisis as banks became less aggressive and focused more on reducing credit risk. Hence, Faruggio and Uhde (2015) results may be influence by new circumstances in the post-crisis period.

Bank size as well as performance have also been found to be significant determinants of securitization in the empirical literature. The empirical studies unanimously show that larger banks are more likely to securitize and issue collateralised securities in higher volumes (Uzun and Webb 2007; Minton et al., 2009; Casu et al., 2013; Farruggio and Uhde, 2015). Evidence on the role of profitability as a motivating factor for securitization is ambiguous as studies report contradictory findings (Affinito and Tagliaferri, 2010; Casu et al., 2013; Farruggio and Uhde, 2015).

Overall, a series of empirical studies analysing the US and European markets provide similar evidence on the determinants of securitization using pre-crisis data. However, our knowledge on the banks securitization decision is especially limited for the post-crisis period. Only Farruggio and Uhde (2015) provides post-financial crisis evidence; however, their study examines the period of 2009-2010 when the European securitization market was mostly inert

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[8] The following indicators are used in each of the studies: Credit risk provision relative to net interest income (Hansel and Bannier, 2008); net charge offs (Panetta and Pozzolo, 2010); bad loans to total loans (Affinito and Tagliaferri, 2010); nonperforming loans to total loans (Minton et al., 2009; Casu et al., 2013); loan loss reserves to total loans (Faruggio and Uhde, 2015).

as issuances had declined by approximately 50% from 2008 levels.. Furthermore, US evidence is non-existent in for the period following the financial crisis.

Conclusions drawn from this strand of literature on financial stability implications of securitization can be interpreted as positive. Based on the literature reviewed above, it can be argued that banks tend to use securitization to manage various risks by modifying their liquidity, capital and credit risk levels. However, it has been argued that securitization, destabilised the soundness of the banking system, and was a leading factor triggering the 2007-2009 financial crisis (Financial Crisis Inquiry Commission, FCIC, 2011). Therefore, the ex-post securitization effects may have deviated from the expectations of issuing banks. These effects are explored in Section 4 below..

4   Ex-post effects of securitization on banks

As discussed in Section 3, risk-shifting is one of the main motivations of securitization, but do banks' risk levels decrease after securitization? This is explained by three key transmission mechanisms. First, the retention of the first loss piece as an incentive-aligning device determines the effective risk transferred by securitisation. Second, the reinvestment of securitization proceeds in new projects higher/lower risk relative to the risk of the securitized portfolio influences the risk of the loans on the balance sheet. Finally, the use of credit risk transfer to effectively reduce capital buffers without corresponding changes in risk levels undermined the loss-absorbing objective of required regulatory capital. In Table 5, we present a summary of the findings of the literature examining the ex-post effects of securitization on bank financials and risks. We identify these effects as credit and other bank risks, equity risk, capital requirements, profitability, lending ability and issuer lending rates.

Securitization is designed to insulate the originator from the performance of the underlying assets. Therefore, if banks intend to close future transactions, they should be inclined to securitise high quality loans, while building their reputation. However, theoretical studies show that this tendency results in the retention of riskier loans which in turn increases banks' risks (Greenbaum and Thakor, 1987; DeMarzo, 2005; Instefjord, 2005). Retention of the first loss piece is also an important mechanism in securitization transactions because it aligns the incentives of the issuing bank with the interests of investors (Parlour and Plantin, 2008;

DeMarzo, 2005; Malekan and Dionne, 2014). However, retention leads to an accretion of credit risk on the balance sheet thereby making banks weaker and vulnerable to economic downturns.

Recent empirical evidence finds that the risk profile of securitizing banks are higher for a given level of capital after securitization (Calem and LaCour-Little, 2004; Dionne and Harchaoui, 2008; Michalak and Uhde, 2012; Agarwal et al., 2012; Casu et al., 2013; Battaglia and Gallo, 2013).[9] Evidence also shows that keeping riskier loans was driven by the lack of risk differentiation and capital requirements that were perceived to be excessive during the pre-crisis period (Basel I and later Basel II). Consequently, banks sought to exploit the benefits of asset securitisation in order to obtain capital relief. The literature uniformly reports that the required relative levels of capital, given the risk, declines after securitization (Calem and LaCour-Little, 2004; Dionne and Harchaoui, 2008; Purnanandam, 2011; Michalak and Uhde, 2012).

A second factor related to increasing risks is the banks' reinvestment policy after securitization. Using simulations, Franke and Krahnen (2005) find that banks increase their risk profile by reinvesting securitization proceeds into granting additional loans rather than investing in risk-free assets or repaying their debt. Empirical evidence shows that prior to the 2007-2009 financial crisis, banks' credit risk increased by holding riskier loans and lending to riskier borrowers (Dionne and Harchaoui, 2008; Le et al., 2017[10]). Securitization also decreases banks' financial soundness (measured by Z-score) and increases return volatility (Michalak and Uhde, 2012). For the US market, Chen et al. (2017) finds that even though securitization active banks had relatively lower short-term risk (measured by Z-score), it significantly increased the probability of bank failure in the long run. Due to risk retention, securitization active banks have higher expected losses in case extreme events (tail risk) occur (Battaglia and Gallo, 2013), and hold less diversified loan portfolios after securitization (Casu et al., 2013).

Another strand of literature empirically investigates whether securitization increased banks' systematic risk - measured using equity beta. Studies find that in the European market, stock betas increase for banks that use securitization proceeds to fund new loans, indicating that the

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[9] Furthermore, retention is found to be inefficient during boom periods (Kuncl, 2015) since asset quality remains unobservable and financial institutions accumulate risky assets on their balance sheet. Reputational concerns should serve as incentives for optimal equity retention; however, evidence shows that retained tranches were usually sold or hedged using credit derivatives (Fender and Mitchell, 2009).

[10] Le et al. (2017) also looks at the post-crisis period of 2009-2012 and do not find evidence of securitization leading to increase in credit risk.

market perceives this as taking on more risk. Battaglia and Gallo (2013) (using marginal expected shortfall as a measure of systemic risk) and Iglesias-Casal et al. (2016) find that securitization increases the probability of Italian and Spanish banks respectively becoming systematically riskier. Similarly, US banks that securitized loans prior to the 2007-2009 financial crisis suffered greater losses on their stocks on days when the market plummeted during the crisis (Stiroh, 2006; Trapp and Weiss, 2016). On the contrary, We et al. (2011), examining the 2002-2007 period in US banks, find that securitizing banks had lower systematic betas until 2007. However, they identify a structural break in 2007, when securitizing banks experienced jumps in both systematic and idiosyncratic risks. Overall, the literature generally indicates that securitizing active banks are more likely to be non-trivial contributors to a systemic crisis.

Table 5: Ex-post effects of securitization on banks financial and risk

This table summarises the main findings of the literature that examines the ex-post effects of bank securitization on bank financials and risk. The effects are sub-categorized as credit risk, overall bank risk, equity (systematic) risk, capital levels required, profitability, lending ability and issuer lending rates. These measures may have been proxied by different variables in each of the studies. Arrows indicate the direction of the relationship between ex-post securitization and the specific indicator. For example, a ↓ for credit risk indicates that after securitization bank credit risk increases.

Authors, date	Data				Capital level required	Credit and Other bank risk	Equity risk	Profitability	Lending ability	Issuer lending rates
	Period	Region	level	Loans						
Calem and LaCour-Little, 2004	1993-1998	US	Loan	All	↓					
Stiroh, 2006	1997-2004	US	Bank	All				↑		
Dionne and Harchaoui, 2008	1988-1998	Canada	Bank	All	↓	↑				
Altunbas et al., 2009	1999-2005	Europe	Loan	All				↑	↑	
Martinez-Solano et al., 2009	1993–2004	Spain	Bank	All				↑		
Loutskina, 2011	1976-2007	US	Bank	All					↑	
Shivdasani and Wang, 2011	1996-2008	US	Loan	Corporate					↑	↓
Wu et al., 2011	2002-2007	US	Bank	All				↓		
Purnanandam, 2011	2006-2008	US	Bank	Mortgages	↓					
Michalak and Uhde, 2012	1997-2007	Europe	Loan	All	↓	↑			↓	
Nadauld and Weisbach, 2012	2002-2007	US	Loan	Corporate						↓
Agarwal et al., 2012	2004-2007	US	Loan	Mortgages		↑				
Carbó-Valverde et al., 2012	2000-2010	Spain	Bank	All					↑	
Zarutskie, 2013	1976-2003	US	Loan	Mortgages					↑	↓
Casu et al., 2013	2001-2008	US	Bank	All	↓	↑				
Battaglia and Gallo, 2013	2000-2009	Italy	Bank	All		↑	↑			
Wang and Xia, 2015	2000-2007	US	Loan	Corporate						
Baradwaj et al., 2015	2001-2010	US	Bank	SME loans					↑	
Termos and Saad, 2016	1985-2005	US	Bank	Mortgages					↑	
Trapp and Weiss, 2016	2006	US	Bank	All				↑		
Bonaccorsi di Patti and Sette, 2016	2007-2008	Italy	Bank	All					↓	↑
Iglesias-Casal et al., 2016	1993-2010	Spain	Loan	Mortgages				↑		
Chen et al., 2017	2002-2012	US	Bank	All		↑				
Le et al., 2017	2001-2012	US	Bank	All		↑				

In terms of performance, securitization should theoretically have a positive effect on bank profitability. Pooling loans and allocating cash flows across varied financial claims can enhance a bank's expected revenue in the presence of information asymmetries (Boot and Thakor, 1993). In order to maximise returns on assets, banks can utilize securitization to systematically pool and sell newly originated or existing assets on a continuously, thereby increasing income for given levels of equity (Wolfe, 2000). Empirical evidence shows that securitization increased the expectation of profitability (Martinez-Solano et al., 2009). In contrast, Michalak and Uhde (2012) find that securitization lowers profitability for European banks while increasing earnings volatility. According to the authors, securitizing banks retaining a large portion of the credit risk and subsequently following risky reinvestment strategies may decrease profits as a result of higher probability of loan losses. This contradiction between two studies' findings is most likely due to the different measures used. Martinez-Solano et al. (2009) conduct an event study assessing stock returns of Spanish banks where positive cumulative abnormal returns around announcement dates are interpreted as investors' expectations about profits. Michalak and Uhde (2012) actually take a direct approach by assessing the effect of securitization on return on assets and find a negative relationship. In this case, the evidence suggests that actual returns fell short of expected returns.

Securitization income may also enhance revenues by lessening the underinvestment[11] problem and, thereby, reducing the cost of equity (Lockwood et al., 1996). Empirical evidence shows that securitization modified banks' access to capital which led to relaxed lending constraints, increased loan supply (Shivdasani and Wang, 2011; Zarutskie, 2013; Baradwaj et al., 2015; Termos and Saad, 2016) and lower lending rates between 2004 and 2007 (Shivdasani and Wang, 2011; Nadauld and Weisbach, 2012; Zarutskie, 2013).

Loutskina and Strahan (2009) and Loutskina (2011) find that prior to the 2007-2009 financial crisis, securitization increased US banks' lending ability and made lending less sensitive to cost of funding shocks. European and international evidence also find that securitization active banks increased their loan levels in the period before the 2007-2009 financial crisis (Altunbas et al., 2009; Carbó-Valverde et al., 2012). The argument here is that securitization active banks

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[11] The underinvestment refers to an agency problem where the bank forgoes profitable projects because of possible wealth transfer to debtholders (depositors) from shareholders. The argument here is that securitization allow banks to issue debt claims senior to depositors claims. The risks to depositors is reduced as funding from securitization may be directed to projects that would have been forgone otherwise as a result of a possible wealth transfer from shareholders to depositors.

were larger and had access to higher liquidity at lower costs. Consequently, they increased their lending supply in order to fund more securitizations. The pliability of this channel largely insulated these banks from the cost of funds from other sources. One exception to this narrative is Bonaccorsi di Patti and Settle (2016). These authors examine the impact of securitization on bank behaviour during the crisis period of 2007-2008. They find that securitization-active banks tightened credit supply and increased lending rates during this period.

The ability to increase loan supply via securitization may pose a risk to financial stability through its weakening effect on monetary policy. The credit channel of monetary policy transmission operates through changes in bank lending. The effectiveness of the bank lending channel for the purposes of monetary policy transmission can be eroded when banks can raise funds through securitization. In Europe, during the pre-crisis period, the use of securitization sheltered banks' loan supply from the effects of monetary policy (Altunbas et al., 2009). In the US, the ability of monetary policy to influence the credit supply was also restricted by securitization. Loutskina (2011) finds that banks with more liquid portfolios exhibited higher loan growth during periods of monetary tightening. However, these banks become vulnerable to liquidity and funding crises as securitization, one of their key sources of funding, dried up during the 2007-2009 crisis (Loutskina, 2011).[12]

In sum, this strand of the empirical literature agrees on the various implications of securitization for bank soundness and financial stability. Firstly, there is clear evidence that securitization increased banks' credit and systematic risk both in the US and European markets. Secondly, evidence drawn both from US and European studies confirms the capital arbitrage effect of securitization. Thirdly, it is evident that through securitization, banks' increased their lending capacity in both regions. Once more, a gap in the literature here is the paucity of research examining the relationship between securitization and bank risk in the post-crisis period. Although issuance volumes have declined significantly compared to the pre-crisis years, the securitisation markets have been gradually gaining momentum, especially after 2010. An exception is the study by Le et al. (2017) that examines the period of 2009-2012 and do not find evidence of securitization leading to banking risks. Although issuance volumes are still low, the securitization markets have been somewhat active especially after 2010. This period

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[12] It is also shown that the balance sheet channel of monetary transmission is stronger for U.S. banks that securitize their assets (Aysun and Hepp, 2011).

has been largely characterized by regulatory tightening and reforms aimed at strengthening the financial system. Consequently, it is imperative to investigate the extent to which securitization results in risk transfer during this period of regulatory reform, and whether securitization remains an effective tool for arbitraging regulatory capital. This line of research is especially important as regulators have now specified minimum retention ratio relative to originator-determined retention ratio during the pre-crisis era. Another interesting empirical undertaking would be to assess the reinvestment tendencies of securitization active banks across multiple regulatory regimes.

5 Securitization and bank lending behaviour

We present a summary of the empirical studies on the impact of securitization on bank lending behaviour in Table 6. We identify five arguments from the literature as follows: adverse selection, screening incentives, monitoring incentives, misreporting and covenant strength.

Securitization may distort bank lending behaviour by incentivising opportunistic behaviour at the expense of ABS investors. Theoretical models establish the link between the decline in credit quality and the financial crisis. For instance, Shin (2009) demonstrates that securitization may not improve financial stability if the imperative to grow bank balance sheets compromises lending standards. Also, Brunnermeier and Sannikov (2010) show that while securitization enhances risk sharing within the financial sector; it can also lead to higher leverage levels thereby increasing bank risks. Thus, securitization enables banks to reduce their capital levels for given levels of risk, which essentially translates to higher leverage and a build-up of systemic risk (through a widespread accumulation of risky assets as a proportion of total assets).

A number of studies empirically investigate the link between securitization and lax lending standards.[13] In the years prior to the 2007-2009 financial crisis, securitization active US banks

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13 Maddaloni and Peydró (2011) also find that low short-term interest rates soften standards for household and corporate loans and this is amplified by securitization.

Table 6: Effects of securitization on bank lending behaviour

This table summarises the main findings of the literature that examines the effects of securitization on bank lending behaviour. The effects are sub-categorized as adverse selection, screening incentives, monitoring incentives, misreporting, covenant strength, and rating shopping/favours. These measures may have been proxied by different variables in each of the studies. Arrows indicate the direction of the relationship between securitization and the specific bank behaviour. For example, a ↓ screening incentives means that securitization reduced banks' screening incentives. Yes (No) indicates whether the sub-category is found (not observed) in the study.

Authors, date	Period	Region	Level	Loans	Adverse selection	Screening incentives	Monitoring incentives	Misreporting	Covenant strength	Rating shopping/favours
Ambrose et al., 2005	1995-2000	US	Loan	Mortgages	Yes					
Mian and Sufi, 2009	1998-2007	US	Loan	Mortgages	Yes	↓				
Keys et al., 2009	2001-2006	US	Loan	Mortgages	Yes	↓				
Keys et al., 2010	2000-2006	US	Loan	Mortgages	Yes	↓				
Purnanandam, 2011	2006-2008	US	Bank	Mortgages	Yes	↓				
Shivdasani and Wang, 2011	1996-2008	US	Loan	Corporate	No				↓	
Dell'Ariccia et al., 2012	2000-2006	US	Loan	Mortgages	Yes	↓				
Agarwal et al., 2012	2004-2007	US	Loan	Mortgages	Yes					
Benmelech et al., 2012	1997-2007	US	Loan	Corporate	No					
Keys et al., 2012	2000-2006	US	Loan	Mortgages	Yes	↓				
Nadauld and Sherlund, 2013	2003-2005	US	Loan	Mortgages	Yes	↓				
Krainer and Laderman, 2014	2000-2007	US	Loan	Mortgages	Yes					
Kamstra et al., 2014	1994-2004	US	Loan	Corporate				↓		
Wang and Xia, 2015	2000-2007	US	Loan	Corporate					↓	
Efing and Hau, 2015	1991-2011	US &Europe	Loan	All						Yes
Elul, 2015	2005-2006	US	Loan	Mortgages	Yes					
Albertazzi et al., 2015	1996-2006	Italy	Loan	Mortgages	No					
Bord and Santos, 2015	2004-2008	US	Loan	Corporate	Yes	↓	↓			
Griffin and Maturana, 2016	2002-2011	US	Loan	Mortgages				Yes		
Piskorski et al., 2015	2005-2007	US	Loan	Mortgages				Yes		
Fabozzi et. Al, 2015	1999-2006	Europe	Loan	Mortgages						No
He et al., 2016	2004-2006	US	Loan	Mortgages						Yes
Kara et al., 2016	2000-2009	Europe	Loan	Corporate	No					
Kara et al., 2017	2005-2007	Europe	Loan	Corporate	No		↓			

originated low quality mortgages that suffered higher default rates subsequently (Keys et al., 2009, 2010, 2012; Purnanandam, 2011). For example, in the pre-crisis period, default rates of mortgage loans increased by about 10 to 25 percent if a securitized bank doubled its securitization volume (Keys et al., 2010). However, it is worth noting that these studies have multiple limitations. For example, Keys et al. (2009, 2010, 2012) rely on samples of securitised subprime mortgages only, hence their inferences might by skewed due to selection bias. Therefore, it is unclear from their evidence whether lending standards also declined for non-securitised mortgages.[14] Also, Purnanandam (2011) does not control for observable characteristics –such as LTV, FICO scores or loan type– and, therefore, it is unclear whether the decline in quality is due to declining lending standards or the origination of observably poor quality loans.

There is also evidence that securitization decreased denial rates in mortgage applications during the pre-crisis period (Mian and Sufi, 2009; Dell'Ariccia et al., 2012; Nadauld and Sherlund, 2013).[15] Using US data, these studies show that areas (proxied by zip codes) with negative relative income and employment growth experienced decreases in denial rates and increases in mortgage approvals. This trend was driven by a relative increase in the portion of mortgages securitised by banks soon after origination. Banks also securitized their (ex-ante) riskiest mortgages (Ambrose et al., 2005; Agarwal et al., 2012; Krainer and Laderman, 2014; Elul, 2015). These studies find that mortgages that were securitized had higher prepayment risk and performed worse in comparison to non-securitized mortgages. The only exception to this narrative is Albertazzi et al., (2015). The authors do not find any evidence of adverse selection in the Italian mortgage securitization market. Overall, there is substantial evidence that prior to the financial crisis, securitization of mortgages reduced lenders' incentives to screen borrowers carefully.

In contrast to mortgage lending, there is evidence suggesting that securitization did not led to riskier lending in the corporate loan market and adverse selection problems seems to be less severe (Shivdasani and Wang, 2011; Benmelech et al., 2012; Kara et al., 2016; Kara et al.,

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[14] Also, they only use data on originations (successful loan applications) hence the extent to which the lending decision can be credibly assessed is limited.

[15] Dell'Ariccia et al. (2012) is relatively superior as their dataset includes securitised and non-securitised prime and subprime mortgages. Furthermore, their sample comprises denied loan applications; therefore, they are able to provide a better assessment of the lending decision, rather than studies that assess successful applications (or originations) only. Relatedly, Mian and Sufi (2009) and Nadauld and Sherlund (2013) arrive at their conclusions based on aggregate data while Dell'Ariccia et al. (2012) uses disaggregated loan level data.

2017). For example, in the US market, securitized corporate loans experienced lower ex-post defaults than those retained in banks' balance sheets (Benmelech et al., 2012). Empirical evidence based on European data also show that banks did not securitize low quality corporate loans (Kara et al., 2016; Kara et al., 2017). On the contrary, Bord and Santos (2015) argue that securitization led to lax underwriting standards in corporate loans. They find that in the US, during the boom years of CLO issuance, securitized loans underperformed relative to unsecuritized loans by the same bank.[16]

A reduction in monitoring intensity of borrowers whose loans are securitized may impair credit quality. Theoretical studies show that banks reduce monitoring after loan sales (Gorton and Pennacchi, 1995; Duffee and Zhou, 2001; Morrison, 2005; Chiesa, 2008) and there is supportive empirical evidence from the US (Kamstra et al., 2014; Wang and Xia, 2015) and Europe (Kara et al., 2017). Broadly speaking, banks imposed looser loan covenants at origination (Shivdasani and Wang, 2011; Wang and Xia, 2015), and borrowers from securitization active banks took on significantly more risk.

Securitization active banks also showed other forms of opportunistic behaviour through misreporting and fraud in ABSs issued in the pre-crisis period. For example, in the US, approximately 10 to 30 percent of mortgages in residential mortgage pools were misreported (Griffin and Maturana, 2015; Piskorski et al., 2015) and banks withheld information from investors showing loan pools were than represented (Griffin and Maturana, 2016).[17]

The literature also scrutinizes the conflict of interests that may arise due to close relationships between the banks and rating agencies that assign credit ratings to securitized bonds. In the securitization process, the issuer-pay structure of compensation may lead to additional misaligned interests (He et al., 2016; Efing and Hau, 2015).[18] For example, it is argued that banks shopped for ratings and only reported favourable ones (He et al., 2016). Relatedly, it has been documented that credit rating agencies issued rating favours to larger banks and to banks that secured ratings on a significant number of securitization deals from them (He et al., 2016;

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[16] Related to this literature, it is found that there may be positive incentive effects when originators are affiliated with sponsors or servicers of the ABS (Demiroglu and James, 2012).

[17] There is also evidence that borrowers of mortgages made inaccurate declarations on applications (Jiang et al., 2013; Griffin and Maturana, 2016).

[18] The accuracy of credit ratings has also been examined as they were inaccurate in assessing ABS risks (Brennan et al., 2009; Coval et al., 2009a; Coval et al., 2009b).

Efing and Hau, 2015).[19] In contrast, Fabozzi et al., (2015) find evidence inconsistent with the rating shopping hypothesis in the European market.

Summarising this strand of literature, there is strong evidence that US banks securitizing mortgages loosened their lending standards due to securitization. They weakened screening, bundled lower quality loans into MBSs and in some cases misreported the initial quality of the mortgages. In corporate loan securitization, evidence of lax lending is inconclusive with majority of studies reporting no adverse selection. However, banks reduced monitoring efforts on securitised corporate loans. Additionally, the European evidence is less likely to report negative influences of securitization. Similar to our remarks in the above sections, empirical evidence on these relationships in the post-crisis period is non-existent also in this strand of the literature. Furthermore, there are only a handful of studies that examines the European banks behaviour, both in mortgage and corporate loan markets.

6 Conclusion

In this paper we systematically reviewed the recently developed empirical literature investigating the determinants of securitization, the ex-post effects of securitization on bank risk, the effects of securitization on bank lending behaviour and securitization's implication on financial stability. Evidently, large banks are most likely to securitise with the intention of obtaining liquidity at relatively lower costs. Although, a commonly cited benefit of securitization is to reduce credit risk, this mechanism has been found to achieve minimal risk transfer due to the use of retention as a signaling device, regulatory capital arbitrage, and the reinvestment policies of securitizing banks.

We find that in the pre- crisis period, securitization active banks had higher exposure to market risk and systemic risk. Securitization increased bank lending capacity which undermined effectiveness of the lending channel as monetary transmission mechanism. US banks, especially in the mortgage market, relaxed lending standards via weaker screening of borrowers, and lower denial rates. They also securitized poorer quality loans and engaged in

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[19] Relatedly, Ashcraft et al. (2010) find a progressive decline in rating standards around the MBS market peak between the start of 2005 and mid-2007.

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pervasive misrepresentation of these loans. In corporate lending, evidence of lax underwriting standards is inconclusive; however, securitization certainly worsened borrower monitoring.

Securitization led to imbalances in credit markets which increased the fragility of the financial system and endangered financial stability over time. As a consequence of banks' failure to conduct their basic monitoring and screening roles, borrowers showed inefficient economic behaviour, increasing financial system's credit risk levels to an unsustainable level. Securitization also reinforced the cyclicality of bank equity values, a major component of systemic risk in financial system, consequently amplifying banking risks at a systemic level. However, securitization yielded unfavourable outcomes due to the misalignment of incentives and regulatory loopholes. Thus, securitization is not a destabilizing tool per se.

Recent empirical research has enhanced our knowledge on the cost and benefits of bank securitization. However, there are still gaps in the literature. We find that the empirical literature in the post 2007-2009 crisis on bank securitization behaviour is extremely limited. Our knowledge on whether, and how, securitization structures and pricing has changed since the financial crisis is very limited. For example, there has been very limited research on post-crisis regulatory incentive aligning mechanisms such as the risk retention requirements and the credit ratings reform. The risk retention rules have been applicable in the EU since 2011. However, little is known on the adequacy of the mandatory retention of an absolute level of risk, regardless of the nature of the transaction or collateral. Evidently, securitizing banks retained too much risk so mandatory retention, albeit justified, is unlikely to be the complete solution. Perverse incentives have always existed in financial markets and securitization was used as a tool to exploit information asymmetry to the detriment of the financial system. In other words, with inadequate oversight, securitization can engender perverse incentives. Therefore, with regulatory intervention, securitization could be effectively used to transfer risks to market participants who are more suited to bear them, and also to boost lending and, consequently, economic growth. In order to achieve this, additional research is required to explain the role of agency conflicts, as well as the interaction of these conflicts, in the years leading to the crash. This is more likely to inform public policy by delineating pragmatic ways of realigning incentives or mitigating further misalignment of interests.

There are only a handful of studies that examines securitization related bank moral hazard issues in Europe. The dearth of evidence in this area obscures our understanding on why securitization's impact on bank behaviour and financial stability differed between the US and the European market, and between the mortgage and corporate loans. We also find that empirical evidence is relatively non-existent on emerging markets, such as Latin America and China, where securitization volumes have been increasing recently. Additionally, although there is ample research on securitizations' impact on financial stability through the bank channel, it is not clear whether and how securitization changes borrower behaviour.

Also the development of a more non-bank investor base, especially in Europe, should mitigate the concentration of risk in the banking sector and diversify sources of funding to the real economy. This could be informed by research evaluating the role of a diversified investor base on the dispersion of risk in the US and European markets. Each market is unique with respect to the participation of non-bank investor base. These findings can also inform policy debates on the segregation of the interbank and capital markets in China with respect to the trading of securitized bonds.

Another imperative line of inquiry would be the relative transparency of post-crisis securitization as the opacity of pre-crisis transactions was a major criticism, especially on multi-layered deals with unwarranted levels of complexity. Disclosures were made on most of these complex deals but this did not mitigate poor decision making as the task of sourcing relevant information from can be challenging, thereby resulting in increased reliance on credit ratings and minimizing due diligence. Policymakers should therefore incentivize simplified disclosures as well as structures without stifling innovation.

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