Securitisation, Bank Capital and Financial Regulation: Evidence from European Banks

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Abstract

The paper analyses the impact of securitisation issuances on bank balance sheets and capital position, by focusing on European banks before and after the crisis. Stylised facts suggest that, at the time of the crisis, European banks continued to issue structured products, but by retaining them on balance sheet for collateral purposes. Based on a new dataset combining tranche-level information for structured products with bank balance sheet data for the corresponding originators, I investigate the effects of securitisation – before and after the crisis – on the risk-weighted capital ratio and on the leverage ratio for different types of products. In the pre-crisis period, banks increased their risk-based capital ratios by using securitisation as a credit risk transfer technique, particularly for the issuances backed by risky assets. In the crisis time, banks improved their risk-weighted capital ratios but without reducing their leverage: across banks, less-liquid institutions obtained larger improvements in prudential solvency than more-liquid ones. This effect was also more relevant for structured instruments eligible as collateral for monetary policy and/or charged with low risk weights for prudential requirements. The paper provides some policy implications, both for the collateral framework of monetary policy, and for the reforms of prudential regulation, such as the introduction of the new leverage ratio in the Basel framework.

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Key-words: securitisation, bank capital ratios, collateral eligibility, prudential requirements.

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1. Introduction

Traditionally, securitisation has been conceived as a credit risk transfer technique, aimed at removing completely the credit risk of an asset pool from the originator's balance sheet, by transferring the underlying assets to a special purpose vehicle for the issuance of structured products. In such perspective, securitisation was used – particularly prior to the crisis - also for regulatory arbitrage purposes, in order to reduce the capital requirements of financial institutions subject to Basel regulations. Indeed, after selling the pool of loans or other credit claims to a third entity, banks were not exposed to the related credit risk, so they could decrease the risk-weighted amount of their assets and could raise their risk-based capital ratios.

However, in many cases and also recently, this transfer of credit risk was not complete for various reasons, either because banks provided explicit or implicit support to special purpose vehicles (Acharya, Schnabl and Suarez, 2013; Sarkisyan and Casu, 2013), or because banks retained on balance sheet some tranches of their structured issuances (ECB, 2013). The decision whether to transfer or to retain the credit risk of the securitised assets may have some relevant impact on the capital position of originator banks. Indeed, the securitiser banks offering credit enhancement or retaining structured tranches have to keep some capital buffer for the retained risk; while the originator banks providing implicit recourse ex post need to readjust their capital base after the support to the securitisation vehicle. On the other hand, banks transferring entirely the credit risk can free up regulatory capital, as a consequence of the asset sale, and then can improve their prudential solvency position.

The scope of this empirical analysis is to investigate the effects of securitisation issuances on the capital position of originator banks, with particular focus on European banks, both when they transferred and when they retained the credit risk. In principle, intuition may suggest that banks transferring the credit risk would obtain an improvement in their risk-based solvency ratios, while banks retaining the credit risk would actually register a decrease in their risk-weighted capital ratios. As an implication of that, we may also suppose that a larger scope for regulatory arbitrage could exist when banks transfer the credit risk rather than when they retain it.

In fact, the empirical evidence reveals that in general European banks involved in securitisation increased their risk-weighted capital ratios after the deals, while not changing their leverage ratios or even reducing them, but also that this occurred more significantly during the crisis period, at the time when they were actually retaining the vast majority of the issued asset-backed securities.

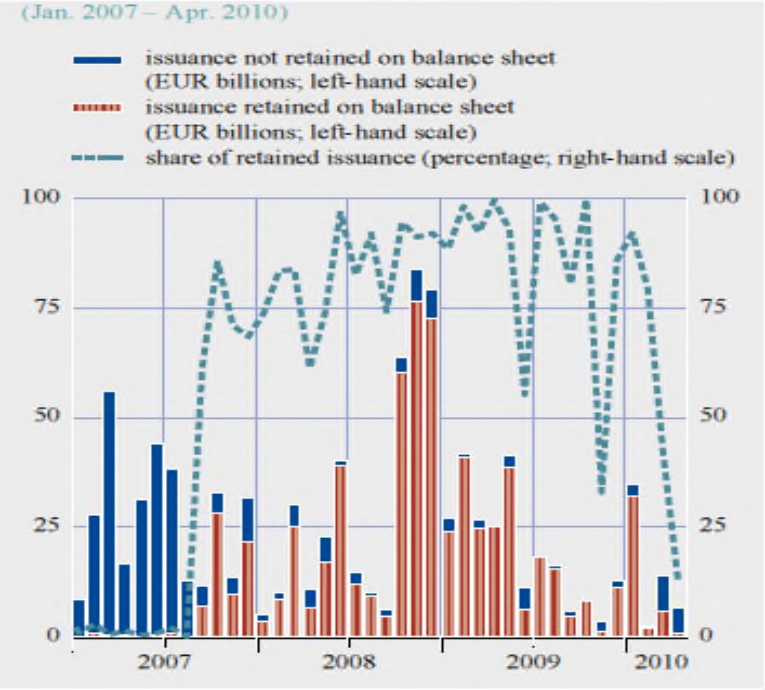
Moreover, the funding liquidity position of credit institutions played a key role in the way originator banks structured their securitisation deals: particularly during the crisis, banks with ex-ante weaker positions in terms of funding liquidity obtained ex post larger increases in their risk-based capital ratios, and possibly also wider decreases in their leverage ratios. This means that, during that period, when designing a securitisation operation, banks with lower liquidity were induced to exploit the arbitrage opportunities offered by the prudential framework relatively more than banks with higher liquidity.

In addition, when classifying the structured products by distinct classes, larger increases in the risk-based capital ratios (while no or small changes in the leverage ratios) were observed during the crisis in particular for those securitisation products subject to a more favourable regulatory

treatment, either because eligible as collateral or because subject to low risk weights in prudential regulation.

The empirical work focuses on the structured finance issuances of European banks in the period between 1999 and 2010, before the introduction of the retention requirements in 2011. In that period, banks were not required by prudential rules to retain risk in securitisation either in the EU or in the US. However, empirical evidence suggests that banks did not transfer completely the credit risk in structured deals and actually adopted multiple strategies for risk retention. In particular, if we consider European banks, we observe that, from the last quarter of 2007 and until mid-2010, almost all the issuances of asset-backed securities (ABSs) were retained on balance sheet. The chart in Figure 1 displays the percentage of retained issuances of ABSs by Euro Area banks, on a monthly basis between 2007 and 2010. The share of retained tranches over total issuances could vary across months, but in 2008 and 2009 it was always included in a range between 75% and 100%, while before August 2007 the retention rate was close to 0[1].

Figure 1: Retained Issuances of Asset-Backed Securities by Euro Area Banks



Source: ECB (2010), *Financial Stability Review*, June, p.78

Such retention behaviour of European banks during the considered period can be explained only to some extent by the difficulties in placing structured products with market investors, given that the concerns for the creditworthiness of securitisation may have induced some reduction in the market demand for these products everywhere. In fact, while in the US such confidence crisis determined the collapse of securitisation markets, in Europe banks continued to issue structured products but by retaining them on balance sheet. Then, some peculiar features of the regulatory framework in Europe may offer some explanations about the incentives for risk retention of European banks. I focus on three main aspects.

[1] We can observe similar figures more generally for European banks, if we analyse the data on retained and placed issuances of structured products provided by the European Securitisation Forum (AFME, 2011).

First, a key motivation for this retention behaviour was due to the possibility of using securitisation products as collateral in the liquidity operations with central banks: indeed, the collateral framework defined by the ECB – and revised during the crisis with the introduction of general and temporary measures – allowed for a broader set of eligible instruments compared with other central banks, in particular for asset-backed securities.

Second, the existing accounting rules in the EU (the IFRS principles) required full consolidation of special purpose vehicles when they were controlled by the sponsor institution; on the contrary, the accounting rules (the GAAP principles) applicable in the US until the reform in 2010 allowed for the treatment of securitisation as a true and effective sale, also when the sponsor bank had the control of the SPV.

Third, the prudential requirements applicable in Europe starting from 2007 (the Basel II rules)[2] established strict conditions for significant and effective risk transfer in order to permit the exclusion of securitised exposures from risk-weighted assets; on the other hand, in the US, the banks benefiting from the accounting treatment of a true sale were not expected to hold capital buffers with regard to securitisation for prudential purposes (at least until the above mentioned reform of the accounting principles and the Dodd-Frank Act).

In order to develop the empirical analysis, I construct a new dataset of more than 17,000 securitisation tranches issued by European banks between 1999 and 2010, such to combine the tranche-level information on structured products with the bank balance sheets of the originator banks. Then, I analyse on a quarterly basis the impact of securitisation issuances on the capital ratios of originator institutions and in particular I focus on four key aspects: a) how differently risk-based capital ratios and leverage ratios have changed after a securitisation operation; b) what effects securitisation issuances have produced on bank capital ratios before and after the crisis; c) whether the funding liquidity position of banks may play a role in determining the impact of securitisation on bank capital; d) how different issuances of structured products, subject to distinct regulatory treatments, have affected the banks' capital position.

The results of the empirical analysis show that, on average, across the entire sample period, banks issuing securitisation obtained an increase in their risk-weighted capital ratios, but a decrease in their (common equity) leverage ratios. In particular, this divergence between the risk-bask based capital ratio and the leverage ratio was also more relevant during the crisis period.

When I consider bank heterogeneity, I observe that the effects of securitisation on bank capital may differ substantially on the basis of the funding liquidity position of originator banks. Indeed, for a given increase in the securitisation activity, less-liquid banks observed a larger increase in their risk-weighted capital ratios and eventually also a wider decrease in their leverage ratios, compared with more-liquid banks. This holds for different measures of funding liquidity, such as the liquid assets ratio, the loans to deposits ratio and the short-term borrowing ratio. In

[2] The Basel II agreement was adopted in the EU by the Capital Requirements Directives, Dir. 2006/48 and Dir. 2006/49, so the new rules were applicable since the beginning of 2007, subject to a transitional period. Basel II was implemented also in the US, but later than in Europe and not for all institutions (mainly for large banks using internal risk models). More recently, in 2011 the Basel Committee approved a new accord on the international regulatory framework for banks, called Basel III. Then, in 2013, the EU adopted a legislative package to implement the Basel III agreement in the EU legal framework: the so-called CRD4 entered into force on 1 January 2014, even if some of the new provisions are phased-in from 2014 to 2019.

general, a weakening in the bank liquidity position implies that banks are more interested in exploiting the regulatory arbitrage opportunities offered by prudential regulation. This link between liquidity shortage and regulatory arbitrage, based on the evidence for the aggregate amount of securitisation issuances, may suggest that banks subject to stronger liquidity pressures, and then potentially more interested in retaining asset-backed securities as eligible collateral for central bank liquidity operations, were induced to design securitisation deals in such a way to minimise the impact of risk retention on bank capital requirements.

In order to explore this hypothesis, I conduct the analysis on a more granular basis, by classifying the outstanding amounts of structured products either by asset type or by credit rating. Then I investigate whether different issuances of securitisation, subject to distinct regulatory regimes, had different impacts on the bank capital position. The empirical results for different categories of securitisation display such heterogeneity in the effects of securitisation for distinct products and, particularly for the crisis period, show larger increases in the risk-based capital ratios for the issuances of products subject to a favourable treatment by collateral and prudential regulation.

Regarding asset types, the evidence shows that in the pre-crisis period an increase in the outstanding issuances of complex and risky products such as CDOs and CBOs was associated with an improvement in the risk-based capital ratios, as banks used securitisation in order to transfer the risk related to the underlying assets. On the other hand, for the crisis period, the results reveal a large increase in the risk-weighted capital ratios for banks issuing ABSs backed by residential mortgages and by home equity loans, which were benefiting from an advantageous regulatory treatment, both because they were eligible as collateral, and because they were subject to lower risk weights than the corresponding underlying assets.

Concerning credit ratings, the evidence displays that before the crisis banks used AAA-rated securitisations to increase their prudential risk-based ratios through asset sales, but without reducing their leverage. On the other hand, the results highlight a large increase in the risk-weighted capital ratios for banks issuing particularly ABSs rated as AA or A, subject to a beneficial regulatory treatment because eligible as collateral and subject to low risk weights: moreover, by exploiting the difference in the risk weights of high-rating ABSs and of the underlying assets, originator institutions could even improve their risk-weighted capital ratios.

The paper contributes to the literature with regard to various aspects. First, it analyses the impact of securitisation on the risk-weighted capital ratios and on the leverage ratios, not only when banks transfer the credit risk, but also when they retain some tranches in the securitisation deal. Second, the study shows that originator banks may find larger scope for regulatory arbitrage in case of risk retention, if the retention of securitisation tranches requires originator banks to include them in the risk-weighted exposures and then to hold capital for that. Third, the paper highlights that the funding liquidity position may play a key role in the design of the securitisation deal by originator banks, potentially by reinforcing the incentives for regulatory arbitrage. Fourth, the analysis investigates the role of the regulatory framework in bank securitisation strategies: originator institutions obtained larger improvements in their prudential solvency from the issuances of asset-backed securities subject to a favourable regulatory regime, as implied by the collateral eligibility criteria and by the prudential capital requirements.

The results of the paper may be relevant in a policy perspective for at least two reasons. First, the study shows - specifically for European banks - that some decisions related to monetary policy implementation, such as the determination of the eligible collateral for the Eurosystem operations, may have significant micro- and macro-prudential implications, because of their effects on the risk management and on the capital structure of originator banks. Indeed, the retention of credit risk in the securitisation process may affect both the capital position and the composition of bank balance sheets, by implying some relevant consequences for prudential supervisors. This highlights also the strong interaction between monetary policy and prudential supervision within the current mandate of many central banks and, given the focus of the analysis on European banks, this implication may be relevant in particular for the European Banking Union. In fact, starting from November 2014, the ECB is responsible not only for the monetary policy in the Eurozone, but also for the prudential supervision of the credit institutions in the Euro Area through the Single Supervisory Mechanism.

Second, the work offers insights for the global reforms of prudential regulation: indeed, after the crisis, the regulatory framework for financial intermediaries has come under scrutiny for its possible role in incentivising the rise of the shadow banking sector and the excessive increase in bank leverage. For this reason, the international standard-setter bodies adopted some proposals to address the consequent risks for financial stability: in particular, I can mention the introduction of the retention requirements for securitisation (implemented) and of the new leverage ratio (in course of implementation).

The regulatory initiatives undertaken in the context of securitisation addressed the potentially negative impact of the originate-to-distribute model on bank monitoring and lending standards: then, both the US and the EU introduced a 5% retention rule, in order to deal with the problem of incentive misalignment between originator and investors. The results of the empirical study, conducted for the period prior to the introduction of the retention requirements, would suggest that their effectiveness may strongly depend on their interaction with the existing collateral and prudential rules.

Moreover, in order to deal with the possible regulatory arbitrage incentives induced by the risk-weighted system in Basel II, the new prudential framework defined in Basel III has introduced a leverage ratio in addition to the existing risk-based capital ratio. At this regard, the empirical analysis shows the complementarity between the leverage ratio and the risk-based capital ratio for prudential regulation, given that the evolution of the leverage ratio can either reveal some additional information not observable from risk-based ratios or even contradict the evidence on the effective bank solvency based on the evaluation of risk-based capital.

2. Securitisation, Credit Risk Transfer and Retention: Related Literature

In the immediate aftermath of the crisis, securitisation had been strongly blamed for being one of the main causes of the disruptions which had distressed the financial system and the real economy. However, it is also true that simple and transparent securitisation can be actually helpful for the economy, especially in bank-based systems. First, it may be useful to reduce the credit risk borne by financial institutions for their lending activity, by distributing the related risk across a wide

range of market investors[3]. Second, it can also contribute to alleviate the supply-induced constraints for credit provision; this may hold particularly in crisis times, when credit institutions are reluctant to extend their supply because of the concerns for the credit risk of their exposures.

In the perspective of originator banks, the transfer of credit risk through securitisation allows to obtain at least two main advantages: removing the credit risk of some loans from their balance sheets, and then also cleaning up their asset portfolio from some potentially non-performing claims; obtaining new funding from market investors through the issuance of structured products, and then eventually using such liquidity for new and possibly more productive investments.

Notwithstanding such advantages from risk transfer, in various cases, originator banks involved in a securitisation deal decided, instead of transferring entirely the credit risk, to retain at least some part of the risk on their balance sheets. Indeed, US banks provided various forms of support to securitisation vehicles, particularly prior to the crisis, while European banks retained the vast majority of the tranches of asset-backed securities issued during the crisis.

An originator bank may decide to retain some risk in a structured finance operation by providing some explicit or implicit support to special purpose vehicles, both for the securitisation of credit claims originated by itself, and for the securitisation of other assets. In particular, a bank provides explicit support when it offers credit or liquidity enhancement on a contractual basis (i.e. for the payment of a fee) or when it retains some tranches in the structured deal and the modalities of the support are defined at the time of the product issuance. Also, a bank offers implicit support when, after the asset sale, and without any previous contractual commitment, it decides to intervene in support of a securitisation vehicle to ensure the timely payment of investors.

The existing literature has analysed the key incentives and strategies of originator banks for the retention of credit risk, focusing in particular on the US experience. The reasons can be several, so it may be useful to consider some of them.

First, financial institutions may be interested in providing contractual support to securitisation vehicles, as a skin in the game mechanism to signal the quality of the underlying assets. Indeed, securitisation markets can be affected by informational asymmetries (Pennacchi, 1988), both in terms of adverse selection (as investors don't know the quality of the underlying assets so banks might be induced to securitise low quality loans), and in terms of moral hazard (as banks not exposed to the credit risk of the underlying assets don't have proper incentives to monitor borrowers after the sale). In such case, by retaining some economic interest in the securitisation, the bank signals to investors that the assets of the securitised pool are of good quality and then that the issued products are not risky (otherwise the bank wouldn't expose itself to such risk) (Gorton and Pennacchi, 1995; Albertazzi, Eramo, Gambacorta and Salleo, 2011). In particular, Demiroglu and James (2012) provide some evidence at this regard, by showing that default rates are significantly lower for securitisations in which the originator is affiliated with the sponsor or the servicer.

A second reason may regard the assignment of a credit rating for structured products and is in part related to the previous one, as a signalling mechanism to overcome the informational asymmetries. Banks may offer support, in agreement with rating agencies and underwriters, to

[3] For an accurate discussion on the benefits and risks of securitization for the economy, as well as on the impediments for a well functioning securitisation market in the EU, see the joint discussion paper by the European Central Bank and the Bank of England (2014)

ensure that the best possible credit rating is assigned to a structured product. Indeed, the assignment of a specific rating (typically AAA or AA) can be extremely important for structured products, in order to ensure an adequate demand for them by market investors[4] (Erel, Nadaul and Stulz, 2011; Adelino, 2009; Cohen and Manuszak, 2013). However, in various cases, the quantity and the quality of the expected cash flows may not be appropriate to assign the desired rating to the issued securities, as the expected rate of delinquencies for the securitised pool could be higher than the expected probability of default required for a given issue rating.

Third, originator banks can be particularly incentivised to provide contractual support to the vehicles to which they have transferred the pool of receivables, when securitisation is used by credit institutions as a funding device (e.g. a parent bank finances new loans through the funds coming from structured products issued by subsidiary vehicles) (Uhde and Michalak, 2010; Loutskina, 2011; Michalak and Uhde, 2012; Almazan, Martin-Oliver and Saurina, 2013). In this perspective, the credit enhancement to the securitisation process is functional to improve the funding conditions of the bank holding, as a higher rating of the product can justify a lower benchmark spread to pay on coupons and then a lower funding cost.

Fourth, banks may be induced to provide contractual support also for regulatory arbitrage reasons, if this allows them to reduce their capital requirements without transferring the credit risk of the exposures. Acharya, Schnabl and Suarez (2013) study the incentives for setting asset-backed commercial paper conduits in the US and in Europe and show that liquidity-guaranteed ABCP was issued more frequently by banks with low economic capital. Indeed banks, by developing guarantees classified as liquidity facilities but effectively covering credit risk, could obtain some relief in terms of regulatory capital. But at the same time, banks suffered significant losses from conduits: as a consequence of that, banks with larger exposures to conduits had lower stock returns.

Banks can provide contractual support in various forms: retention of subordinated tranches[5], interest-only strips[6], over-collateralisation[7], credit guarantees[8] or liquidity lines[9]. In particular, Sarkisyan and Casu (2013) analyse the effects of different forms of retained interests on insolvency risk for US banks and find that credit enhancement increases their default probability, while liquidity facilities don't have a significant impact on bank risk. Moreover, the relationship between credit enhancement and insolvency risk seems to be non-linear due to the size of the outstanding securitisation amounts: indeed, credit support can have a risk-reducing effect for "small-scale" securitisers, while a risk-increasing effect for "large scale" securitisers, depending on the fraction of the assets that banks decide to securitise.

[4] Indeed, only securities with a given rating can satisfy the requests of those underwriters and investors, who are willing to enter a structured deal only if the rating of the product corresponds to the requirements of a given investment strategy. Moreover, when securitisation products are purchased by banks, credit ratings may matter also for prudential requirements, because in the Basel II framework the issue credit rating determines the risk coefficient of the securitisation position, with the consequence that a lower amount of capital is required for a higher rating exposure.

[5] Originators may retain the first-loss piece in the securitisation issuance

[6] Interest-only strips are based on the spread between the interest rate on the securitised assets and the interest rate on the coupons of the issued securities

[7] Over-collateralisation is based on the difference between the value of the underlying assets and the value of the issued products.

[8] A credit guarantee is a commitment to provide protection against the losses on the underlying assets

[9] A liquidity line is a commitment to provide liquidity to ensure the timely payment of investors.

Finally, in some cases, financial institutions can also offer implicit recourse to a sponsored vehicle - even without a previous contractual commitment - mostly for reputational reasons when the SPV is not able to repay investors. This may happen when the bank perceives that the failure to provide this support, even though not contractually required, would damage its future access to the ABS market. Higgins and Mason (2004) show the beneficial effects of implicit support for the reputation of securitisation sponsors: the recourse to securitised debt can improve their short and long-term stock returns and their long-term operating performance, by revealing that the occurred shocks are transitory and don't affect deal characteristics. Implicit recourse may also present some advantages in terms of prudential requirements: while banks are required to hold risk-based capital for contractual credit enhancement or liquidity provision, they are not expected to keep capital buffers ex ante in case of implicit support, given that there is not an explicit commitment but only a posterior intervention[10]. Cases of implicit recourse[11] are relatively frequent in revolving securitisations, such as those used for credit card lines, where banks might have an incentive to avoid early amortisation in case of under-performance of the asset pool.

3. The Regulatory Framework for Securitisation in Europe

In Europe, during the period considered for the empirical analysis, the securitisation process presented some peculiar features, which were related to the accounting regime, the prudential framework and the collateral requirements for monetary policy. All these aspects were determinant in shaping the incentives which affected the strategy of European banks with regard to credit risk retention and capital management in securitisation operations. For this reason, before presenting the data and the empirical strategy, I introduce here the main institutional features of the securitisation framework in Europe in the period between 1999 and 2010.

3.1 The Accounting Regime

As for the accounting regime, the European Union has endorsed since 2003 the IFRS (International Financial Reporting Standards), which are international accounting standards defined by the IASB (International Accounting Standards Board). This is particularly relevant for securitisation because, under the IFRS, it is more difficult to obtain an off-balance sheet treatment for securitisation vehicles rather than under the US GAAP, at least until the reforms introduced after the crisis. More precisely, the accounting regime established by the IFRS implies a two-stage evaluation process.

First, the accounting principles require an assessment as to whether the sponsor or the originator consolidates the special purpose vehicle. The IAS 27 defines the consolidation principles

[10] Actually, in the US some prudential rules on implicit recourse in securitisation had been introduced by the US federal regulatory agencies in 2001.

[11] Implicit support can take various forms, such as the sale of further assets to a special purpose entity at a discount from the par value; the purchase of assets from a SPV at an amount greater than fair value; the exchange of performing assets for nonperforming assets in a SPV; the modification of loan repayment terms; the payment of deficiency losses by a servicer; the reimbursement of the credit enhancer's actual losses.

for sponsored entities and specifically the SIC 12 provides some interpretation criteria regarding SPVs, such as: whether the sponsor obtains benefits from the SPV operations, whether it exerts or delegates the decision-making powers for SPV activities, whether it is exposed to the risks coming from SPV operations. If some of these requirements are fulfilled, that implies that the sponsor has some control on the SPV and then it needs to consolidate it.

Second, even if the SPV is not consolidated by the sponsor, an assessment is needed to determine whether the transferred asset has to be recognised by the sponsor institution. The IAS 39 establishes some conditions, such as: whether the sponsor has the rights to the cash flows from the assets; whether it has assumed after the transfer an obligation to pay the cash flows from the assets; whether it has retained risks and rewards related to the assets.

Based on the application of the above criteria, sponsor institutions have to consolidate the sponsored entities or they have to recognise the assets in their balance sheets. This is important for the purpose of the empirical analysis because, since the implementation of the IFRS, European banks could not apply an off-balance sheet treatment for sponsored vehicles and then securitisation activities should be included in bank balance sheets (and then computed in the amount of bank total assets).

This general rule doesn't exclude a priori that, in some particular cases, ad hoc corporate structures could be used for special purpose entities, with the effect of excluding the control or the ownership by the sponsor and then avoiding their consolidation. Various solutions were exploited by banks in different jurisdictions[12]. This is also relevant for the empirical analysis, as the amount of total assets reported on balance sheet might not always reflect full consolidation of sponsored entities in the case of complete risk transfer[13].

3.2 The Prudential Framework

As for the ***prudential framework***, the period considered in the analysis covers the implementation of two different regimes, Basel I and Basel II.

Basel I provided strong incentives to use securitisation for regulatory arbitrage purposes. Under the risk-based capital requirements, the risk weights required for consumer and corporate loans (100%) and for mortgages (50%) were higher than the risk weights for claims on OECD banks (20%), including also asset sales with recourse. Then, banks could securitise a package of loans and retain the related credit risk - through tranche retention or credit guarantees –with the advantage of reducing significantly the amount of capital to keep for such exposures. Banks could also securitise a pool of claims and provide liquidity facilities to the SPV, with the effect of being completely relieved from capital requirements for such positions, given that liquidity lines were considered to cover liquidity risk but not credit risk (Acharya, Schnabl and Suarez, 2013).

[12] For instance, also in some European jurisdictions (UK, Ireland, Netherlands), SPVs could be constituted as orphan vehicles, i.e. entities whose share capital is a nominal amount and held beneficially by a charitable trust. Another way was to set up a financial vehicle incorporated in the US, in order to exploit the more favourable treatment provided by the FASB accounting requirements for a true sale.

[13] The problem doesn't exist in the case of risk retention because, even if the accounting principles for consolidation are not fully implemented, the risk retention per se implies the inclusion of the transferred claims in the amount of total assets for prudential purposes.

Basel II has changed the incentives for regulatory arbitrage in various aspects, by defining operational requirements for risk transfer in securitisation, by regulating the treatment of off-balance sheet securitisation positions and by introducing a more risk-sensitive approach for exposures.

First, an originator can exclude securitised exposures from the calculation of risk-weighted assets only if significant credit risk has been transferred to third parties, if the transferor doesn't maintain effective or indirect control over the transferred exposures and if the securities issued are not obligations of the transferor. If any of these conditions is not met, banks have to hold regulatory capital against securitisation exposures.

Second, all off-balance sheet securitisation exposures, including liquidity facilities, are subject to credit conversion to derive a credit equivalent amount for risk-weighted capital requirements. Then, also banks providing liquidity lines to a SPE have to keep capital for that.

Third, risk weights are assigned to general exposures on the basis of their credit risk, as measured by credit ratings in the standardised approach and by internal models in the internal rating approach. In particular, in the securitisation framework, the rating-based approach is put at the top of the hierarchy also for banks using internal models, such that banks completely rely on credit ratings for the credit risk assessment of such positions. Under this approach, high-rating securities (such as AAA or AA) receive a very favourable treatment, still better than the one applicable to the underlying assets; medium-rating products (like BBB) are subject to risk weights which increase more than proportionally with respect to the credit risk; low-rating securities (below investment grade) require full deduction from capital, i.e. banks have to keep a capital buffer equal to the amount of the exposure (see Appendix A).

Overall, Basel II has limited the incentives to use securitisation for regulatory arbitrage due to the requirements for effective risk transfer, but it has further encouraged the issuance of high-rating structured products, while reducing market interest for medium and low-rating securities.

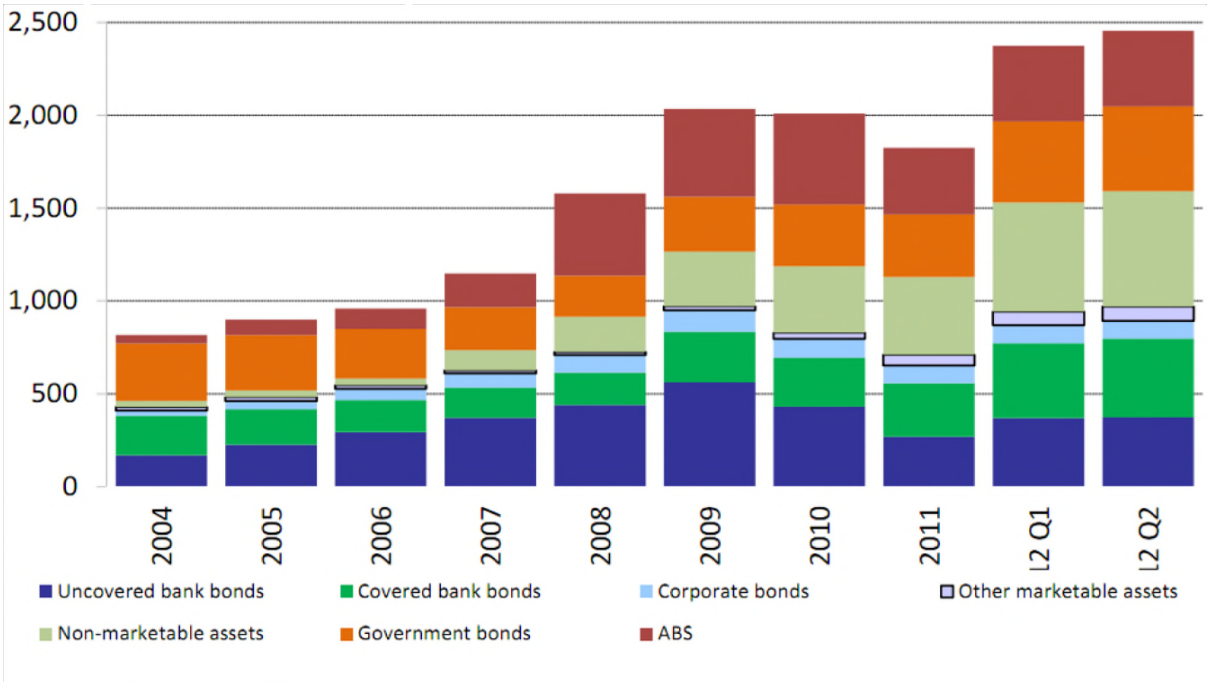
3.3 The Collateral Requirements for Monetary Policy

In the crisis period, European banks largely retained securitisation products to pledge them as collaterals in the repo operations with the European Central Bank. This was favoured by the flexibility of the ECB collateral framework, which recognised a broad range of assets as eligible collateral for all its liquidity operations even before the crisis, in particular for asset-backed securities. As explained also by the ECB (2013), such breadth was due also to the institutional and structural differences across the collateral frameworks previously adopted by the national central banks.

Then, even before the crisis and still at present, the ECB has been accepting asset-backed securities, issued in the European Economic Area[14] and denominated in Euro, provided that they fulfill the general credit quality threshold of a "single A" both at issuance and over the lifetime of the transaction. In this respect, the ECB kept unchanged the minimum credit quality threshold for asset-backed securities also at the beginning of the crisis. Indeed, in October 2008, the ECB

[14] The European Economic Area (EEA) includes the member states of the European Union, plus Iceland, Liechtenstein and Norway.

Figure 2. Use of Collateral with the Eurosystem by Asset Type (Euro billions)



Source: Coeuré B. (2012), *Collateral Scarcity – a Gone or a Going Concern?*, Speech

amended its collateral eligibility requirements for marketable and non-marketable assets, by decreasing the minimum credit threshold from "A-" to "BBB-", but with the exception of asset-backed securities, for which the minimum threshold of "A-" has remained in force.

Then, in the following years, the above collateral requirements were subject to some technical refinements[15]. However, they did not change the main collateral requirement in terms of credit rating threshold, i.e. the asset-backed security must keep a single A rating over the lifetime of the transaction. This is relevant for the empirical analysis, given that the data show the evolution of the credit ratings for a given tranche over time. At the same time, the ECB adopted some measures to control for the risks of eligible ABS collaterals, by requiring higher haircuts compared with other marketable assets and by applying graduated valuation haircuts for ABS products depending on their ratings. For this reason, even with a large set of eligible collaterals (in terms of credit ratings), banks still preferred structured products with the highest possible rating: pledging lower-rating collateral could imply higher haircuts on the repo and then higher cost of funding.

Moreover, during the entire period under consideration, banks could not pledge credit claims as collateral in the refinancing operations with the Eurosystem. This would explain the incentive that banks had to securitise the existing portfolio of loans on their balance sheets in order to issue and retain asset-backed securities to be pledged as collateral. This incentive was significantly reduced when, in December 2011, the ECB Governing Council allowed national

[15] Firstly, in January 2009 the Eurosystem decided to require a rating at the AAA level at issuance as an additional eligibility criterion for all ABSs issued as of 1 March 2009, while retaining the existing single A minimum threshold over the lifetime of the product; this requirement was then extended to the previously issued ABSs, starting from 1 March 2010. Secondly, in November 2009, the Eurosystem decided to require at least two ratings for all ABSs issued as of 1 March 2010, by introducing the "second-best" rule: not only the best, but also the second-best available credit rating must comply with the credit quality threshold for ABSs; this requirement was then applied to the previously issued ABSs, starting from 1 March 2011.

central banks, as a temporary solution, to accept as collateral performing credit claims subject to specific eligibility criteria[16]. This further extension of the eligibility requirements, motivated by the funding difficulties of banks during the sovereign debt crisis, was aimed to ensure the availability of sufficient collateral to counterparties, such that they could obtain the necessary amount of liquidity from the Eurosystem through the 3-year Long Term Refinancing Operations, given the distress in the interbank and the wholesale markets.

3.4 Post-Crisis Regulatory Changes to the Securitisation Framework

In the recent years, following the subprime crisis, the academic and policy debate has considered the implications of the transfer or retention of credit risk in securitisation for financial stability. According to a widely accepted view, a complete transfer of credit risk in securitisation can imply risks for financial stability, as long as – due to informational asymmetries - banks might be induced to originate and distribute loans with a very high credit risk and special purpose vehicles might issue structured products with high ratings but based on assets of poor quality. As a consequence of that, the institutions with significant investments in structured finance might be exposed to high credit risk and then might not be able to use those products as collateral in repo transactions, or might employ them subject to very high haircuts. In fact, during the crisis, some financial institutions with large securitisation positions lacked liquid assets to get funding in the repo market and so they were affected by a severe liquidity crisis.

In this perspective, various policy initiatives were adopted at the regulatory level in order to repair the distortions in the system of incentives characterising the OTD model. With regard to the securitisation framework, I would specifically highlight two aspects. First, regulatory bodies intervened to mitigate the conflict of interests in the credit rating process and to limit the reliance on credit ratings in financial regulation[17], which contributed to the flaws in the credit risk assessment of structured products. Second, in order to avoid the negative effects of a complete transfer of credit risk on the lender's incentives to screen and monitor, the amendments to the Basel securitisation framework introduced in the US with the Dodd-Frank Act and in the EU with the Capital Requirements Directive II required the originator or the sponsor to retain a material net economic interest of at least 5% in the securitised assets[18].

The main rationale for the retention requirements is that they should help solving the problem of incentive misalignment between originator and investors: indeed the lender, by keeping

[16] Indeed the responsibility related to the acceptance of such loans has to be borne by the national central banks authorising their use. Also for this reason, only some national central banks have authorised the use of loans as collateral, given the issues related to the evaluation of the credit risk associated with these credit claims.

[17] In particular, in the US the Dodd-Frank Act completely abolishes any reference to credit ratings for the evaluation of credit risk for structured finance products, while in the EU the new legislation on CRA (Reg. 462/2013 and Dir. 2013/14) introduces several measures to reduce a mechanistic reliance on credit ratings, by increasing the transparency and the accountability of the rating process and by inducing the development of internal risk assessment by financial institutions. Moreover, the Basel Committee has recently proposed a new hybrid approach for the treatment of securitisation positions.

[18] This principle has been applied differently in the US and in the EU. The Capital Requirements Directive II (Dir. 2009/111) defines a retention requirement for the investor banks, which are allowed to assume exposures to a securitisation only if the originator or the sponsor has explicitly disclosed the retention of a 5% net economic interest. On the contrary, the Dodd-Frank Act requires directly a securitiser to retain no less than 5 per cent of the credit risk in the securitised assets and prohibits a securitiser from directly or indirectly hedging or otherwise transferring the credit risk that it would be required to retain.

an economic interest in the securitised assets, would be induced to choose better borrowers at the time of loan applications and to monitor them more closely during the duration of the loan. In this sense, a better quality of the underlying assets in the securitisation process would contribute to reduce the credit risk of structured products and then to decrease risks for financial stability. Also the recommendations formulated by the Financial Stability Board for the regulation of the shadow banking sector indicate such requirements among the key measures to address the risks for financial stability in the area of securitisation.

4. Conceptual Framework

The aim of the paper is to investigate the impact of securitisation on the capital position of European banks, both when they transfer and when they retain the credit risk of the securitised assets. In order to tackle this question, I introduce some theoretical hypotheses about the effects that securitisation may have on bank balance sheets in case of risk transfer or retention, by considering the impact on two different measures of bank solvency, the risk-weighted capital ratio and the leverage ratio.

4.1 Bank Capital, Credit Risk and Securitisation

The decisions of securitiser banks - for the transfer or retention of credit risk – affect the amount of capital to be held for their exposures, since the capital buffer is determined with regard to the credit risk of bank assets. The theoretical literature (Dewatripont and Tirole, 1994; Freixas and Rochet, 2008) has extensively investigated why and to what extent banks should hold capital for their exposures and then why capital regulation may be desirable for credit institutions.

First, bank capital provides a buffer to absorb losses potentially coming from banking activities, in relation to various types of risk (i.e. credit risk, market risk, operational risk), such that in case of losses the bank can avoid the insolvency status by using capital reserves and without recurring to asset sales. So various operations, such as the securitisation of some assets, as long as they may change the risk profile of bank activities, may induce or require some changes in the buffer of capital held by credit institutions.

However, banks may not always hold an appropriate amount of capital for various reasons, either because of the moral hazard incentives due to the coverage of deposit insurance, or because of the unpredictability of some losses on bank assets. In particular, in order to deal with the unexpected losses of bank activities[19], prudential regulation defines a minimum target for bank capital as well as risk-sensitive criteria for computing the solvency requirements. In this sense, it provides an indication of the minimum size of the buffer that a bank should hold to cover the relevant risks.

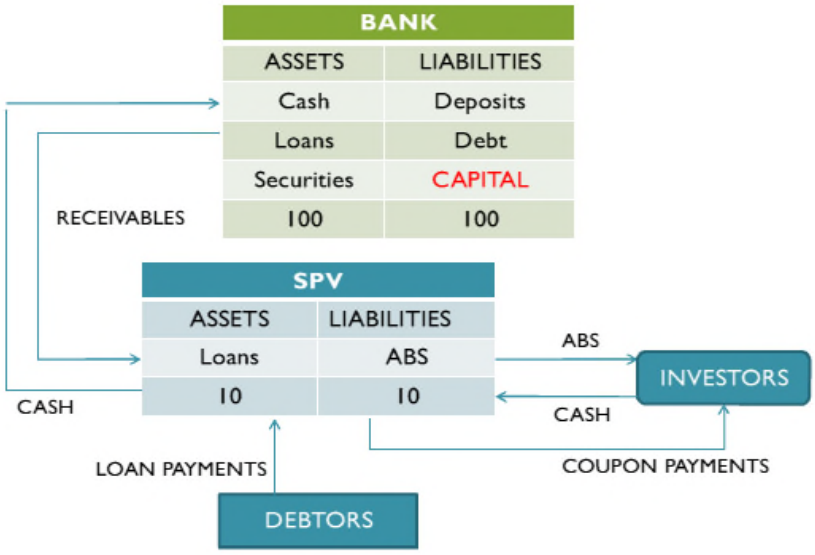
[19] Banks are supposed to manage expected losses as a cost of their business: in particular, they may do so either by accounting for the expected loss in the balance sheet value of their credit exposures or by including a loss provision in the income statement.

In fact, the amount of capital that banks tend to keep in practice might be different from the minimum requirements which are set by the Basel framework for prudential purposes (see Berger, DeYoung, Flannery, Lee and Oztekin, 2008). On average, banks tend to keep an amount of risk-based capital which is even higher than the minimum required by the Basel rules, for various reasons. Banks might want to hold a larger amount of capital to satisfy some market expectations, based on the credit rating assigned to the institution, or on a target rating that the bank would like to achieve. Also, banks might hold additional capital to protect against risks which are not specifically taken into account by the existing prudential regulation but which can affect bank balance sheets.

A securitisation operation may imply various effects on the balance sheets and then on the capital ratios of originator banks. I hereby discuss the key effects by using a simple illustration, where an originator bank securitises some credit claims previously existing on its balance sheet.

Figure 3 presents the balance sheet of such a hypothetical bank[20]: to simplify, this bank has cash, loans and securities on the assets side, while it has deposits, debt and capital on the liabilities side, for a total amount equal to 100. Let us suppose that this bank creates and sponsors a special purpose vehicle, to which it transfers a given amount of loans, for example 10. The SPV finances the purchase of the asset pool through the issuance of asset-backed securities: indeed, the revenues collected from the investors in structured products are passed on to the bank in order to pay for the sale of receivables.

Figure 3. A stylised representation of the securitisation process



Source: Author's elaboration

Given the accounting framework implemented in the EU[21] through the IFRS principles, this SPV has to be consolidated by the bank holding, so the assets transferred to the SPV need to be included in the consolidated amount of total assets for accounting purposes. This general principle

[20] The above example assumes many simplifications from the accounting point of view. The key purpose of the example is to identify the main economic effects of different bank decisions on capital ratios.

[21] Switzerland is not a member of the EU, so it is not subject to the mandatory implementation of the accounting principles as for the EU countries. However it has implemented the IFRS.

of accounting consolidation may admit some exemptions due to specific legal structures but in any case, even when it is fully implemented, it doesn't imply automatically risk retention.

4.2 Risk Transfer, Explicit Support and Implicit Recourse

At the time of a securitisation operation, the originator bank has to take at least two important decisions: 1) whether to transfer or to retain the credit risk of the asset pool and eventually how much of it (direct effect of securitisation); 2) how to use the revenues coming from the asset sale, and so eventually how to change the bank balance sheet composition (indirect effect of securitisation).

To identify the key effects of securitisation on bank capital, I will first consider the direct impact of risk transfer and retention on the risk-based capital ratios. Then, in the following section, I will extend the discussion also to the various indirect effects on the balance sheet composition and I will consider all the possible impacts on risk-weighted capital and leverage ratios.

In the design of a securitisation deal, an originator bank has to decide whether to transfer or retain the credit risk, and in case of risk retention whether to provide an explicit or an implicit support. In all cases, this decision has implications in terms of bank capital: indeed, depending on this choice, banks may need to hold capital for protection against the credit risk. I present below these effects, particularly on the risk-weighted capital ratios.

First, if the bank transfers entirely the credit risk related to the securitised pool, it reduces the amount of risk-weighted assets and then, for a given capital buffer, it increases the risk-adjusted capital ratio.

Second, if the bank provides explicit support or retains some tranches of structured issuances and if this implies a securitisation position for prudential purposes, the bank should hold some risk-based capital for the exposure. In this case, the effects of securitisation on the risk-based capital ratio will depend on the changes in the amount of risk-weighted assets (the denominator), provided that the bank doesn't change its capital base (the numerator). For this purpose, we have to compare the risk-weighted value of the securitisation position and the risk-weighted amount of the underlying assets (i.e. we have to check whether the risk weight for the securitisation position is equal or lower than the corresponding risk weight for the securitised assets). In particular, if the risk-weighted value of the securitisation position is equal to the risk-weighted amount of the underlying assets, the capital ratio should remain unchanged after securitisation. Instead, if the risk-weighted value of the securitisation position is lower than the risk-based amount of the securitised assets[22], the capital ratio is expected to increase.

Third, if the bank offers some implicit support to a SPV without a previous contractual arrangement, the bank is not expected to hold ex ante any capital buffer. However, the implicit recourse implies an ex post increase in the amount of risk-weighted assets and then it determines a decrease in the risk-weighted capital ratio afterwards. Moreover, the negative impact of the implicit

[22] This is a quite relevant case in the empirical analysis, also for the implications of securitisation in terms of regulatory arbitrage. Indeed, if a bank – by securitising a given amount of assets and retaining the structured tranches on balance sheet – can obtain an improvement in terms of risk-based capital ratios, this may induce substantial incentives to securitise for regulatory capital reasons. A similar argument is developed, with regard to the liquidity enhancement provided to ABCP conduits by US banks, in the paper by Acharya, Schnabl and Suarez (2013).

recourse on capital ratios may be even larger if the bank has to stand some losses from securitisation and then it has to reduce capital. In particular, in the latter case, the event triggering the vehicle's insolvency may happen sometime after the securitisation issuance, during the maturity period of the product, so the decrease in capital ratios might be observed after sometime[23].

4.3 The Effects of Securitisation on Risk-Weighted Capital and Leverage Ratios

The indirect impact of securitisation depends on the way the bank uses the revenues collected from the asset sale and it restructures the composition of its assets and liabilities after the structured finance operation (Uhde and Michalak, 2010; Michalak and Uhde, 2012). This is because banks may adopt securitisation for multiple purposes: as a pure credit risk transfer technique, in order to reduce the credit risk on-balance sheet and to free up regulatory capital; as a funding scheme, in order to get some liquidity from the issuance of structured products to finance their asset portfolio; as a way to create further collateral, by issuing securitisation products and retaining them on balance sheet. Given the various possible purposes of the operation, banks can adopt multiple strategies. This significantly expands the range of effects we can observe in the relationship between securitisation issuances and bank capital.

In order to analyse the possible signs of this relationship, I examine the main strategies that a bank can adopt and the related consequences in terms of risk-weighted capital and leverage ratios, in case of risk transfer and retention. Figure 4 displays the possible effects of structured finance issuances on bank capital ratio and leverage ratio[24], depending on the bank's decisions for risk retention in securitisation and for assets and liabilities management.

Let's start from the case of complete risk transfer. When the bank transfers the asset pool to the SPV, then it has to decide how to use the amount of liquidity from the asset sale. It can keep cash on balance sheet, it can invest in less risky assets or it can use liquidity to repay debt[25]: in all these cases, the risk-weighted assets will decrease and so the capital ratio will increase. That could be the case of many banks that, before the crisis, used securitisation in order to improve their capital ratios, by transferring risky assets to SPVs without retaining any risk (or just providing some liquidity lines which however did not require risk-based capital under Basel I). This would confirm the argument that banks used securitisation in order to obtain relief in terms of regulatory capital (regulatory arbitrage). We can also observe a slightly different case when the bank invests in equally risky assets (for instance it securitises residential mortgages to provide new residential mortgages): in this case, provided that the bank has transferred the credit risk of the previous asset pool, the amount of risk-weighted assets remains unchanged and the capital ratio doesn't change[26].

[23] This effect could not be captured by considering only the flows of new issuances in the previous period: also for this reason, I use the outstanding amount of securitisation issuances as a key explanatory variable for the analysis.

[24] The hypotheses presented in the table for the effects on capital ratios assume that the capital base for the risk-based capital ratio and the capital base for the leverage ratio coincide. Under this assumption, the two ratios would differ only in the denominator (the risk-weighted assets vs. the total assets). This is actually useful in order to capture the role of the risk-weighted system in determining the effects of securitisation on bank capital.

[25] In such case, if we consider the securitisation operation in a funding perspective, the bank is just changing the composition of its liabilities: instead of rolling over the existing debt, it repays the maturing obligations while it gets funding through the issuance of structured products.

[26] In principle, this process of lending and securitising, by transferring the related credit risk every time, could be repeated an infinite amount of times. The bank can expand credit by keeping the same risk-based capital ratios, so

Figure 4. The Impact of Securitisation Issuances on Risk-Based Capital and Leverage Ratios

RISK TRANSFER		RISK RETENTION	
Risk-based capital ratio		***Risk-based capital ratio***	
⇧	If the bank keeps cash, invests in less risky assets or repays debt	⇧	If $RWA_{SECURITISATION} < RWA_{ASSETS}$ Or if bank increases capital
=	If the bank invests in equally risky assets	=	If $RWA_{SECURITISATION} = RWA_{ASSETS}$ And if bank keeps capital constant
⇩	If the bank invests cash in more risky assets	⇩	If $RWA_{SECURITISATION} > RWA_{ASSETS}$ Or if bank provides implicit support
Leverage ratio		***Leverage ratio***	
⇧	If the bank doesn't consolidate the SPV or derecognises the transferred assets	⇧	If the bank increases capital
=	If the bank uses cash to repay debt	=	If the bank keeps capital constant
⇩	If the bank keeps cash or invests in new assets	⇩	If the bank provides implicit support

As an alternative but less likely option, the bank can also invest in more risky assets (e.g. use the proceeds from the sale of residential mortgages to provide corporate loans): in such case the risk-weighted assets will increase and so the capital ratio will decrease.

The above strategies for assets and liabilities management would also have an impact on leverage ratios. At this regard, we firstly have to consider whether the transferred assets are included in the consolidated balance sheet for accounting purposes. Indeed, if the bank doesn't consolidate the SPV or derecognises the transferred assets, the amount of bank total assets will decrease, so the leverage ratio will increase. On the contrary, if the SPV is consolidated on balance sheet, we can have different effects depending on the way the bank uses the revenues from the asset sale. In particular, if the bank uses cash to repay debt, i.e. the holding simply changes the composition of its liabilities, the amount of consolidated total assets will remain unchanged and so the leverage ratio will not vary. Instead, if the banking group keeps the additional liquidity on balance sheet or invests in new assets (independently from the risk of the asset), this will increase the amount of consolidated total assets, so the leverage ratio will decrease.

without apparently raising any concern from the micro-prudential point of view. However, such praxis can generate very significant risks in a macro-prudential perspective, because of the uncontrolled credit expansion.

Then we can consider the case of risk retention. In such hypothesis, the transferred assets are included in the amount of risk-weighted assets for prudential requirements[27]. However, the impact of risk retention on bank capital ratios may be different depending on the strategies adopted by the bank, i.e. whether it provides an explicit or an implicit support to the securitisation. In case of explicit support (in particular tranche retention), the bank has to keep ex ante a capital buffer for this securitisation position. Given this, as explained in the previous section, if the risk-weighted value of the securitisation exposure is equal to the risk-weighted amount of the securitised assets, and if the bank doesn't change its capital base, the amount of risk-weighted assets will remain unchanged, so the capital ratio won't vary. While, if the risk-weighted value of the securitisation position is lower than the risk-weighted amount of the underlying pool, or also if the bank providing explicit support increases capital more than required by the risk-weighted assets, the risk-weighted capital ratio will increase. Differently, in case of implicit support, the bank is not expected to hold capital ex ante. This implies that, when the bank offers implicit recourse to the securitisation vehicle, this expansion of bank activities will increase the risk-weighted amount of assets and then it will decrease the risk-adjusted capital ratio. Moreover, if the securitisation-related activities also imply significant losses, the sponsor bank will have to reduce capital accordingly, so this will determine an even larger decrease in the risk-based capital ratio.

As for the leverage ratio, in case of risk retention the effects of securitisation would essentially depend on eventual changes in the capital base, given that the transferred assets are consolidated on balance sheet. Indeed, in case of explicit support, the bank might increase capital, if it considers that the securitisation exposure may require a higher capital buffer: in such hypothesis, the leverage ratio would increase. While, if the bank doesn't change its capital base, the capital ratio is expected to remain unchanged. Finally, in case of implicit support, as the bank expands the amount of the activities, we have to expect that total assets will increase and that the leverage ratio will decrease (such decrease can be even larger in presence of losses from the securitisation activities).

5. The Data

In order to address the empirical question, I construct a new dataset which combines the tranche-level data on structured finance issuances with the institution-level data on the balance sheets of the corresponding originator banks, based on the information provided by Capital IQ for European banks.

The empirical analysis focuses on the issuances of securitisation products by European banks in the period between 1999 and 2010 and it is organised on a quarterly basis. To identify the issuances, I consider all the tranches of structured finance issued by special purpose entities whose ultimate parent is a bank with the main geographical location in Europe. This screening criterion is aimed at including all the subsidiary vehicles, independently from their country of establishment,

[27] To set a clear distinction between the two cases of risk transfer and of risk retention, here I suppose that the originator bank retains entirely the credit risk related to the underlying pool of assets. However, I cannot exclude that, in certain cases, banks retained only a part of the credit risk, for instance the equity tranche of the securitisation. In such hypothesis, banks would still dispose of some liquidity from the asset sale.

provided that the bank holding is headquartered in Europe[28]. This is because several European banks issued structured products through vehicles established in non-European countries, like the United States (in most cases) or the Cayman Islands (in few cases), in order to exploit better conditions offered by other legal systems for corporate or taxation law. On the other hand, the dataset doesn't include the issuances of structured finance products by SPVs controlled by US banks which may have subsidiaries or branches in Europe or securitise assets originated in Europe. This is to ensure consistency with the objective of the work, focused on the capital strategy of European banks after securitisation: indeed, even when the European subsidiaries of US banks are subject – for specific supervisory purposes - to the regulatory framework of the country of establishment, the main strategic decisions in terms of capital and liquidity management are taken at the holding level.

The availability of granular data at the tranche-level allows studying the effects of securitisation, by considering the specific features of the structured deals. For this purpose, I classify the tranches by product, collateral type and credit rating. Capital IQ classifies 4 types of structured products: Asset-Backed Securities (ABS), Collateralised-Mortgage Obligations (CMO), Collateralised-Loan Obligations (CLO), Collateralised-Debt Obligations (CDO). Within these categories, I can further distinguish on the basis of the underlying assets: CMOs are based on residential and commercial mortgages; ABSs can be backed by various collateral types, such as credit card receivables, auto leases, home equity loans; CLOs are securitised portfolios of large corporate loans, mostly provided by loan syndicates for leveraged buy-outs; CDOs are backed by a pool of other fixed income instruments, such as asset-backed securities or corporate bonds.

The products are classified on the basis of their long-term issue rating, assigned by Standard and Poor's to each tranche. Different tranches (senior, mezzanine, equity) of the same securitisation deal can have different ratings, depending on their order of priority with respect to the payment rights on the asset cash-flows. In particular, I observe the evolution of the credit risk assessment by rating agencies, given that it can affect the amount of the risk-weighted assets for banks: for this reason, I use data on historical ratings for each securitisation tranche.

Given the offering date and the maturity date of the deal, the data indicate the outstanding amounts of the tranche, i.e. the total amounts of securities outstanding in the market (net of possible early amortisation). The outstanding amounts, classified by product, collateral and rating, are collected on a quarterly basis, in order to match the data on structured finance issuances with the data on bank balance sheets (which are provided on a quarterly basis).

Table 1 provides summary statistics, at the bank level, for the variables I use in the analysis, both for the bank balance sheet variables and for the structured finance data. In particular, with regard to the securitisation data, I present both the outstanding amounts (in € millions) and the securitisation ratios (over total assets) and I classify the outstanding issuances by collateral type, issuer nationality and credit rating.

[28] In my definition, Europe refers to the geographical continent. Then I include not only the member states of the European Union, but also Switzerland.

6. The Impact of Securitisation on Bank Capital

The first part of the empirical analysis examines the impact of securitisation on the capital position of originator banks, by considering the overall amount of issuances, without distinction across types of product. In particular, I investigate the effects of securitisation issuances on the risk-weighted capital ratios and on the leverage ratios of the corresponding originator banks.

6.1 The Empirical Specification

In the baseline empirical specification, I estimate the following panel regression model by using bank and time fixed effects:

$$(1)\ y_{it} = \alpha_i + \delta_t + \beta\, SECUR_{it-1} + \gamma\, BANKCONTROLS_{it-1} + u_{it}$$

The dependent variable can be, depending on the specifications, either the risk-weighted capital ratio or the leverage ratio. I define the risk-weighted capital ratio ($CapRatio_{it}$) as the ratio of regulatory capital over risk-weighted assets, using the notion of capital ratio as considered in the traditional Basel framework. Moreover, in order to exclude the effects of the risk weights, I conduct the analysis also on the leverage ratio, as introduced in Basel III to complement the risk-based capital ratio. In order to allow for comparability of empirical results, I use two distinct definitions of the leverage ratio. The first one, indicated as $LevRatioCAP_{it}$, is computed as the ratio of regulatory capital over total assets (same numerator as the risk-based capital ratio, but different denominator). The second one, denoted as $LevRatioCE_{it}$, and closer to the Basel III definition, is calculated as the ratio of common equity[29] over total assets (same denominator as the first leverage ratio, but smaller numerator).

The leverage ratio was not yet implemented in the European prudential framework during the period under consideration[30]. This has two implications. On one side, the analysis of the impact on leverage ratios can be considered as a counterfactual to understand how leverage ratios would have changed compared with risk-based capital ratios, if the leverage ratio had been applied before in prudential regulation. Such comparison may be useful also to understand whether, in some cases, a leverage ratio could have worked better than a risk-based capital ratio to warn against the build-up of excessive risks in the banking sector. On the other side, given that I don't have a prudential measure of total assets for that period, in order to run this counterfactual experiment I need to assume that that the amount of total assets reported for accounting purposes corresponds also to the amount of total assets for prudential regulation[31].

[29] Common Equity includes the value of common shares, retained earnings and additional paid-in capital. It doesn't comprise other components which are included in the TIER 1 capital (like preferred shares and non-controlling interests) and in the TIER 2 capital (such as undisclosed reserves, revaluation reserves, subordinated debt and hybrid instruments). For this reason common equity is smaller than regulatory capital.

[30] Actually, a similar leverage ratio was provided in the US prudential regulation. However, the US prudential framework required the application of capital and leverage requirements only for securitisation positions which were consolidated in the balance sheet for accounting purposes. So, if the transfer was considered as a true sale for accounting purposes, the transferred assets could not be included anymore in bank total assets. As discussed above, the GAAP principles were quite flexible in allowing for an off-balance sheet treatment of securitised assets. Then, in such case, the leverage ratio could not work effectively as a credible backstop against the build-up of excessive leverage through securitisation.

[31] This assumption can be considered as feasible with respect to the accounting framework of European banks, provided that under the IFRS principles the amount of total assets should reflect the full consolidation of all sponsored entities.

The main explanatory variable is defined as the ratio of the outstanding amounts of securitisation sponsored by a bank j in quarter t, over the amount of bank total assets. I divide the amount of outstanding issuances by bank total assets to avoid that the values of the coefficients may be driven by size effects. At this stage of the analysis, I consider the overall amount of outstanding securitisation, without distinction across asset types and credit ratings.

$BANKCONTROLS_{it}$ is a vector of bank balance sheet variables and ratios, used to control for other factors able to affect capital ratios. Indeed, the risk-weighted capital ratio and the leverage ratio may evolve over time due to a broad set of balance sheet factors, related to the composition and the quality of bank assets, to the bank business model, to the profitability and to the funding strategies of the bank. To control for asset quality, I consider the ratio of nonperforming loans over total loans: it provides a measure of the riskiness of bank assets, as a higher ratio implies a higher probability of standing losses which can affect bank capital. To take into account the role of bank business model, I use the ratio of trading assets over investment securities: it provides a balance sheet measure of the bank's involvement in trading activities and it can have heterogeneous effects on bank capital, depending on the considered period and on the degree of market distress[32]. Also, to consider the diversification in terms of income sources, I introduce the ratio of non-interest income over total revenues: it defines the fraction of bank revenues coming from fee-based activities rather than from lending activities and it may be associated with higher or lower capital, depending on the analysed period and on the individual bank's assessment. To control for bank profitability, I employ the return on assets (RoA), computed as the ratio of net income over total assets: a higher ratio implies higher profitability and is generally associated with higher capital ratios, as banks making more profits can use them to increase the capital base.

In the period considered for the empirical analysis, nor the originator neither the sponsor were required to retain any part of the credit risk related to securitisation[33]. For this reason, the relevant decisions regarding capital structure and balance sheet composition were up to the securitiser bank and then they could be driven also by some bank-specific characteristics. Then, as described above, the impact of securitisation on bank capital has to be analysed by controlling for some bank-specific characteristics. However, bank balance sheet controls may not completely account for all the unobserved fixed characteristics, also related to the risk propensity of the institution, which may matter for the decisions about risk transfer or retention after securitisation. This explains the rationale for a panel estimation with bank fixed effects, provided that the decisions of different institutions may be driven by various bank-specific factors captured by the individual fixed components.

As mentioned in the theoretical framework, bank liquidity position may affect the incentives of banks for securitisation in various ways: by inducing banks to securitise in order to get funding from investors in structured products, when the issuances are placed on the market; or by incentivising banks to securitise in order to issue asset-backed securities to be pledged as collateral with central banks, when the issuances are retained on bank balance sheets. Banks may display substantial heterogeneity in terms of liquidity position. The empirical analysis captures such

[32] In general we observe that, before the crisis, banks more involved in trading activities were also better capitalised (at least in terms of risk-based capital ratios), while in the crisis period a larger trading activity was associated with a lower capitalisation.

[33] The retention requirements for securitisation were introduced in the EU and in the US only in 2011.

differences across banks by introducing an interaction term of the securitisation ratio with a measure of bank funding liquidity. Such interaction is useful to explain the role of funding liquidity in determining the effects of securitisation on bank balance sheets and capital position. Then I run the following panel regression model by using bank and time fixed effects:

$$(2)\ y_{it} = \alpha_i + \delta_t + \beta_1\, SECUR_{it-1} + \beta_2\, SECUR_{it-1} * FUNDING_{it-1} + \gamma\, BANKCONTROLS_{it-1} + u_{it}$$

For the interaction term, I employ three different measures of bank funding. The liquidity ratio is defined as the ratio of liquid assets over total deposits and short-term borrowing: it indicates the buffer of liquid assets a bank can dispose of with respect to its short-term liabilities; a lower liquidity ratio means either that a bank has a limited amount of liquid assets or that it has a relatively large amount of short-term liabilities. A second relevant measure is the ratio of total loans over total deposits: a higher ratio means that a larger quantity of loans is financed by a smaller amount of deposits, so it implies a higher reliance on wholesale funding and short-term borrowings; such banks can be more easily affected by liquidity problems. Finally, a third indicator is the ratio of short-term borrowing over total liabilities, which can be informative about the composition of bank liabilities: a higher ratio means that the bank funding position depends more on short-term sources, which can be easily available and also relatively cheap in good times but subject to market disruptions in distressed times. So, in general, we can argue that banks with lower liquid assets ratio, higher loans to deposits ratio and higher short-term borrowing ratio are also weaker in terms of funding liquidity. For this reason, they may be eventually also more incentivised to use securitisation to deal with such funding issues.

6.2 Empirical Results

I present the empirical results both for the entire sample period (1999Q1-2010Q4), and for two distinct sub-sample periods, 2003Q1-2007Q2 (the pre-crisis period) and 2007Q3-2010Q4 (the crisis period), which are identified in such a way to ensure the homogeneity of the regulatory framework for their entire duration. Indeed, in 2003 the IFRS principles were adopted in the EU accounting framework[34], while in mid-2007 the Basel II agreement was implemented in the EU prudential regulation. Moreover, in the 3rd quarter of 2007 we observed the beginning of the subprime crisis, which determined the shut-down of the securitisation market. Given these facts, the two sub-periods were characterised by very different conditions: in the first sub-period, European banks were induced both by lax prudential requirements and by favourable market conditions to use securitisation mostly as a credit risk transfer technique; in the second sub-period, European banks were highly discouraged by market conditions to use securitisation to obtain funding from external investors, due to the lack in demand for such securities, but they were incentivised by the monetary policy collateral framework to issue structured products, in order to retain and to pledge them as collateral in the liquidity operations with the ECB.

[34] This is the main reason why I don't include the period between 1999 and 2002 in the first sub-period: at that time, the accounting framework enforced in the EU did not require yet the full consolidation of securitisation vehicles by sponsoring banks. In any case, by excluding that period, I don't lose many observations, given that the issuance of securitisation products in Europe was quite limited at that time.

6.2.1 The Impact on Risk-Based Capital and Leverage Ratios

First, following the specification in equation (1), I estimate the impact of the overall amount of securitisation issuances on bank capital ratios. Table 2 presents the results of this baseline specification. In particular, I consider the impact of securitisation on the risk-weighted capital ratio, on the (regulatory capital) leverage ratio and on the (common equity) leverage ratio. Moreover, to gauge the economic size of the effects, I estimate the impact of a one-standard-deviation increase in the (one-quarter lagged) securitisation ratio on the above capital ratios.

This preliminary regression is focused on the overall amount of securitisation for a given bank and in a given quarter, but without distinction across product types. So the results of this regression are meant to provide some indications about the main trends in securitisation and the aggregate effects on bank capital ratios. This doesn't exclude that different issuances may have different effects, given the various characteristics of the products, as well as the distinct treatments of regulation[35].

The evidence suggests that the definition of bank capital ratios may play a major role in determining the sign and the size of the effects of securitisation on bank solvency: the conclusions which can be inferred from the observation of a given ratio may be significantly different from the ones obtained on the basis of another ratio. This may have also relevant policy implications for the definition of solvency requirements in prudential regulation.

Firstly, let us consider the results for the whole sample period. The coefficients for the risk-weighted capital ratio and for the (regulatory capital) leverage ratio are both positive, although with different magnitudes, while the coefficient for the (common equity) leverage ratio is negative. In particular, a one-standard-deviation increase in the securitisation ratio implies: a rise in the risk-weighted capital ratio by 0.44 points (+3.5% with respect to the mean ratio); an increase in the (regulatory capital) leverage ratio by 0.25 points (+5.2% with respect to the mean ratio); a decrease in the (common equity) leverage ratio by 0.15 points (-3.6% with respect to the mean ratio). It may be useful to recall that the first and the second ratio share the same numerator, while the second and the third one present the same denominator. Then the first and the third ratio have different numerators and denominators.

In particular, the evidence reveals that an increase in the securitisation activity is associated with an increase in the risk-weighted capital ratio but with a decrease in the common equity leverage ratio. This means that on average, for the entire sample period, banks expanding their securitisation issuances were improving their prudential solvency from the viewpoint of Basel regulations, while they were in fact increasing their leverage, also by reducing their common equity base. So they were exploiting the regulatory arbitrage opportunities offered by the risk-weighted system and by the broad definition of capital in the Basel framework, in order to raise their prudential capital ratios through securitisation.

During the overall sample period, some regulatory changes had modified the existing prudential framework. In particular, the computation of the risk weighted assets was relevantly revised by Basel II, while the definition of regulatory capital remained fundamentally unchanged.

[35] The results obtained in this regression reflect some compositional effects, as they are determined as the weighted average of the impacts observed for different types of products, whereas the sign may be positive for some and negative for others.

To account for the differences in the regulatory regime, I examine separately the effects of securitisation on capital ratios in the two sub-sample periods, 2003Q1-2007Q2 (pre-crisis) and 2007Q3-2010Q4 (crisis).

In the pre-crisis time, the coefficients for the securitisation ratio are positive for all the three capital ratios, but they are not significant and in general are of small magnitude. As confirmed by a more granular analysis, the issuances of different types of product may have induced effects of opposite sign on bank capital ratios. Then the positive but non-significant impact found for the overall securitisation ratio may reflect the coexistence of such heterogeneous effects for distinct products.

In the crisis time, an expansion in the securitisation activity was associated with a substantial increase in the risk-weighted capital ratios, but with no significant change in the leverage ratios. In particular, a one-standard-deviation increase in the securitisation ratio implied an increase in the risk-weighted capital ratio by 1.2 points (+8.9% with respect to the mean ratio). Instead, the coefficients for the leverage ratio are non-significant: they display a positive sign for the regulatory capital leverage ratio and a negative sign for the common equity leverage ratio. Then, on average, banks issuing securitisation during the crisis registered a quite substantial improvement in their prudential risk-based ratios, while they were not in fact changing their leverage. Also, the greater discrepancy in the effects - between the risk-weighted capital ratio and the leverage ratio - as observed in the crisis period versus the pre-crisis time, may suggest possibly an even larger scope for regulatory arbitrage after mid-2007, when the new Basel II regime was in place.

6.2.2 Bank-level Heterogeneity in Funding Liquidity

In the period prior to the crisis, securitisation was largely used by banks to expand their funding sources and high-rating structured products were used as collateral in the repo transactions among financial institutions. Then the subprime crisis induced a severe liquidity shock in the interbank market and relevant disruptions in the private repo market, by inducing credit institutions to increase their recourse to central bank refinancing operations. So, for various reasons before and after the crisis, bank funding liquidity may have played a key role in the securitisation decisions of credit institutions, especially of the large ones, which are also the main sponsors and originators of securitisation.

For this reason, I exploit the heterogeneity across banks in their funding liquidity in order to explore whether the differences in bank funding needs can also explain eventual differences in the effects of securitisation on bank balance sheets. In particular, I extend the analysis of the previous section by introducing an interaction term between the securitisation ratio and the funding liquidity indicator. I use three indicators of funding liquidity position: the liquid assets ratio, the loans to deposits ratio and the short-term borrowing ratio. I estimate the regression in equation (2), by employing as dependent variables the three measures of capital ratios: the risk-weighted capital ratio, the (regulatory capital) leverage ratio and the (common equity) leverage ratio.

Table 3 presents the results of this specification, where the interacted indicator of funding liquidity is the liquid assets ratio.

For the entire sample period, I observe that an expansion in the securitisation activities has a positive impact on the risk-based capital ratio, but that this effect is larger for banks with weaker liquidity position (i.e. with lower liquid assets ratio). In particular, I compute the impact of a one-standard-deviation increase in the securitisation ratio for different values of the liquid assets ratio. I find that the overall effect of securitisation on the risk-weighted capital ratio (considering the main explanatory and the interaction term) is positive for all values of the liquid assets ratio below 1.5[36]. Within the distribution of this variable, I notice that a decrease in the liquidity ratio (a weakening in the bank's funding liquidity) from the 75th percentile to the 25th percentile would increase the positive effect on the risk-based capital ratio from +0.676 to +1.209. This means that banks with weaker funding liquidity may be more interested in using securitisation to improve their prudential solvency ratios and, in particular, that - when designing a structured finance operation – they may be induced in managing their balance sheet composition in such a way to obtain a larger increase in their risk-based capital ratios. A possible explanation would be that less-liquid banks may have stronger interest than more-liquid banks in signalling – to market participants or supervisory authorities – to have a sound capital position: then the structuring of the securitisation deal would be functional to such purpose.

At the same time, as observed previously in Table 2, the evidence shows that securitisation has a significant negative effect on the (common equity) leverage ratio. Indeed, for banks with an average liquid assets ratio, a one-standard deviation increase in the securitisation ratio induces a decrease in the (common equity) leverage ratio by -0.367 (-9.3% with respect to the mean ratio). Also, the funding liquidity position of a bank may have a substantial role in explaining this effect: a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile implies an increase in the magnitude of the negative effect from - 0.276 to - 0.536. This means that, during the entire sample period, when structuring a securitisation operation, less-liquid banks increased their leverage more than more-liquid-banks and this occurred mostly through a reduction in their common equity relative to total assets. We can argue that from the comparison of the coefficient for the (common equity) leverage ratio - negative and significant - with the coefficient for the (regulatory capital) leverage ratio - marginally positive but non-significant. Provided that they have the same denominator (total assets) but different numerators (capital base), we may also suppose that banks substituted common equity - more loss-absorbing but also more costly - with other sources of capital - less loss-absorbing but possibly more affordable for weaker banks.

In order to capture this liquidity-induced source of regulatory arbitrage, we may want to compare the effects on the risk-weighted capital ratio and on the (common equity) leverage ratio, for banks with low (25th percentile) and high (75th percentile) liquidity. Both the positive effect on the risk-based capital ratio and the negative effect on the (common equity) leverage ratio almost double in terms of magnitude when banks move from the 75th percentile to the 25th percentile of the liquid assets ratio. This fact is observed for the whole sample period but we may be interested in exploring whether this effect may work differently, depending on the existing situation in bank funding markets and on the liquidity needs of banks in distinct sub-periods. For this reason we consider the pre-crisis and the crisis periods.

[36] For the entire sample period, the mean value of the liquid assets ratio is equal to 0.54, while the 25th percentile value is equal to 0.16 and the 75% percentile value is equal to 0.75. Then the threshold of 1.5 would correspond to the 94th percentile in the distribution.

In the pre-crisis period, when banks could easily get funding from the interbank market or from the private repo market, the funding liquidity position of banks didn't seem to have a relevant role in explaining the impact of securitisation on bank capital ratios. Indeed, I observe some minor and non-significant effects for the main explanatory and for the interaction term: they are in line with the above evidence in terms of sign but they are also economically quite small. This is consistent with the non-significant effects for the pre-crisis time in Table 2.

For the crisis time, when banks experienced substantial liquidity pressures, the evidence reveals a substantial role of liquidity in determining the effects of securitisation on bank capital position. In particular, for a bank with an average liquid assets ratio[37], a one-standard-deviation increase in the securitisation ratio induces a rise in the risk-based capital ratio by 1.98 points (+14.6% with respect to the mean ratio), an increase in the (regulatory capital) leverage ratio by 0.29 points (+6.4% with respect to the mean ratio) but no significant change in the (common equity) leverage ratio. Moreover, a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile raises the positive impact of securitisation on the risk-based capital ratio from +1.70 to +3.17, while it doesn't change (statistically) the non-significant effect on the (common equity) leverage ratio. This confirms that in the period between 2007Q3 and 2010Q4 less-liquid banks obtained from securitisation larger gains in terms of prudential solvency ratios than more-liquid banks.

In this period we don't observe statistically significant decreases in the (common equity) leverage ratio, because the full consolidation of structured vehicles for accounting purposes would exclude that possibility. But the gap between the positive effect on the risk-based capital ratio and the null impact on the (common equity) leverage ratio becomes much larger during the crisis than in previous periods. Also, this difference is even more pronounced when banks display lower buffers of liquidity with respect to their total assets. This means that, during the crisis, banks subject to liquidity pressures exploited the regulatory arbitrage opportunities offered by the prudential framework even more than in the past, and that the driver for this effect was actually the funding shortage of banks.

I obtain equivalent results also when I use different indicators of funding liquidity, namely the loans to deposits ratio (Table 4) and the short-term borrowing ratio (Table 5).

In particular, the loans to deposits ratio explains to what extent the lending activity of a bank is financed through retail funding sources (more stable) instead of wholesale funding (potentially more unstable). Then banks with higher loans to deposits ratio could be more subject to liquidity pressures. In Table 4, the results show that – for the entire sample period – an increase in the loans to deposits ratio from the 25th percentile to the 75th percentile (then a weakening in the funding liquidity position) raises the positive impact of securitisation on the risk-weighted capital ratio from +0.754 to +1.084, but it also augments the negative effect on the (common equity) leverage ratio from -0.244 to -0.696. Then banks with higher loans to deposits ratio obtained larger improvement in their risk-based ratios, although they increased their leverage to a wider extent. This effect of funding liquidity is even more evident in the effects on the risk-weighted capital ratios during the crisis time.

[37] For the crisis period, the mean value of the liquid assets ratio is equal to 0.80, while the 25th percentile value is equal to 0.30 and the 75% percentile value is equal to 0.91.

The short-term borrowing ratio is another indicator of potential weakness in the funding position of credit institutions: banks more reliant on short-term funding sources may be more subject to a liquidity crisis. The results in Table 5 suggest that banks obtaining a larger fraction of their funding from short-term sources tend to increase their leverage to a larger extent when they securitise. Indeed, for the entire sample period, a rise in the short-term borrowing ratio (then a weakening in the bank funding liquidity) from the 25th percentile to the 75th percentile increases the magnitude of the negative effect of securitisation from -0.053 to -0.268. As for the other measures, the role of liquidity in the impact of securitisation is also more evident in the crisis time. The evidence for that period reveals that an increase in the loans to deposits ratio from the 25th percentile to the 75th percentile increases the positive effect on the risk-weighted capital ratio from +0.291 to +1.163, while it doesn't change the non-significant effect on the (common equity) leverage ratio. This means that, during the crisis, when structuring a securitisation operation, banks more reliant on short-term borrowing increased their risk-weighted capital ratios by a larger measure than banks less dependent on short-term funding, even by keeping the same leverage.

6.2.3 Funding Liquidity, Securitisation and Regulatory Arbitrage

The evidence observed from the interaction of the securitisation ratio with the various measures of funding liquidity suggests that banks with lower liquid assets ratio, higher loans to deposits ratio and higher short-term borrowing ratio, had stronger incentives to exploit the opportunities of the prudential framework, in order to increase their risk-based capital ratios while keeping or even decreasing their leverage ratios.

In particular, this effect of liquidity was sensibly stronger during the crisis time, that is when banks were retaining on balance sheet most tranches of the issued asset-backed securities. Such key role of funding liquidity in securitisation over the crisis is consistent also with the main motivation of banks for retaining ABSs during that period, i.e. to enlarge the availability of eligible collateral in order to participate in the liquidity operations of central banks. Indeed, we can imagine that credit institutions with weaker liquidity position were also more interested in participating in central bank liquidity operations[38], and then potentially more active in increasing - through ABS retention - the amount of eligible collateral for central bank repos.

Then the key question is through which channel this eventual need for liquidity could affect the design of structured deals and so the capital management of originator banks. For this purpose, we need to consider that the retention of asset-backed securities on balance sheet implies – for originator banks – the need to hold an appropriate amount of capital for the credit risk of these exposures. Given the cost of capital, banks planning to retain asset-backed securities for collateral purposes might be interested in avoiding that this risk retention may excessively increase their capital requirements. In particular, originator institutions would be induced to design the

[38] The available bank balance sheet data do not report the actual amounts of liquidity withdrawn from the Eurosystem and of the collateral pledged for central bank operations. However, from the viewpoint of banks, the availability of large amount of eligible assets was even more important than the actual use of the instruments as collateral. Indeed, a bank could retain some asset-backed securities to have more eligible assets but without using them in actual repo operations. For this reason, given that most eligible assets are actually marketable instruments held as trading securities (and then included in the amount of liquid assets), the liquid assets ratio may be a good indicator of funding liquidity also with respect to the availability of eligible assets. This means that banks with a lower liquid assets ratio would have stronger need to expand the set of eligible assets.

securitisation deal in such a way to minimise the impact of risk retention on prudential solvency, and possibly to improve their regulatory ratios. To achieve this aim, banks could retain those asset-backed securities which are subject to lower risk weights or, more precisely, which present a larger gap between the risk weight of the securitised asset and the risk weight of the (retained) securitisation exposure.

To sum up, banks which were under stronger pressures for liquidity reasons, and which could then be more interested in retaining asset-backed securities for collateral purposes, might have also stronger incentives to exploit the regulatory arbitrage opportunities offered by the prudential framework, in order to minimise the effects of risk retention on capital requirements. This would possibly explain why, when securitising, and in particular during the crisis, less-liquid banks registered a larger improvement in their prudential solvency ratios than more-liquid banks.

In order to investigate this hypothesis more in depth, we need to distinguish the various categories of structured products, provided that they may be subject to different regulatory regimes, both for collateral criteria, and for prudential requirements. Indeed, only some products may be eligible as collateral for central bank liquidity operations and also different securitisation exposures may get assigned different risk weights for prudential regulation. This opens the scope for a more granular analysis, focused on distinct categories of structured products, as presented in the following section.

7. Heterogeneity across Different Classes of Securitisation

In the second part of the analysis, I classify the outstanding amounts of structured products in various classes and I analyse the impact of different types of securitisation issuances on bank capital position. In this way, I want also to investigate the potential role of financial regulation in driving such effects. Indeed, the regulatory treatment provided for distinct types of product may have some role in affecting the decisions of the banks involved in securitisation, and then the effects of the issuances on bank balance sheets.

7.1 The Role of Financial Regulation for Distinct Types of Securitisation

In order to study the potential role of regulation in the effects of securitisation, firstly we need to identify how regulation works, i.e. how it can affect the decisions of originator banks in the design of a structured deal and in the management of the balance sheets.

Regulation identifies a particular group of instruments, on the basis of their characteristics (asset type, credit rating or issuer nationality), and then it assigns a specific regulatory treatment to that set of products. Depending on the type of rule, this regulatory treatment may have various effects: it may require the on-balance sheet consolidation of some securitised assets in the financial statements (accounting);it may impose a minimum required capital for a securitisation position (prudential); or it may establish the eligibility of a financial instrument as collateral for monetary policy operations (collateral). In all cases, the rule implies a specific consequence for a given category of products while it has no impact or different impacts on other categories of instruments. For this reason, different rules imply different effects on distinct categories of products.

In the analysed period, nor the originator neither the sponsor were required to retain any part of the credit risk related to securitisation. However, the regulatory treatment provided for a given category of products could induce some incentives, by increasing or reducing the advantages that banks may obtain from a given decision. First, the eligibility of an instrument as collateral can increase the amount of liquidity that a credit institution may obtain from central banks, if it retains that product on balance sheet. Second, the assignment of a low risk weight to a securitisation exposure can reduce the amount of capital that a bank has to hold, if it retains some tranches on balance sheet. Then, collateral and prudential rules may determine – for some specific types of product – a more (less) beneficial regulatory treatment, by favouring (limiting) the access to central bank liquidity or by reducing (increasing) the burden in terms of regulatory capital. The type of regulatory regime provided for a product may then affect banks' decisions about how to structure the securitisation deals and how to manage their balance sheets and their capital.

Based on this, I formulate the hypothesis that differences in the regulatory treatment across types of structured products may induce differences in the effects of securitisation on bank capital for distinct categories of instruments. I test this hypothesis by analysing the effects of different types of securitisation issuances on the capital ratios of European banks. The identification assumption is that, if regulation matters for affecting bank decisions, the issuance of structured products subject to a given regulatory regime X produces different effects on bank balance sheets and capital position than the issuance of securitisation products subject to another regulatory treatment Y. Then, if the issuances of distinct classes of structured products imply different impacts on bank capital and if such differential effects reflect the distinct regulatory treatment of one category of product with respect to another one, we can conclude that regulation played some relevant role in determining the effects of bank securitisation.

From an empirical point of view, we may need to consider that the regulatory treatment implied by the considered rules may assume various forms. In some cases, it can take a binary format (treatment or no treatment), as it is for the collateral eligibility criteria of monetary policy, given that a product can or cannot be pledged for refinancing operations. In some other cases, the regulatory regime may be more complex and it may establish a multiplicity of provisions for different categories of product, as it is for the Basel prudential requirements. Indeed, they assign different risk weights to securitisation positions, depending on their credit rating, and also determine diverse risk weights for the exposures to the underlying assets, based on the type of claims[39].

Given this multiplicity of treatments, I have two objectives for the analysis: 1) compare the effects of different types of securitisation, subject to distinct regulatory regimes, on the capital ratios; 2) analyse the specific impact of a given type of issuance and explore whether this may be heterogeneous across banks with different characteristics (in particular for funding liquidity). Then I follow two different specifications.

[39] Prudential regulation can affect securitisation incentives on two sides, through the risk weights assigned to the exposures to the underlying assets or through the risk weights attributed to the structured products issued on the basis of such collateral. The incentives that may induce a bank to securitise certain assets and to retain some credit risk depend on the regulatory arbitrage between the minimum required capital to hold on the underlying assets and the minimum capital buffer to keep for retained securitisation positions.

In a first specification, reported as equation (3), I consider the various types of securitisation in the same regression and I compare the effects of the issuances of different categories of structured products.

$$(3)\ y_{it} = \alpha_i + \delta_t + \beta_1 SECUR\_X_{it-1} + \beta_2 SECUR\_Y_{it-1} + \cdots + \beta_n SECUR\_Z_{it-1} + + \gamma\ CONTROLS_{it-n} + u_{it}$$

In this way, I investigate whether the issuances of distinct categories of products implied different effects – in terms of sign and magnitude – on bank capital ratios.

In a second specification, reported as equation (4), I consider the various categories of securitisation products separately in each regression. So I estimate the effects of the securitisation issuances of a specific category of product. Also, I introduce an interaction term between the securitisation ratio (for a given category of product) and an indicator of funding liquidity position, namely the liquid assets ratio.

$$(4)\ y_{it} = \alpha_i + \delta_t + \beta_1\ SECUR\_X_{it-1} + \beta_2\ SECUR\_X_{it-1} * FUNDING_{it-1} + \gamma\ BANKCONTROLS_{it-1} + u_{it}$$

Based on this specification, I explore whether and how the funding liquidity position of a bank may have some role in affecting the securitisation decisions of banks with respect to specific categories of product.

For the purpose of the analysis, I classify the outstanding amounts of securitisation issuances either by asset type or by credit rating. Then, as in the first part of the analysis, I present the empirical results both for the entire sample period (1999Q1-2010Q4), and for two distinct sub-sample periods, 2003Q1-2007Q2 (the pre-crisis period) and 2007Q3-2010Q4 (the crisis period).

7.2 Empirical Results: Securitisation Classified by Asset Types

First, I consider the issuances of securitisation classified by asset type. Securitisation may be backed by different types of assets, such as residential mortgages, home equity loans, personal loans, syndicated loans, corporate bonds or other structured products. The type of underlying asset is relevant to determine the regulatory treatment, both for the collateral standards and for the prudential requirements.

First, only structured products backed by relatively transparent assets, such as Asset-Backed Securities based on residential mortgages, can be accepted as eligible collateral, while other more complex structured instruments backed by riskier assets, like Collateralised Debt Obligations backed by corporate bonds or other structured products, cannot be eligible as collateral for monetary policy operations.

Second, in a capital regulation perspective, if a bank plans to issue and retain some asset-backed securities as eligible collateral, the incentive to securitise certain assets versus others may depend also on the difference between the risk weight for the underlying assets and the risk weight for the retained structured products. In particular, if the risk weight for the (retained) securitisation is lower than the risk weight for the securitised assets, banks may have incentive to securitise and retain also to improve their capital ratios. So the size of this wedge between the risk weight of the assets and the risk weight of the tranches explain why securitisation may be more or less convenient for certain assets rather than for others.

7.2.1 The Impact of Securitisation Issuances Backed by Different Asset Types

In equation 5, I classify the outstanding amounts of structured products by asset type, in order to compare the effects of securitisation issuances backed by different assets on capital and leverage ratios. In this way, I explore whether and how the issuances of structured products backed by different asset types induced different effects on the banks' capital position. I estimate the following equation:

$$(5)\ y_{it} = \alpha_i + \delta_t + \beta_1 CBO_{it-1} + \beta_2 CDO_{it-1} + \beta_3 CLO_{it-1} + \beta_4 CommLoans_{it-1} + \beta_5 HomeEquity_{it-1} + \beta_6 PersLoans_{it-1} + \beta_7 ResidMort_{it-1} + \beta_8 CreditCard_{it-1} + \gamma\ CONTROLS_{it-1} + u_{it}$$

The dependent variable y_{it} can be, depending on the specifications, the risk-weighted capital ratio (CapRatio), the (regulatory capital) leverage ratio (LevRatioCAP) or the (common equity) leverage ratio (LevRatioCE). The main explanatory variables are the ratios of the outstanding amounts of securitisation, classified by asset type[40], over bank total assets.

Table 6 presents the results for the effects of securitisation issuances backed by different asset types. To illustrate the economic relevance of the results, I report also the estimates of the changes in the risk-based capital ratios and in the leverage ratios, as they would result from a 1-standard-deviation increase in the securitisation ratio for distinct categories of structured products.

This empirical exercise also provides a quantitative idea of the regulatory arbitrage incentives driving the securitisation process: the different sizes of the changes in the risk-weighted capital ratios, for distinct categories of structured products, suggest how large improvements in the prudential solvency ratios banks could obtain from the securitisation of certain types of assets versus others.

In the ***pre-crisis period***, banks issuing structured products showed in general an improvement in their risk-based capital ratios, mostly because they were using securitisation as a credit risk transfer technique to remove credit risk from their balance sheets. These results hold both for complex products not eligible as collateral, like CDOs or CBOs[41], and for simpler eligible products, such as ABSs backed by personal loans. Indeed, at that time banks didn't have particular liquidity needs, or at least they could exhaustively satisfy their liquidity demand through the wholesale market, so they didn't have to retain structured products as a way to increase their collateral availability. Plausibly, this transfer of credit risk was also implemented through the derecognition of some underlying assets for accounting purposes, given that we observe also some increase in the leverage ratios (due to the decrease in the consolidated amount of total assets).

During this period, since banks were transferring the credit risk of the asset pool, the rise in the risk-weighted capital ratios was proportional to the risk of the securitised assets: the higher was the credit risk of the (transferred) assets, the larger was the improvement in the risk-adjusted solvency ratios. For instance, a 1-standard-deviation increase in the securitisation ratio for the issuances of CBOs (typically high-risk products) would have increased the risk-weighted capital ratio by 0.79 points, while a corresponding rise in the issuances of ABSs backed by personal loans

[40] In particular, I consider various collateral types: Collateralised Bond Obligations, Collateralised Debt Obligations, Collateralised Loan Obligations, Commercial Loans, Home Equity Loans, Personal Loans, Residential Mortgages, Credit Card Receivables, Mixed Receivables.

[41] CBOs stand for Collateralized Bond Obligations. They are structured products backed by high-risk and high-yield bonds.

would have raised the risk-based capital ratio by 0.23 points.

The only exception to this risk transfer approach, for the pre-crisis period, concerns structured products backed by credit card receivables: in this case, the issuance of securitisation was associated with a significant decline in the risk-weighted capital ratios. This effect can be interpreted as a consequence of the implicit recourse which is often provided by originator banks for credit card securitisation.

During the ***crisis period***, the issuances of ABSs backed by residential mortgages and home equity loans induced substantial improvements in the risk-weighted capital ratios, but without changing or eventually by increasing bank leverage. In particular, a one-standard deviation increase in the securitisation ratio for residential mortgages was associated with a rise in the risk-weighted capital ratio by + 0.78 and with a decrease in the (common equity) leverage ratio by - 0.19. Also, a corresponding rise in the issuances of ABSs backed by home equity loans implied an increase in the risk-based capital ratio by +0.76 and no significant change on the (common equity) leverage ratio.

This positive effect on risk-based capital ratios highlights the improvements in prudential solvency that originator banks could gain from the issuances of asset-backed securities backed by these assets. These products were eligible as collateral for central bank liquidity operations and then banks had incentives in retaining them on balance sheet for liquidity reasons. Moreover, ABSs based on residential mortgages and home equity loans were subject to a favorable regulatory treatment, as they were charged with low risk weights. In particular, the risk weight for the (retained) securitisation products could be lower than the risk weight for the underlying (securitised) loans. For this reason, banks issuing ABSs backed by these underlying assets and retaining them on balance sheet could even get an increase in their risk-weighted capital ratios.

7.2.2 Securitisation Classified by Asset Types: Interaction with Funding Liquidity

In equation (6), I estimate the impact of the securitisation issuances backed by specific types of assets and I investigate whether the funding liquidity position of banks may have some role in affecting these effects - for specific categories of underlying assets - on the capital position of originator banks.

$$(6)\quad y_{it} = \alpha_i + \delta_t + \beta_1\, SECUR\_ASSET\_TYPE_{it-1} + \beta_1\, SECUR\_ASSET\_TYPE_{it-1} * FUNDING_{it-1} + \gamma\, BANKCONTROLS_{it-1} + u_{it}$$

The dependent variable y_{it} can be, depending on the specifications, either the risk-weighted capital ratio (CapRatio) or the (common equity) leverage ratio[42] (LevRatioCE).

The results reported in Table 7 suggest that the interaction with the liquidity ratio may have a substantial role in driving the impact of securitisation on bank capital position and that this effect may be different across distinct types of underlying assets as well as across different time periods.

In the presentation of the results, I distinguish two broad categories of products: the asset-backed securities (backed directly by various types of loans, like residential mortgages, home equity

[42] I estimate this regression also for the (regulatory capital) leverage ratio. For space reasons, to make tables more readable, I report the results for the two dependent variables which are actually more relevant from the regulatory point of view: the risk-based capital ratio, i.e. the traditional prudential solvency ratio in the Basel framework; the (common equity) leverage ratio, which is closer to the current definition of leverage ratio in the Basel III accord.

loans, commercial loans) and the collateralised debt obligations in a broad sense[43] (backed by other debt instruments). This distinction is important for the purpose of central bank collateral framework: indeed, ABSs can be eligible as collateral while CBOs and CDOs are not. Also, the evidence reveals that bank liquidity may have a role particularly in the effects of the issuances of asset-backed securities (backed by credit claims) and only to a minor extent in the impact of the issuances of collateralised debt obligations (backed by other securities).

Let's focus first on the issuances of structured products (***CBOs and CDOs***) backed by other debt instruments. When considering the overall sample period, we observe that a one-standard-deviation increase in the securitisation ratio increases the risk-weighted capital ratios by 0.99 points for the issuances of CBOs and by 1.43 points for the issuances of other types of CDOs. However, since the interaction term displays a non-significant coefficient, this effect is homogeneous across banks, as it doesn't depend on the liquidity position of individual institutions. Then we may want to compare the results for the two sub-sample periods.

In the ***pre-crisis period***, banks sponsoring the issuances of CBOs and CDOs obtained a considerable rise in the risk-weighted capital ratios, but no change in their (common equity) leverage ratios. Moreover, the increase in the risk-based capital ratios registered for such products is much larger than the effect observed for any other type of structured products in the pre-crisis period. In fact, at that time banks were using securitisation mostly for risk transfer: so the increase in the risk-weighted capital ratios was proportional to the credit risk transferred through the deals and it was larger for the issuances backed by more risky assets.

Then, in the ***crisis time***, the positive effect of the issuance of more complex structured products was sensibly smaller or not statistically significant. This is consistent with the fact that, at that time, banks were less interested in issuing such types of structured products, since they could not use them as collateral in repos with central banks and it was difficult to find interested market investors. Indeed, the positive effect of the issuance of CBOs on the risk-based capital ratios decreased from +1.029 in the pre-crisis time to +0.627 (on average) during the crisis.

However, within the fewer issuances of CBOs[44] at that time, I find evidence that banks with lower liquid assets ratios used securitisation to obtain larger improvements in their prudential solvency. Indeed, a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile implies an increase in the positive effect on the risk-weighted capital ratios from +0.45 to +1.38, with no significant effect on the leverage ratio. This means that, also in the relatively few cases where banks were transferring the credit risk during the crisis time[45], a weaker liquidity position was a relevant incentive to exploit the regulatory arbitrage opportunities related to securitisation[46].

Now we can examine the impact of the issuances of ***asset-backed securities***, backed by

[43] In this category, I include both the products previously labeled as CBOs and as CDOs. The key feature of these structured products is that the underlying asset is not constituted by loans, but by other financial instruments (bonds, asset-backed securities, etc.)

[44] The change in the issuance trends of different types of products may suggest, as an extension of this analysis, to model also the issuance decisions of banks, preliminarily to the post-issuance effects on bank capital.

[45] Since these products could not be pledged as collateral, there wouldn't have been any point in retaining them.

[46] We may suppose that banks chose, among the financial instruments to be used as underlying assets, those products with higher credit risk and higher risk weight, but we would need data on the individual securities pooled in a CBO issuance in order to prove specifically this point.

residential mortgages, home equity loans and commercial loans. The results for the overall sample period reveal that the funding liquidity position of banks played a major role in driving the effects of the issuances on bank balance sheets.

Firstly, a rise in the securitisation ratio for these products induced an increase in the risk-based capital ratio and a decrease in the (common equity) leverage ratio: then banks were improving their prudential solvency ratios but in fact they were raising their leverage. For an average bank in terms of funding liquidity, a one-standard-deviation increase in the securitisation ratio for residential mortgages would have induced a rise in the risk-weighted capital ratio by +0.774, while a decrease in the (common equity) leverage ratio by -0.313. The same increase in the securitisation of home equity loans would have improved the risk-based capital ratio by +0.556 and reduced the (common equity) leverage ratio by -0.366.

Also, this discrepancy between the effects on the two capital ratios is even more pronounced – following the securitisation of these loans – for banks with a weaker liquidity position. For the issuances of ABSs backed by residential mortgages, a decrease in the liquid assets ratio from the 75^{th} percentile to the 25^{th} percentile would have increased both the size of the positive effect on the risk-based capital ratio – from +0.614 to +1.073 – and the magnitude of the negative impact on the (common equity) leverage ratio – from -0.232 to -0.465. Similar effects hold also for ABSs backed by home equity loans and commercial loans. As observed in Table 3 for the overall issuances of securitisation, banks which were more liquidity-constrained had stronger incentives to exploit the regulatory arbitrage opportunities offered by the prudential framework. Then we are interested in exploring whether these effects may hold differently depending on the periods.

In the ***pre-crisis time***, the funding liquidity position of banks doesn't seem to be relevant for the effects on capital ratios. Also the coefficients for the securitisation ratios of ABSs are not significant, as noticed in the model without the interaction term. Only the issuances of ABSs backed by commercial loans displayed a positive impact on the risk-based capital ratios. The effect is smaller – in magnitude - than the one observed for CDOs and CBOs but it is still significant (at the 10% level). This impact is also consistent with the risk transfer approach: given that commercial loans were subject to higher risk weights than residential mortgages, the securitisation of commercial loans could imply also a larger decrease in the risk-weighted assets and a wider increase in the risk-based capital ratio.

During the ***crisis period***, the securitisation of residential mortgages, home equity loans and commercial loans induced substantial improvements in the risk-based solvency ratios, while no change in the (common equity) leverage ratios, and this effect was also particularly relevant for banks with lower liquid assets ratios. Indeed, a decrease in the liquid assets ratio from the 75^{th} to the 25^{th} percentile would have increased the positive effect of securitisation on the risk-based capital ratios to a quite significant extent: from +0.928 to +2.296 for issuances backed by residential mortgages; from +0.758 to +1.806 for ABSs backed by home equity loans; from -0.072 to +0.804 for securitisation backed by commercial loans. The ABSs backed by the above types of loans were also eligible as collateral for central bank liquidity operations. This is important for the crisis period, given that at that time banks retained almost all the tranches of the issued ABSs.

This result, obtained for securitiser banks under stronger liquidity constraints and for products eligible as collateral, would confirm the hypothesis about funding liquidity and regulatory

arbitrage: during the crisis, less-liquid banks – and then more interested in increasing the availability of collateral through ABS retention – exploited the regulatory arbitrage opportunities of securitisation to obtain larger improvements in prudential solvency than more-liquid banks.

7.3 Empirical Results: Securitisation Classified by Credit Ratings

In this section, I consider the issuances of structured products with different credit ratings. In particular, I classify the ratings provided by Standard and Poor's in 7 groups, based on relatively homogeneous risk characteristics: AAA, AA and A, BBB, BB and B, CCC, CC and C, D; and I investigate the effects of securitisation issuances on capital ratios for distinct rating classes.

Credit ratings are important to determine the regulatory treatment of structured products, both for collateral reasons and for prudential purposes. Indeed, in the Eurosystem framework at the time of the analysis, only structured products with at least a single A rating could be pledged as collateral, while other instruments with lower rating could not be eligible in the refinancing operations. Also, in the Basel II securitisation framework, founded on the rating-based approach, credit ratings were relevant to determine the risk weights for securitisation positions: the higher was the credit rating of the product, the lower was the risk weight assigned to the securitisation tranche, and then the lower was the capital buffer that the bank has to keep for that exposure.

7.3.1 The Impact of Securitisation Issuances with Different Credit Ratings

In equation (7), I classify the outstanding amounts of securitisation products by credit ratings and I analyse whether and how the issuances of structured products with different ratings induced different effects on the banks' capital position. I run the following regression:

$$(7)\ y_{it} = \alpha_i + \delta_t + \beta_1 AAA_{it-1} + \beta_2 AA\_A_{it-1} + \beta_3 BBB_{it-1} + \beta_4 BB\_B_{it-1} + \beta_5 CCC_{it-1} + \beta_6 CC\_C_{it-1} + \beta_7 D_{it-1} + \gamma\ CONTROLS_{it-1} + u_{it}$$

The dependent variable y_{it} can be, depending on the specifications, the risk-weighted capital ratio (CapRatio), the (regulatory capital) leverage ratio (LevRatioCAP) and the (common equity) leverage ratio (LevRatioCE). The main explanatory variables are the (one-lagged) ratios of the outstanding amounts of securitisation, classified by credit ratings, over bank total assets. Then, AAA_{it-1} indicates the ratio for the outstanding amount of AAA products,AA_A_{it-1} denotes the ratio for the outstanding amount of AA and A securities, etc.

The results presented in Table 8 illustrate the impact of structured issuances of different ratings on capital and leverage ratios[47]. I also report the estimates of the impact of a one-standard deviation increase in the securitisation ratio for various rating buckets. In particular, I focus on some rating buckets which are specifically relevant for regulatory reasons and for investment strategies, like the AAA, the AA and A, the BBB tranches.

In the ***pre-crisis period***, banks issuing AAA products showed a substantial increase in their

[47] In the appendix, Table C.1 reports the estimates for an alternative specification proposed as a robustness check, where I introduce an interaction term with a crisis dummy for each explanatory variable.

risk-weighted capital ratios, no significant change in their (regulatory capital) leverage ratios and a relevant decrease in their (common equity) leverage ratios. Precisely, a one-standard deviation increase in the securitisation ratio for AAA products was associated with a rise in the risk-based capital ratio by +0.85 points and with a decrease of -0.28 points in the (common equity) leverage ratio.

Indeed, banks were transferring the credit risk through securitisation and so they could exclude the underlying pool from their risk-weighted assets[48], even if the assets were included in the balance sheets of some controlled special purpose vehicles. This result is important also to compare the adequacy of different measures of prudential solvency in reflecting the build-up of excessive leverage through securitisation. While the evolution of the risk-weighted capital ratio shows an improvement in prudential solvency, the observation of the (regulatory capital) leverage ratio doesn't display any change in the capital position and the consideration of the (common equity) leverage ratio highlights even an increase in bank leverage. This was the effect of two combined elements: the system of risk weights (which explains the difference between the risk-based ratio and the regulatory capital ratio); and the substitution of common equity with other instruments eligible as regulatory capital (which illustrates the difference between the regulatory capital ratio and the common equity ratio).

During the ***crisis period***, structured products were heavily downgraded, because of the concerns related to the creditworthiness of the underlying assets. This process of downgrading affected in particular the previously AAA rated products; for the same reason, during that period few issuances of securitisation were rated as AAA, and many safe issuances were assigned a AA or a A rating.

The results reveal that banks issuing AA or A securitisation products during the crisis registered a significant increase in their risk-weighted capital ratios, while no significant change in the (regulatory capital) leverage ratio and a relevant decrease in the (common equity) leverage ratio. In particular, a one-standard-deviation increase in the issuance of AA and A rated products implied an increase in the risk-weighted capital ratio by +0.82 and a decrease in the (common equity) leverage ratio by -0.41.

So, in this case, banks were improving their prudential solvency ratios while in fact they were increasing their leverage. Provided that these products were eligible as collateral and then banks had incentives to retain them on balance sheet during the crisis, the positive impact on the risk-weighted capital ratios can be explained on the basis of the favourable prudential treatment assigning low risk weights for high ratings. When the risk weight for the (retained) securitisation tranche was lower than the risk weight of the underlying (securitised) assets, banks could obtain an improvement in their prudential solvency ratios. At the same time, banks could keep the same amount of regulatory capital by substituting common equity with other instruments: this explains why the regulatory capital ratio doesn't display any significant change while the common equity ratio shows a decrease, notwithstanding that the two ratios have the same denominator (total assets).

The results of the analysis also provide some evidence of implicit recourse for some tranches of securitisation which were subject to an unfavourable regulatory treatment, either

[48] At that time, before the introduction of Basel II, there were not strict conditions requiring a significant and effective risk transfer to exclude securitisation exposures from the risk-weighted assets for prudential purposes.

because they were not eligible as collateral or because they were charged with high risk weights, or also for both reasons at the same time. The BBB products provide an interesting example of this case, given the relevant negative effect of securitisation on bank capital ratios. Indeed, BBB is the lowest investment-grade rating in the Standard and Poor's scale, which implies that investors might not be interested in purchasing these tranches, given that a one or two-notch downgrade may move them from an investment grade to a non-investment grade. Then, given the difficulties in placing such products on the market, originator banks may be induced to provide some implicit support to securitisation vehicles. This would explain the negative effect of securitisation on risk-based capital ratios, which is observed both before and after the crisis.

Also, the magnitude of this negative effect increases substantially from the pre-crisis period (-0.33) to the crisis period (-1.28), for two reasons related to the regulatory regime. First, in a period when the demand for structured products was mostly driven by collateral purposes, BBB tranches could not be pledged in the liquidity operations with the Eurosystem, so financial institutions were not interested in these products and originator banks had to intervene in support of their securitisation vehicles.

Second, in the Basel II securitisation framework, implemented in Europe starting from 2007, BBB tranches were heavily subject to a "cliff effect" in prudential regulation. In the rating-based approach, the risk weights were assigned to structured products on the basis of their credit ratings: however, the relationship between credit risk and risk weight embedded in the Basel weighted system was non-linear, in fact it may be described as a convex function (i.e. the marginal increase in risk weight was quite modest for high-rating products but it rises for riskier products). This implies that, for medium-low rating products, such as BBB tranches, an increase in the credit risk was associated with a more than proportional rise in the risk weight[49], with the consequence that BBB tranches were strongly penalised by prudential regulation.

7.3.2 Securitisation Classified by Credit Ratings: Interaction with Funding Liquidity

In equation (8), I estimate the impact of securitisation issuances belonging to different rating buckets and I investigate whether the funding liquidity position of banks may have some role in affecting these effects - for products with distinct ratings - on the capital position of originator banks.

$$(8)\quad y_{it} = \alpha_i + \delta_t + \beta_1\, SECUR\_CREDIT\_RATING_{it-1} + \beta_1\, SECUR\_CREDIT\_RATING_{it-1} * FUNDING_{it-1} + \gamma\, BANKCONTROLS_{it-1} + u_{it}$$

The dependent variable y_{it} can be, depending on the specifications, either the risk-weighted capital ratio (CapRatio) or the (common equity) leverage ratio[50] (LevRatioCE).

The results reported in Table 9 focus on high-rating products, namely the tranches rated as

[49] For a more precise idea of the rating scale and of the corresponding risk weights in the Basel II Securitisation Framework, see the table in the Appendix A, as reported from the Basel II Framework. Also, for tranches below BB-, the securitisation framework requires the full deduction of the exposure tranche from the computation of bank capital. Then it follows that the cliff effect is particularly evident for rating classes like BBB.

[50] I estimate this regression also for the (regulatory capital) leverage ratio. For space reasons, to make tables more readable, I report the results for the two dependent variables which are actually more relevant from the regulatory point of view: the risk-based capital ratio, i.e. the traditional prudential solvency ratio in the Basel framework; the (common equity) leverage ratio, which is closer to the current definition of leverage ratio in the Basel III accord.

AAA, AA or A, which represented more than 70% of the rated securitisation products and almost 60% of all the securitisation issuances over the entire sample period.

The evidence confirms that, during the ***entire sample period***, the issuances of high-rating securitisation had opposite effects on different measures of prudential solvency, by implying an increase in the risk-weighted capital ratios and a decrease in the (common equity) leverage ratios. For an average bank in terms of funding position, a one-standard-deviation increase in the securitisation ratio for AAA products implied a rise in the risk-weighted capital ratio by +0.2 and a decrease in the (common equity) leverage ratio by -0.196. Also, a corresponding expansion in the issuance of AA products was associated with an increase in the risk-weighted capital ratio by +0.293 and a reduction in the (common equity) leverage ratio by -0.198. Considering that over the entire sample period the mean risk-weighted capital ratio was equal to 11.16 and the mean (common equity) leverage ratio was equal to 4.19, securitiser banks obtained substantial improvements in their prudential solvency ratios, while in fact they were significantly increasing their leverage.

Moreover, the results suggest that the funding liquidity position of banks played an important role in driving the impact of securitisation on bank capital position for high-rating products. For the entire sample period, less-liquid banks obtained larger increases in their risk-based capital ratios and wider decrease in their (common equity) leverage ratios than more-liquid banks. In particular, a decrease in the liquid assets ratio from the 75^{th} percentile to the 25^{th} percentile implied – for the issuances of AAA products - an increase in the positive effect on the risk-weighted capital ratio from +0.061 to +0.461 as well as in the negative effect on the (common equity) leverage ratio from -0.135 to -0.312. Similarly, for the issuances of AA products, a corresponding weakening in the bank liquidity position increased the size of the positive effect on the risk-based capital ratios from +0.188 to +0.49 and of the negative impact on the (common equity) leverage ratios from -0.142 to -0.304. Banks more subject to liquidity constraints exploited the regulatory arbitrage opportunities from the prudential framework to a larger extent than banks in a stronger funding position. Then we may want to consider the results for the two sub-sample periods.

In the ***pre-crisis time***, the funding liquidity position doesn't appear to be relevant for explaining the effects of securitisation on bank capital position, as the coefficients for the interaction term are not significant.

For the ***crisis period***, the introduction of the interaction term for funding liquidity is useful to investigate the drivers for the different effects of securitisation issuances with distinct ratings, as they were observed in the previous section. In particular, the heterogeneity in the liquidity position across banks is relevant to explain the size of the negative impact of the AAA-rated issuances on the risk-based capital ratios during the crisis. This effect was larger for high-liquidity banks than for low-liquidity banks. Precisely, institutions with a liquid assets ratio at the 75^{th} percentile (0.80) would have reduced their risk-weighted capital ratios by -0.978, while intermediaries with a liquidity ratio at the 25^{th} percentile (0.30) would have decreased their risk-based capital ratios by -0.324. This effect could be clarified in relation to the various downgrades affecting in particular AAA-rated securitisation products and then with the implicit recourse provided by originator banks, in order to deal with the negative performance of the underlying assets.

When the assets backing some AAA-rated issuances showed a higher than expected

probability of default, and since rating downgrades could affect the reputation of the issuer parent in the wholesale market, originator banks had incentives to provide implicit recourse to the issuer vehicles in order to shield investors from losses. However, implicit recourse could be costly in terms of lower risk-weighted capital ratios, both for the increase in the assets on bank balance sheets, and for the rise in the risk weights of the (ex-post retained) securitisation exposures - as determined by the rating downgrade. For this reason, only relatively stable banks not subject to particular liquidity pressures could afford such decision. Then we can argue that more-liquid banks registered larger decreases in their risk-based capital ratios than less-liquid banks, as they could provide more implicit support and then stand the consequences of that on their prudential solvency ratios[51].

During the crisis period, significant positive effects of securitisation on prudential solvency ratios were actually observed for the issuances of AA and A products. In particular, for the tranches rated as AA, the interaction with the liquid assets ratio displays that the funding liquidity position of banks was relevant to determine the impact of securitisation on bank capital. Indeed, for an average bank, a one-standard-deviation increase in the securitisation ratio implied an increase in the risk-weighted capital ratio by 0.347, while no significant change in the leverage ratio. In addition, a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile implied an increase in this positive effect from +0.235 to +0.827. This is relevant for our hypothesis about funding liquidity and regulatory arbitrage. The AA-rated products were both eligible as collateral and subject to very low risk-weights for prudential requirements, being the safest products after the AAA-rated tranches. So this evidence would suggest that the banks subject to stronger liquidity pressures, and then potentially more interested in retaining high-rating products as collateral, obtained also larger improvements in their prudential solvency when issuing AA-rated products[52].

8. Conclusions

This paper analyses the effects of securitisation issuances on the risk-based capital ratios and on the leverage ratios for European banks in the period between 1999 and 2010, before the introduction of the retention requirements in 2011. The study is conducted on a dataset of more than 17,000 securitisation tranches, classified by product, collateral type, credit ratings and issuer nationality, which were issued by vehicles sponsored by European banks.

[51] This argument could be supported on a more granular basis if we could have specific information about the implicit recourse provided by banks for individual tranches of securitisation. In fact, while indications about explicit support - through credit or liquidity enhancement - may be extracted from the deals, it is quite difficult to find such detailed information about implicit recourse, because it occurs only ex-post and banks may be interested in avoiding public disclosure – especially to supervisors - mainly to avoid the regulatory implications of that for capital requirements, as due to the provisions for effective risk transfer. For a discussion about the provision of implicit support and the issues for testing it empirically, see also Kuncl (2015).

[52] Also for the issuance of A-rated products, the evidence reveals a strong positive impact of securitisation on the risk-weighted capital ratios. The interaction term has the same economic effect but it is not statistically significant, so the effect seems to be more homogeneous across banks. In fact, it seems plausible that the discussed liquidity effect may be stronger for securitisation tranches with higher ratings (in this case AA-rated), provided that higher ratings should imply lower collateral haircuts (and then larger amount of liquidity obtainable against that collateral) and lower risk weights for the (retained) securitisation exposures.

The study is motivated by the sudden change in the retention policy of European banks occurred in mid-2007, when financial institutions started to retain most of their issuances of asset-backed securities, especially to pledge them as collateral in central bank refinancing operations.

Based on a tranche-level analysis for different categories of structured products, I find that: 1) in pre-crisis period, banks used securitisation to increase their risk-based capital ratios through the transfer of credit risk; 2) given the risk transfer, securitiser banks obtained larger improvements in their prudential solvency from the issuance of products backed by more risky assets; 3) in the crisis period, the increase in the risk-weighted capital ratios due to securitisation was larger for originator institutions with a weaker liquidity position; 3) the retention behaviour in the crisis time induced larger increases in the prudential solvency ratios for structured products with a favourable regulatory treatment (eligible as collateral and subject to low risk weights).

Overall, the outcomes of the empirical work show that originator banks exploited the regulatory arbitrage opportunities offered by the prudential framework particularly during the crisis period, when they were retaining most tranches of the issued asset-backed securities. In fact, originator institutions more subject to liquidity pressures, and then potentially more interested in increasing the amount of eligible collateral through the retention of asset-backed securities, were induced to design the securitisation deals in such a way to minimise the impact of risk retention on bank capital requirements. The results of the study may be relevant in a policy perspective for at least two aspects.

First, the study shows - specifically for European banks - that some decisions related to monetary policy implementation, such as the determination of the eligible collateral for the Eurosystem operations, may have significant micro- and macro-prudential implications, because of their effects on the risk management and on the securitisation behaviour of originator banks.

Second, the work suggests some insights for the current reforms of prudential regulation, such as the introduction of the retention requirements for securitisation originators and sponsors and of the new leverage ratio for prudential solvency requirements.

In particular, the paper provides evidence in favour of the introduction of the new leverage ratio in Basel III as a backstop to identify the build-up of excessive leverage in addition to the risk-based capital ratio. The results reveal that the issuance of a given category of structured products may produce different effects on the risk-adjusted capital ratio and on the leverage ratio, where such differences are mainly driven by the risk weighted system. For this reason, the analysis supports the idea of their complementarity in the definition of the prudential ratios in capital regulation: by defining both benchmarks to measure bank solvency, the new system can also reduce the margins for regulatory arbitrage that credit institutions could exploit in the past.

References

- Acharya V. V., Schnabl P. and Suarez G. (2013), *Securitisation without Risk Transfer*, Journal of Financial Economics, Vol. 107, Issue 3, pp.515-536
- Adelino M. (2009), *How Much Do Investors Rely on Ratings? The Case of Mortgage Backed Securities*, Working paper, MIT
- Affinito M. and Tagliaferri E. (2010), *Why do (or did) Banks Securitize their Loans? Evidence from Italy*, Journal of Financial Stability, Vol. 6, Issue 4, pp. 189-202
- AFME (2011), *Securitisation Data Report 2010*, European Securitisation Forum
- Albertazzi U., Eramo G., Gambacorta L. and Salleo C. (2011), *Securitisation is not that Evil After All*, BIS Working Paper Series No. 341
- Almazan A., Martin-Oliver A. and Saurina J. (2013), *Loan Securitisation, Access to Funds and Banks' Capital Structure*, mimeo
- Ashcraft A., Goldsmith-Pinkham P. and Vickery J. (2010), *MBS Ratings and the Mortgage Credit Boom*, CentER Discussion paper No.89, Tilburg University
- Bank of England and European Central Bank (2014), *The Case for a Better Functioning Securitisation Market in the European Union*, Joint Discussion Paper
- Basel Committee on Banking Supervision (2009), *Report on Special Purpose Entities*, The Joint Forum, Bank for International Settlements
- Benmelech E. and Dlugosz J. (2010), *The Credit Rating Crisis*, NBER Macro Annual 2009, pp.161-207.
- Benmelech E. and Dlugosz J. (2009), *The Alchemy of CDO Ratings*, Journal of Monetary Economics, Vol.56, pp. 617-634
- Berger A. N., DeYoung R., Flannery M. J., Lee D. and Oztekin O. (2008), *How Do Large Banking Organizations Manage Their Capital Ratios?*, Journal of Financial Services Research, Vol. 34, pp.123-149
- Calomiris C. W. and Mason J. R. (2004), *Credit Card Securitisation and Regulatory Arbitrage*, Journal of Financial Services Research, Vol. 26, Issue 1, pp.5-27
- Carbo-Valverde S., Marques-Ibanez D. and Rodríguez-Fernández F. (2012), *Securitisation, Risk-transferring and Financial Instability: the Case of Spain*, Journal of International Money and Finance, Vol. 31, Issue 1, pp. 80-101
- Cerasi V. and Rochet J. C. (2014), *Rethinking the Regulatory Treatment of Securitisation*, Journal of Financial Stability, Vol. 10, pp. 20-31
- Coeuré B. (2012), *Collateral Scarcity – a Gone or a Going Concern?*, ECB-DNB Joint Central Bank Seminar on Collateral and Liquidity, Amsterdam
- Cohen A. and Manuszak M. D. (2013), *Ratings Competition in the CMBS Market*, Journal of Money, Credit and Banking, Vol. 45, Issue s1, pp. 367-384
- Coval J., Jurek J. and Stafford E. (2009), *The Economics of Structured Finance*, Journal of Economic Perspectives, Vol.23, pp.3-25
- De Haas R. and Van Horen N. (2010), *The Crisis as a Wake-Up Call. Do Banks Tighten Screening and Monitoring During a Financial Crisis?*, DNB Working Papers Series No.255
- Dell'Ariccia G., Igan D. and Laeven L. (2012), *Credit Booms and Lending Standards: Evidence from the Subprime Mortgage Market*, Journal of Money, Credit and Banking, Vol. 44, Issue
- Demiroglu C. and James C. (2012), *How Important is Having Skin in the Game? Originator-Sponsor Affiliation and Losses on Mortgage-Backed Securities*, The Review of Financial Studies, Vol.25, pp. 3217-3258
- Demyanyk Y. and Loutskina E. (2013), *Mortgage Companies and Regulatory Arbitrage*, mimeo
- Dewatripont M. and Tirole J. (1994), *The Prudential Regulation of Banks*, MIT Press
- Dionne G. and Harchaoui T. M. (2002), *Banks' Capital, Securitisation and Credit Risk: An Empirical Evidence for Canada*, THEMA Working Papers 2002-33, Université de Cergy-Pontoise

- Erel I., Nadauld T. and Stulz R. M. (2013), *Why Did US Banks Invest in Highly-Rated Securitisation Tranches?*, Review of Financial Studies, forthcoming
- European Central Bank (2013), *The Eurosystem Collateral Framework throughout the Crisis*, Monthly Bulletin, July, pp.71-86
- Freixas X. and Rochet J. C. (2008), *Microeconomics of Banking*, MIT Press, 2nd edition
- Gorton G. B. and Pennacchi G. G. (1995), *Bank and Loan Sales: Marketing Nonmarketable Assets*, Journal of Monetary Economics, Vol. 35, pp.389-411
- Higgins E. J. and Mason J. R. (2004), *What is the Value of Recourse to Asset-Backed Securities? A Clinical Study of Credit Card Banks*, Journal of Banking and Finance, Vol.28, pp.875-899
- Kara A., Marques-Ibanez D. and Ongena S. (2015), *Securitisation and Lending Standards. Evidence from the European Wholesale Loan Market*, Working Paper, SSRN: http://ssrn.com/abstract=1787595
- Keys B., Muckerjee T., Seru A. and Vig V. (2010), *Did Securitisation Lead to Lax Screening? Evidence from Subprime Loans*, Quarterly Journal of Economics, Vol. 125, Issue 1, pp.307-362
- Keys B., Muckerjee T., Seru A. and Vig V. (2009), *Financial Regulation and Securitisation: Evidence from Subprime Loans*, Journal of Monetary Economics, Volume 56, Issue 5, July 2009, Pages 700–720
- Kiff J. and Kisser M. (2014), *A Shot at Regulating Securitization*, Journal of Financial Stability, Vol. 10, pp. 32-49
- Kuncl M. (2015), *Securitization under Asymmetric Information over the Business Cycle*, Bank of Canada Working Paper Series, No. 2015-9
- Liu P. and Shi L. (2013), *Sponsor-Underwriter Affiliation and the Performance of Non-Agency Mortgage-Backed Securities*, Working Paper
- Loutskina E. (2011), *The Role of Securitisation in Bank Liquidity and Funding Management*, Journal of Financial Economics, Vol.100, Issue 3, pp. 663-684
- Michalak T. C. and Uhde A. (2010), *Credit Risk Securitisation and Bank Soundness in Europe*, The Quarterly Review of Economics and Finance, Vol. 52, pp.272-285
- Nijskens R. and Wagner W. (2011), *Credit Risk Transfer Activities and Systemic Risk: How Banks Became less Risky Individually but Posed Greater Risks to the Financial System at the Same Time*, Journal of Banking and Finance, Elsevier, Vol. 35, Issue (6), pp. 1391-1398.
- Panetta F. and Pozzolo A. F. (2010), *Why do Banks Securitize their Assets? Bank-level Data from Over One Hundred Countries*, Working Paper
- Pennacchi G. G. (1988), *Loan Sales and the Cost of Capital*, Journal of Finance, Vol. 43, pp.375-396
- Pozsar Z., Adrian T., Ashcraft A. and Boesky H. (2010), *Shadow Banking*, Staff Report No.458, Federal Reserve Bank of New York
- Sarkisyan A. and Casu B. (2013), *Retained Interests in Securitisations and Implications for Bank Solvency*, ECB Working Paper Series No.1538
- Sarkisyan A., Casu B., Clare A. and Thomas S. (2013), *Securitisation and Bank Performance*, Journal of Money, Credit and Banking, forthcoming
- Shin H. S. (2009), *Securitisation and Financial Stability*, The Economic Journal, Vol. 119, pp.309-332
- Uhde A. and Michalak T. C. (2012), *Securitisation and Systematic Risk in European Banking: Empirical Evidence*, Journal of Banking and Finance, Vol. 34, pp.3061-3077
- Wagner W. and Marsh I. W. (2006), *Credit Risk Transfer and Financial Sector Stability*, Journal of Financial Stability, Vol. 2, Issue No.2, pp. 173-193

Table 1

Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Bank Balance Sheet Variables and Ratios					
Total Capital	504	38341.19	21890.39	1820	117964.6
Total Common Equity	696	31083.08	18597.17	1601	101406.7
Total Assets	665	836242	508183.9	21119	2638365
Risk Adjusted Assets	537	304664.6	168403.4	10862	881222.1
Risk-Weighted Capital Ratio	499	.1271365	.0232583	.0816162	.2190018
Risk-Weighted Common Equity Ratio	537	.1116344	.0302366	.0491629	.2354243
Leverage Ratio (Total Capital)	504	.048	.0175857	.0152542	.0904294
Leverage Ratio (Common Equity)	665	.0418814	.0156491	.0073446	.1124575
Return on Assets	653	.0013137	.0014968	-.0109709	.009844
Non Performing Loans Ratio	507	.0109395	.0085998	.000651	.0651184
Loans Deposits Ratio	427	1.169953	.8513491	.4024901	8.660161
Trading Investment Ratio	492	2.238224	2.479072	.0068855	15.47318
Outstanding Securitisation Amounts and Ratios					
Total Securitisation Amount	816	6206.726	15646.36	0	106371.6
Total Securitisation Ratio	665	.0064869	.016193	0	.1291329
By Collateral Type					
Credit Card Secur. Amount	816	64.15883	288.2885	0	1559.43
Credit Card Secur. Ratio	665	.0000681	.0002944	0	.0021157
Home Equity Loans Secur. Amount	816	1535.162	4407.14	0	34458.43
Home Equity Loans Secur. Ratio	665	.0016538	.0050069	0	.0402573
CBO Secur. Amount	816	24.8515	89.88344	0	687.82
CBO Secur. Ratio	665	.0000438	.0001396	0	.0009163
CDO Secur. Amount	816	409.0203	1221.922	0	7828.518
CDO Secur. Ratio	665	.0005934	.001516	0	.0081215
CLO Secur. Amount	816	36.80065	132.1476	0	1113.94
CLO Secur. Ratio	665	.0000388	.000151	0	.001484
Commercial Loans Secur. Amount	816	1474.078	5062.839	0	38368.7
Commercial Loans Secur. Ratio	665	.0013905	.004483	0	.0417383
Personal Loans Secur. Amount	816	22.35504	108.833	0	1050.17
Personal Loans Secur. Ratio	665	.000022	.0001004	0	.0010966
Residential Mortgages Secur. Amount	816	2550.436	7247.976	0	53135.33
Residential Mortgages Secur. Ratio	665	.0025753	.0073375	0	.0648616
Mixed Receivables Secur. Amount	816	52.39292	133.2624	0	928.74
Mixed Receivables Secur. Ratio	665	.000097	.0002386	0	.0012373
By Issuer Nationality					
EU Issuer Secur. Amount	816	227.1666	676.3788	0	3316.6
EU Issuer Secur. Ratio	665	.000402	.0012019	0	.0073791
Non-EU Issuer Secur. Amount	816	5979.559	15567.21	0	105194.9
Non-EU Issuer Secur. Ratio	665	.0060849	.0160191	0	.1277045

Continued

Variable	Obs	Mean	Std. Dev.	Min	Max
Bank-Level Outstanding Securitisation Amounts and Ratios (over Total Assets)					
By Issue Credit Rating					
AAA Secur. Amount	816	3375.38	8795.046	0	61815.99
AAA Secur. Ratio	665	.003273	.0075594	0	.0583121
AA & A Secur. Amount	816	736.3444	1706.702	0	15514.71
AA & A Secur. Ratio	665	.0008204	.0018907	0	.0188345
BBB Secur. Amount	816	254.4795	760.6171	0	7124.931
BBB Secur. Ratio	665	.0002735	.0007045	0	.0086495
BB & B Secur. Amount	816	381.7074	1506.313	0	15845.76
BB & B Secur. Ratio	665	.0003634	.0013422	0	.0121179
CCC Secur. Amount	816	386.6446	1796.403	0	20401.5
CCC Secur. Ratio	665	.0003794	.0015754	0	.0169002
CC & C Secur. Amount	816	151.3581	626.1325	0	6376.934
CC & C Secur. Ratio	665	.0002235	.0009019	0	.0084954
D Secur. Amount	816	51.60061	301.1712	0	5011.573
D Secur. Ratio	665	.0000615	.0003673	0	.0060839
Non-Rated Secur. Amount	816	869.2107	3674.248	0	48319.89
Non-Rated Secur. Ratio	665	.0010924	.0049073	0	.0561732

Note: The bank balance sheet variables and the outstanding amounts of securitisation issuances are expressed in € millions. The data on outstanding securitisation are computed at the bank level, based on the aggregation of all the tranches issued by a given bank.

Table 2. The Impact on Risk-Based Capital and Leverage Ratios.

	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
VARIABLES	(1) CapRatio	(2) LevRatioCAP	(3) LevRatioCE	(4) CapRatio	(5) LevRatioCAP	(6) LevRatioCE	(7) CapRatio	(6) LevRatioCAP	(9) LevRatioCE
MAIN EXPLANATORY									
Total Securitisation_1	0.271***	0.153***	-0.0935**	0.119	0.0981	0.0208	0.482**	0.0668	-0.0288
	(0.0882)	(0.0425)	(0.0469)	(0.209)	(0.0917)	(0.0849)	(0.217)	(0.0667)	(0.0719)
ECONOMIC EFFECT									
1 St. Dev. Increase in Total Secur_1	**+0.439*** **	**+0.248*** **	**-0.151** **	+0.116	+0.096	+0.02	**+1.204** **	+0.167	-0.072
CONTROLS									
RoA_1	1.696**	0.933***	1.706***	-0.0546	1.477**	1.274**	3.488***	0.365	1.286***
	(0.730)	(0.352)	(0.385)	(1.516)	(0.664)	(0.618)	(1.153)	(0.354)	(0.368)
NPL Ratio_1	0.00246	0.0522	0.0524	0.283	0.283	-0.0213	-0.168	0.0738	0.167***
	(0.0970)	(0.0463)	(0.0472)	(0.254)	(0.254)	(0.0958)	(0.148)	(0.0455)	(0.0481)
Trad Invest Ratio_1	-0.000140	0.000222	0.000520	0.00103	0.00103	0.000151	-0.00417***	-0.000748*	-0.000732
	(0.000666)	(0.000322)	(0.000362)	(0.000912)	(0.000912)	(0.000384)	(0.00142)	(0.000434)	(0.000461)
Non Inter Income Ratio_1	0.00675	0.00105	-0.000197	0.0145	-0.00446	-0.0106***	0.00762	-0.00214	-0.000871
	(0.00492)	(0.00237)	(0.00128)	(0.0116)	(0.00510)	(0.00398)	(0.00747)	(0.00229)	(0.000934)
Constant	0.105***	0.0536***	0.0417***	0.110***	-0.00446	0.0489***	0.118***	-0.00214	0.0417***
	(0.0123)	(0.00594)	(0.00483)	(0.00872)	(0.00510)	(0.00308)	(0.00985)	(0.00229)	(0.00343)
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.651	0.517	0.464	0.326	0.631	0.575	0.729	0.651	0.714

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3. The Impact on Risk-Based Capital and Leverage Ratios: Interaction with the Liquid Assets Ratio

Regression Results

	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE
MAIN EXPLANATORY									
Total Securitisation_1	0.833***	0.0167	-0.373***	0.277	-0.0264	-0.0591	1.563***	0.250**	0.0562
	(0.199)	(0.0982)	(0.108)	(0.358)	(0.156)	(0.152)	(0.332)	(0.108)	(0.122)
INTERACTION									
Tot Secur_1*LiqAssetsRatio_1	-0.557***	0.127	0.271***	-0.142	0.112	0.0713	-0.964***	-0.170**	-0.0828
	(0.174)	(0.0859)	(0.0952)	(0.259)	(0.113)	(0.113)	(0.235)	(0.0769)	(0.0861)
CONTROLS									
NPL Ratio_1	0.0149	0.0430	0.0461	0.262	-0.0274	-0.0147	0.0226	0.103**	0.178***
	(0.0948)	(0.0464)	(0.0466)	(0.258)	(0.112)	(0.0968)	(0.142)	(0.0464)	(0.0510)
Trad Invest Ratio_1	0.000686	6.91e-05	0.000159	0.00109	0.000468	0.000120	-0.00252*	-0.000410	-0.000557
	(0.000690)	(0.000342)	(0.000381)	(0.000924)	(0.000402)	(0.000389)	(0.00132)	(0.000433)	(0.000477)
RoA_1	1.919***	0.894**	1.632***	-0.106	1.517**	1.293**	4.230***	0.488	1.334***
	(0.711)	(0.352)	(0.379)	(1.528)	(0.666)	(0.622)	(1.048)	(0.342)	(0.371)
Non Inter Income Ratio_1	0.00533	0.00150	0.000738	0.0145	-0.00446	-0.0106***	0.00535	-0.00257	-0.00121
	(0.00480)	(0.00238)	(0.00130)	(0.0117)	(0.00510)	(0.00400)	(0.00671)	(0.00219)	(0.00102)
Constant	0.104***	0.0603***	0.0419***	0.110***	0.0507***	0.0490***	0.106***	0.0390***	0.0409***
	(0.0119)	(0.00589)	(0.00476)	(0.00878)	(0.00383)	(0.00309)	(0.00864)	(0.00282)	(0.00355)
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.675	0.525	0.487	0.329	0.637	0.578	0.790	0.691	0.725

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio

Dependent Variables	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
	Values of the LiqAssetsRatio			Values of the LiqAssetsRatio			Values of the LiqAssetsRatio		
	Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.
Risk Weighted Capital Ratio	**0.861*** **	**1.209*** **	**0.676*** **	0.194	0.246	0.15	**1.983*** **	**3.175*** **	**1.705*** **
(Regulatory Capital) Leverage Ratio	0.138	0.059	0.180	0.034	-0.007	0.069	**0.286** **	**0.496** **	**0.237** **
(Common Equity) Leverage Ratio	**-0.367*** **	**-0.536*** **	**-0.276*** **	-0.020	-0.046	0.003	-0.025	0.078	-0.048

Table 4. The Impact on Risk-Based Capital and Leverage Ratios: Interaction with the Loans to Deposits Ratio

Regression Results

	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE
MAIN EXPLANATORY									
Total Securitisation_1	-0.169	0.536***	0.485***	-0.138	0.264*	0.192	-0.954	-0.257	-0.412*
	(0.242)	(0.114)	(0.122)	(0.354)	(0.154)	(0.143)	(0.683)	(0.209)	(0.228)
INTERACTION									
Tot Secur_1*LoanDepoRatio_1	0.549*	-0.499***	-0.750***	0.347	-0.224	-0.240	1.884**	0.415	0.496*
	(0.290)	(0.137)	(0.146)	(0.385)	(0.167)	(0.162)	(0.864)	(0.265)	(0.287)
CONTROLS									
NPL Ratio_1	-0.0184	0.0566	0.0657	0.255	-0.0257	-0.0163	-0.101	0.0844*	0.182***
	(0.0964)	(0.0449)	(0.0448)	(0.256)	(0.111)	(0.0951)	(0.149)	(0.0457)	(0.0487)
Trad Invest Ratio_1	0.000226	-3.39e-05	0.000101	0.00122	0.000388	3.92e-05	-0.00461***	-0.000804*	-0.000814*
	(0.000679)	(0.000320)	(0.000352)	(0.000939)	(0.000408)	(0.000389)	(0.00140)	(0.000430)	(0.000461)
RoA_1	1.821**	0.845**	1.560***	0.377	1.198*	1.041	2.907**	0.229	1.144***
	(0.724)	(0.341)	(0.364)	(1.592)	(0.692)	(0.633)	(1.150)	(0.352)	(0.369)
Non Inter Income Ratio_1	0.00619	0.00183	-0.000182	0.0129	-0.00344	-0.00978**	0.00594	-0.00253	-0.000928
	(0.00488)	(0.00230)	(0.00120)	(0.0118)	(0.00512)	(0.00399)	(0.00730)	(0.00224)	(0.000919)
Constant	0.105***	0.0599***	0.0423***	0.110***	0.0509***	0.0494***	0.117***	0.0411***	0.0407***
	(0.0122)	(0.00571)	(0.00456)	(0.00877)	(0.00381)	(0.00307)	(0.00904)	(0.00277)	(0.00344)
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.663	0.554	0.528	0.334	0.642	0.588	0.752	0.679	0.733

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio

Dependent Variables	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
	Values of the LoanDepoRatio			Values of the LoanDepoRatio			Values of the LoanDepoRatio		
	Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.
Risk Weighted Capital Ratio	**1.035*** [1] [0.761 [2]]	**0.754*** [1] [0.480 [2]]	**1.084*** [1] [0.810 [2]]	0.236	0.147	0.268	**6.426**** [3] [4.043 [4]]	**4.367**** [3] [1.984 [4]]	**6.464**** [3] [4.081 [4]]
(Regulatory Capital) Leverage Ratio	**-0.073*****	**0.183*****	**-0.117*****	**0.427*** [5] [0.030 [6]]	**0.427*** [5] [0.125 [6]]	**0.427*** [5] [-0.004 [6]]	0.774	0.320	0.782
(Common Equity) Leverage Ratio	**-0.629*****	**-0.244*****	**-0.696*****	-0.115	-0.013	-0.151	**0.663***	**0.121***	**0.673***

[1] The effect considers only the coefficient of the interaction term, which is significant at the 10% level
[2] The overall effect considers both coefficients (of the securitisation ratio and of the interaction term). However, only the interaction term is significant and at the 10% level
[3] The effect considers only the coefficient of the interaction term, which is significant at the 5% level
[4] The overall effect considers both coefficients (of the securitisation and of the interaction term). However, only the interaction term is significant and at the 5% level
[5] The effect considers only the coefficient of the securitisation ratio, which is significant at the 10% level
[6] The overall effect considers both coefficients (of the securitisation and of the interaction term). However, only the securitisation ratio is significant and at the 10% level

Table 5. The Impact on Risk-Based Capital and Leverage Ratios: Interaction with the Short-Term Borrowing Ratio

Regression Results

	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE
MAIN EXPLANATORY									
Total Securitisation_1	0.196	0.365***	0.144	0.354	0.354*	0.132	-0.0188	-0.0824	-0.0859
	(0.186)	(0.0848)	(0.0875)	(0.469)	(0.190)	(0.192)	(0.281)	(0.0777)	(0.0948)
INTERACTION									
Tot Secur_1*ShortBorrRatio_1	0.377	-0.805***	-0.730**	-0.935	-0.770	-0.0846	1.760**	0.472**	0.177
	(0.648)	(0.295)	(0.296)	(1.415)	(0.575)	(0.611)	(0.728)	(0.201)	(0.244)
CONTROLS									
NPL Ratio_1	0.0263	0.0822*	0.0124	0.524	0.192	-0.0282	-0.141	0.0727*	0.175***
	(0.106)	(0.0476)	(0.0466)	(0.356)	(0.145)	(0.156)	(0.147)	(0.0406)	(0.0496)
Trad Invest Ratio_1	-1.09e-05	0.000340	0.000538	0.00138	0.000561	0.000105	-0.00509***	-0.000904**	-0.000836*
	(0.000702)	(0.000319)	(0.000329)	(0.000944)	(0.000383)	(0.000390)	(0.00146)	(0.000404)	(0.000499)
RoA_1	1.713**	0.727**	1.178***	0.466	1.417	0.549	3.794***	0.451	1.326***
	(0.790)	(0.360)	(0.366)	(2.146)	(0.872)	(0.806)	(1.141)	(0.316)	(0.375)
Non Inter Income Ratio_1	0.00676	0.000804	0.00188	0.0165	-0.00199	-0.00689	0.00613	-0.00251	-0.00128
	(0.00557)	(0.00254)	(0.00124)	(0.0124)	(0.00506)	(0.00431)	(0.00788)	(0.00218)	(0.00109)
Constant	0.108***	0.0586***	0.0510***	0.112***	0.0419***	0.0448***	0.116***	0.0393***	0.0306***
	(0.0127)	(0.00577)	(0.00599)	(0.0127)	(0.00516)	(0.00537)	(0.00977)	(0.00270)	(0.00321)
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.672	0.566	0.613	0.517	0.735	0.656	0.771	0.730	0.741

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio

Dependent Variables	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
	Values of the ShortBorrRatio			Values of the ShortBorrRatio			Values of the ShortBorrRatio		
	Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.
Risk Weighted Capital Ratio	0.406	0.345	0.456	0.216	0.304	0.135	**0.774**** [1] [0.728 [2]]	**0.291**** [1] [0.244 [2]]	**1.163**** [1] [1.116 [2]]
(Regulatory Capital) Leverage Ratio	**0.401*****	**0.532*****	**0.295****	**0.346*** [3] [0.239 [4]]**	**0.346*** [3] [0.312 [4]]**	**0.346*** [3] [0.172 [4]]**	**0.208**** [3] [0.002 [4]]	**0.078**** [3] [-0.128 [4]]**	**0.312**** [3] [0.106 [4]]**
(Common Equity) Leverage Ratio	**-0.172**** [3] [0.061 [4]]	**-0.053**** [3] [0.180 [4]]	**-0.268**** [3] [-0.035 [4]]	0.117	0.125	0.110	-0.137	-0.185	-0.098

[1] The effect considers only the coefficient of the interaction term, which is significant at the 5% level

[2] The overall effect considers both coefficients (of the securitisation ratio and of the interaction term). However, only the interaction term is significant and at the 5% level

[3] The effect considers only the coefficient of the securitisation ratio, which is significant at the 10% level

[4] The overall effect considers both coefficients (of the securitisation ratio and of the interaction term). However, only the securitisation ratio is significant and at the 10% level

Table 6. The Impact of Securitisation Issuances Classified by Asset Type

Regression Results

	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	CapRatio	LevRatioCAP	LevRatioCE	Cap_Ratio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE
CBO_1	55.11***	12.03**	8.252	60.64***	22.77***	16.57***	-25.41	-5.225	-10.12
	(10.37)	(5.351)	(6.150)	(8.961)	(5.385)	(6.363)	(40.67)	(10.96)	(12.85)
CDO_1	2.452**	1.275**	-0.767*	2.816***	1.266**	-0.210	5.527	1.342	4.815***
	(1.015)	(0.538)	(0.458)	(0.907)	(0.545)	(0.396)	(3.587)	(0.967)	(1.099)
CLO_1	-3.133	8.674**	1.137	12.56	20.13***	18.11***	14.86	7.829	0.516
	(6.482)	(3.423)	(3.871)	(7.610)	(4.574)	(4.589)	(26.56)	(7.157)	(8.470)
CommLoans_1	-0.440**	-0.157	-0.210	0.0919	-0.332	-0.424*	-0.0155	0.0694	0.266*
	(0.213)	(0.113)	(0.148)	(0.350)	(0.210)	(0.239)	(0.431)	(0.116)	(0.137)
HomeEquity_1	0.358	0.270**	0.102	0.0355	-0.105	-0.187	1.030**	0.241*	0.153
	(0.232)	(0.123)	(0.154)	(0.299)	(0.180)	(0.200)	(0.508)	(0.137)	(0.162)
PersLoans_1	7.845	3.913	2.455	27.42***	11.82**	9.093*	-1.758	-2.477	-3.806
	(6.453)	(3.417)	(4.382)	(7.559)	(4.543)	(5.283)	(11.24)	(3.030)	(3.574)
ResidMort_1	0.520***	-0.0209	-0.164	0.198	-0.0733	-0.242	0.682**	0.0637	-0.167*
	(0.162)	(0.0858)	(0.111)	(0.320)	(0.192)	(0.228)	(0.299)	(0.0807)	(0.0949)
CreditCard_1	-6.437**	-2.189	7.403***	-23.72***	-7.093**	5.749*	4.607	-6.298	1.613
	(2.933)	(1.554)	(2.037)	(4.795)	(2.881)	(3.406)	(17.84)	(4.807)	(5.654)
Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.564	0.443	0.344	0.476	0.566	0.505	0.637	0.575	0.588

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6. Continued

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio[1]

VARIABLES	2003Q1-2007Q2			2007Q3-2010Q4		
	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE
Collateralised Bond Oblig. (CBO)	**+ 0.791 *** **	**+ 0.297 *** **	**+0.216*** **	- 0.37	- 0.076	- 0.147
Collateralised Debt Oblig. (CDO)	**+ 0.361 *** **	**+ 0.162 ** **	+ 0.027	+ 1.177	+ 0.286	**+ 1.025*** **
Collateralised Loan Oblig. (CLO)	+ 0.137	**+ 0.219*** **	**+0.197*** **	+ 0.344	+ 0.181	+ 0.012
Commercial Loans	+ 0.025	- 0.090	**- 0.115* **	- 0.011	+ 0.049	**+ 0.188* **
Home Equity Loans	+ 0.014	- 0.043	- 0.076	**+ 0.757 ** **	**+ 0.177 * **	+ 0.112
Personal Loans	**+ 0.229 *** **	**+ 0.099 ** **	**+ 0.076* **	- 0.026	- 0.037	- 0.057
Residential Mortgages	+ 0.085	- 0.031	- 0.104	**+ 0.782 ** **	+ 0.073	**- 0.192* **
Credit Card Receivables	**- 0.860 *** **	**- 0.257 ** **	**+ 0.208* **	+ 0.074	+ 0.102	+ 0.026

*** p<0.01, ** p<0.05, * p<0.1

[1] The results in bold characters denote the effects which correspond to statistically significant coefficients in the regression analysis.

Table 7. The Impact of Securitisation Classified by Asset Types: Interaction with the Liquid Assets Ratio

Regression Results

Panel A: 1999Q1-2010Q4

VARIABLES	(1) CapRatio	(2) LevRatioCE	(3) CapRatio	(4) LevRatioCE	(5) CapRatio	(6) LevRatioCE	(7) CapRatio	(8) LevRatioCE	(9) CapRatio	(10) LevRatioCE
CBO_1	70.63***	3.560								
	(17.67)	(9.928)								
CBO_1*LiqAssetsRatio_1	-23.08	1.160								
	(15.60)	(8.880)								
CDO_1			9.416***	4.928***						
			(3.345)	(1.688)						
CDO_1*LiqAssetsRatio_1			-3.578	-1.856						
			(2.723)	(1.414)						
CommLoans_1					1.996***	-1.154***				
					(0.710)	(0.371)				
Com_1*LiqAssetsRatio_1					-1.608**	0.886***				
					(0.625)	(0.332)				
HomeEquity_1							1.943***	-1.215***		
							(0.590)	(0.313)		
HoEq_1*LiqAssetsRatio_1							-1.504***	0.895***		
							(0.492)	(0.264)		
ResidMort_1									1.627***	-0.717***
									(0.433)	(0.237)
Resid_1*LiqAssetsRatio_1									-1.058***	0.537**
									(0.391)	(0.215)
Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.682	0.456	0.661	0.485	0.655	0.481	0.660	0.493	0.675	0.481

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. Continued

Panel B: 2003Q1-2007Q2

VARIABLES	(1) CapRatio	(2) LevRatioCE	(3) CapRatio	(4) LevRatioCE	(5) CapRatio	(6) LevRatioCE	(7) CapRatio	(8) LevRatioCE	(9) CapRatio	(10) LevRatioCE
CBO_1	78.87***	-0.986								
	(15.09)	(8.412)								
CBO_1*LiqAssetsRatio_1	-7.088	11.48								
	(12.66)	(7.057)								
CDO_1			7.330*	-0.516						
			(4.044)	(1.684)						
CDO_1*LiqAssetsRatio_1			-1.933	1.469						
			(2.898)	(1.290)						
CommLoans_1					2.430*	0.857				
					(1.323)	(0.615)				
Com_1*LiqAssetsRatio_1					-0.927	-0.750				
					(1.192)	(0.552)				
HomeEquity_1							-0.197	-0.239		
							(0.717)	(0.317)		
HoEq_1*LiqAssetsRatio_1							-0.270	0.248		
							(0.519)	(0.237)		
ResidMort_1									-0.155	0.0272
									(0.624)	(0.279)
Resid_1*LiqAssetsRatio_1									0.203	0.126
									(0.559)	(0.250)
Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.583	0.617	0.346	0.602	0.398	0.605	0.337	0.601	0.314	0.599

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. Continued

Panel C: 2007Q3-2010Q4

VARIABLES	(1) CapRatio	(2) LevRatioCE	(3) CapRatio	(4) LevRatioCE	(5) CapRatio	(6) LevRatioCE	(7) CapRatio	(8) LevRatioCE	(9) CapRatio	(10) LevRatioCE
CBO_1	126.4***	7.350								
	(42.42)	(15.25)								
CBO_1*LiqAssetsRatio_1	-104.5**	-8.407								
	(39.67)	(14.27)								
CDO_1			10.16	1.267						
			(6.464)	(2.206)						
CDO_1*LiqAssetsRatio_1			-4.221	0.275						
			(5.291)	(1.818)						
CommLoans_1					1.753*	-0.130				
					(0.997)	(0.361)				
Com_1*LiqAssetsRatio_1					-2.031**	0.0600				
					(0.793)	(0.287)				
HomeEquity_1							3.165***	-0.125		
							(0.969)	(0.355)		
HoEq_1*LiqAssetsRatio_1							-2.337***	0.0871		
							(0.798)	(0.292)		
ResidMort_1									2.594***	0.154
									(0.620)	(0.234)
Resid_1*LiqAssetsRatio_1									-1.954***	-0.217
									(0.538)	(0.203)
Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.747	0.680	0.731	0.689	0.744	0.679	0.752	0.679	0.773	0.687

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. Continued

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio[1]

Asset Types		1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
		Values of the LiqAssetsRatio			Values of the LiqAssetsRatio			Values of the LiqAssetsRatio		
		Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.
CBO	CapRatio	**0.986*** [2]** [0.812] [3]	**0.986*** [1]** [0.936] [2]	**0.986*** [1]** [0.746] [2]	**1.029*** [1]** [0.979] [2]	**1.029*** [1]** [1.013] [2]	**1.029*** [1]** [0.949] [2]	**0.627****	**1.38****	**0.451****
	LevRatioCE	0.058	0.052	0.062	0.069	0.013	0.117	0.009	0.070	-0.005
CDO	CapRatio	**1.427*** [1]** [1.134] [2]	**1.427*** [1]** [1.343] [2]	**1.427*** [1]** [1.023] [2]	**0.939* [4]** [0.803] [5]	**0.939* [3]** [0.896] [4]	**0.939* [3]** [0.724] [4]	1.447	1.892	1.343
	LevRatioCE	**0.747*** [1]** [0.595] [2]	**0.747*** [1]** [0.703] [2]	**0.747*** [1]** [0.537] [2]	0.037	-0.033	0.098	0.317	0.288	0.323
Commercial Loans	CapRatio	**0.505*****	**0.783*****	**0.357*****	**0.658* [3]** [0.521] [4]	**0.658* [3]** [0.615] [4]	**0.658* [3]** [0.440] [4]	**0.094****	**0.804****	**-0.072****
	LevRatioCE	**-0.303*****	**-0.456*****	**-0.221*****	0.121	0.197	0.056	-0.058	-0.079	-0.053
Home Equity Loans	CapRatio	**0.566*****	**0.856*****	**0.411*****	-0.140	-0.099	-0.175	**0.956*****	**1.806*****	**0.758*****
	LevRatioCE	**-0.366*****	**-0.539*****	**-0.274*****	-0.042	-0.079	-0.009	-0.041	-0.072	-0.033
Residential Mortgages	CapRatio	**0.774*****	**1.073*****	**0.614*****	-0.019	-0.051	0.009	**1.187*****	**2.296*****	**0.928*****
	LevRatioCE	**-0.313*****	**-0.465*****	**-0.232*****	0.041	0.021	0.059	-0.022	0.101	-0.051

*** p<0.01, ** p<0.05, * p<0.1

[1] The results in bold characters denote the effects which correspond to statistically significant coefficients in the regression analysis.

[2] The effect considers only the coefficient of the securitisation ratio, which is significant at the 1% level.

[3] The overall effect considers both coefficients (of the securitisation ratio and of the interaction term). However, only the securitisation ratio is significant and at the 1% level

[4] The effect considers only the coefficient of the securitisation ratio, which is significant at the 10% level.

[5] The overall effect considers both coefficients (of the securitisation ratio and of the interaction term). However, only the securitisation ratio is significant and at the 10% level

Table 8. The Impact of Securitisation Issuances Classified by Credit Ratings

Regression Results

	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE
AAA_1	-0.142	-0.0116	-0.117	1.386***	-0.169	-0.463**	-0.382	-0.00280	0.258***
	(0.145)	(0.0784)	(0.0974)	(0.321)	(0.181)	(0.194)	(0.305)	(0.0961)	(0.0984)
AA_A_1	1.259	1.440***	0.842	-4.418***	-0.586	-0.142	2.900**	0.233	-1.441***
	(0.818)	(0.442)	(0.546)	(1.045)	(0.590)	(0.655)	(1.356)	(0.427)	(0.416)
BBB_1	-12.76***	-5.942***	-5.709***	-13.34**	-5.763	1.741	-11.08***	-0.887	-1.315
	(2.487)	(1.346)	(1.649)	(6.266)	(3.538)	(3.449)	(3.229)	(1.017)	(1.038)
BB_B_1	4.528***	0.839	1.046	-9.327	42.08***	38.45***	4.986***	0.822*	1.906***
	(1.114)	(0.603)	(0.664)	(23.47)	(13.25)	(14.61)	(1.412)	(0.445)	(0.365)
CCC_1	2.587***	-0.0719	0.0330	135.7	57.19	132.6	2.276***	0.126	0.480*
	(0.752)	(0.407)	(0.510)	(143.1)	(80.81)	(92.66)	(0.793)	(0.250)	(0.248)
CC_C_1	0.750	0.880	-1.825***	-85.03	-64.35	-21.49	1.609	0.109	-1.371***
	(1.070)	(0.579)	(0.604)	(73.58)	(41.54)	(47.15)	(1.309)	(0.413)	(0.372)
D_1	5.572	3.774**	5.549**	-159.8**	-100.4**	-114.2**	-0.558	0.510	2.274*
	(3.530)	(1.910)	(2.356)	(72.50)	(40.94)	(46.23)	(3.863)	(1.217)	(1.182)
Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.577	0.439	0.342	0.289	0.480	0.442	0.736	0.579	0.681

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 8. Continued

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio[1]

	2003Q1-2007Q2			2007Q3-2010Q4		
VARIABLES	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE
AAA	**+ 0.849 *** **	- 0.104	**- 0.284****	- 0.416	- 0.003	**+ 0.281*****
AA & A	**- 0.613 *** **	- 0.081	+ 0.020	**+ 0.817 ****	+ 0.066	**-0.406*****
BBB	**- 0.333 ****	- 0.144	+ 0.043	**- 1.276 *** **	- 0.102	-0.151

*** p<0.01, ** p<0.05, * p<0.1

[1] The results in bold characters denote the effects which correspond to statistically significant coefficients in the regression analysis.

Table 9. The Impact of Securitisation Classified by Credit Ratings: Interaction with the Liquid Assets Ratio

Regression Results

Panel A: 1999Q1-2010Q4

VARIABLES	(1) CapRatio	(2) LevRatioCE	(3) CapRatio	(4) LevRatioCE	(5) CapRatio	(6) LevRatioCE
AAA_1	0.749**	-0.475***				
	(0.328)	(0.175)				
AAA_1*LiqAssetsRatio_1	-0.895***	0.398***				
	(0.279)	(0.151)				
AA_1			5.439**	-3.306***		
			(2.288)	(1.200)		
AA_1* LiqAssetsRatio_1			-4.886**	2.611**		
			(2.049)	(1.098)		
A_1					8.280**	-3.921*
					(3.872)	(2.177)
A_1* LiqAssetsRatio_1					-3.489	2.793
					(3.738)	(2.111)
Bank Controls	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES
R-squared	0.661	0.475	0.651	0.475	0.675	0.469

Panel B: 2003Q1-2007Q2

VARIABLES	(1) CapRatio	(2) LevRatioCE	(3) CapRatio	(4) LevRatioCE	(5) CapRatio	(6) LevRatioCE
AAA_1	0.610	-0.0619				
	(0.453)	(0.208)				
AAA_1*LiqAssetsRatio_1	-0.00547	0.0986				
	(0.392)	(0.179)				
AA_1			-1.618	-0.354		
			(2.635)	(1.191)		
AA_1* LiqAssetsRatio_1			-2.209	0.826		
			(2.071)	(0.967)		
A_1					-11.19*	-0.895
					(6.648)	(3.157)
A_1* LiqAssetsRatio_1					-0.680	2.175
					(5.971)	(2.841)
Bank Controls	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES
R-squared	0.351	0.596	0.366	0.600	0.388	0.599

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Panel C: 2007Q3-2010Q4

VARIABLES	(1) CapRatio	(2) LevRatioCE	(3) CapRatio	(4) LevRatioCE	(5) CapRatio	(6) LevRatioCE
AAA_1	-3.49e-05	-0.0847				
	(0.491)	(0.199)				
AAA_1*LiqAssetsRatio_1	-0.983**	0.107				
	(0.385)	(0.155)				
AA_1			8.131*	-0.904		
			(4.379)	(1.526)		
AA_1* LiqAssetsRatio_1			-7.034*	1.074		
			(3.947)	(1.377)		
A_1					10.79**	-0.201
					(4.566)	(1.655)
A_1* LiqAssetsRatio_1					-5.532	-1.063
					(4.378)	(1.585)
Bank Controls	YES	YES	YES	YES	YES	YES
Bank Fixed Effects	YES	YES	YES	YES	YES	YES
Quarter Fixed Effects	YES	YES	YES	YES	YES	YES
R-squared	0.796	0.681	0.727	0.681	0.762	0.703

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio[1]

Rating Groups		1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
		Values of the LiqAssetsRatio			Values of the LiqAssetsRatio			Values of the LiqAssetsRatio		
		Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.	Mean	25th Perc.	75th Perc.
AAA	CapRatio	**0.2*** **	**0.461*** **	**0.061*** **	0.373	0.373	0.371	**-0.854**[2]** [-0.854] [3]	**-0.324**[1]** [-0.324] [2]	**-0.978**[1]** [-0.978] [2]
	LevRatioCE	**-0.196*** **	**-0.312*** **	**-0.135*** **	-0.005	-0.027	0.015	-0.0007	-0.057	0.014
AA	CapRatio	**0.293****	**0.49****	**0.188****	-0.285	-0.202	-0.357	**0.347***	**0.827***	**0.235***
	LevRatioCE	**-0.198****	**-0.304****	**-0.142****	0.010	-0.021	0.037	-0.007	-0.080	0.011
A	CapRatio	**0.813**** [4] [0.627] [5]	**0.813**** [3] [0.759] [4]	**0.813**** [3] [0.557] [4]	**-0.487*** [5] [-0.503] [6]	**-0.487*** [5] [-0.492] [6]	**-0.487*** [5] [-0.513] [6]	**1.746**** [1.032]	**1.746**** [1.475]	**1.746**** [0.928]
	LevRatioCE	**-0.385*** [6] [-0.237] [7]	**-0.385*** [5] [-0.342] [6]	**-0.385*** [5] [-0.180] [6]	0.013	-0.023	0.043	-0.170	-0.085	-0.190

[1] The results in bold characters denote the effects which correspond to statistically significant coefficients in the regression analysis.

[2] The effect considers only the coefficient of the interaction term, which is significant at the 5% level

[3] The overall effect considers both coefficients (of the securitisation ratio and of the interaction term). However, only the interaction term is significant and at the 5% level

[4] The effect considers only the coefficient of the securitisation ratio, which is significant at the 5% level.

[5] The overall effect considers both coefficients (of the securitisation ratio and of the interaction term). However, only the securitisation ratio is significant and at the 5% level

[6] The effect considers only the coefficient of the securitisation ratio, which is significant at the 10% level.

[7] The overall effect considers both coefficients (of the securitisation ratio and of the interaction term). However, only the securitisation ratio is significant and at the 5% level

Appendix A

The regulatory treatment of securitisation positions in the Ratings-Based Approach (Basel II)

RBA risk weights when the external assessment represents a long-term credit rating and/or an inferred rating derived from a long-term assessment

External Rating (Illustrative)	Risk weights for senior positions and eligible senior IAA exposures	Base risk weights	Risk weights for tranches backed by non-granular pools
AAA	7%	12%	20%
AA	8%	15%	25%
A+	10%	18%	35%
A	12%	20%	
A-	20%	35%	
BBB+	35%	50%	
BBB	60%	75%	
BBB-	100%		
BB+	250%		
BB	425%		
BB-	650%		
Below BB- and unrated	Deduction		

Source: Basel Committee (2006), *Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework - Comprehensive Version*, p.135.

Appendix B

Table B.1. The Impact of Securitisations Classified by Asset Type: Interaction with Crisis Dummy

The table presents the results from the estimation of the regression equation in equation (5), with the introduction of an interaction term with a crisis dummy for each explanatory variable. In this way, I estimate the regression equation for the entire sample, without distinguishing a pre-crisis and a crisis period.

VARIABLES	(1) CapRatio	(2) LevRatio_CAP
CBO	**38.66*** ** (11.60)	**6.517** (5.741)
CBO * CRISIS	**14.26** (15.00)	**40.41***** (7.604)
CDO	**3.456*** ** (1.196)	**1.175*** (0.611)
CDO * CRISIS	**-1.801**** (0.854)	**0.110** (0.436)
CLO	**5.211** (10.90)	**16.67*** ** (10.90)
CLO * CRISIS	**-12.64** (14.30)	**-3.244** (7.293)
Comm Loans	**0.767*** (0.392)	**-0.273** (0.200)
Comm Loans * CRISIS	**-2.297*** ** (0.433)	**-0.556**** (0.221)
Home Equity	**0.117** (0.411)	**-0.360*** (0.210)
Home Equity * CRISIS	**0.836*** (0.471)	**1.130*** ** (0.240)
Pers Loans	**7.574** (10.88)	**-3.111** (5.551)
Pers Loans * CRISIS	**-1.342** (11.84)	**8.860** (6.043)
Resid Mort	**-0.304** (0.379)	**-0.00634** (0.193)
Resid Mort * CRISIS	**0.872**** (0.402)	**-0.196** (0.205)
Credit Card	**-7.701*** ** (2.819)	**-2.954**** (1.439)
Credit Card * CRISIS	**-25.21*** ** (5.752)	**-16.06*** ** (2.933)
Mix Receiv	**-11.47**** (5.015)	**-3.367** (2.559)
Mix Receiv * CRISIS	**12.84** (16.88)	**-38.71*** ** (8.527)
Issuer EU	**1.833**** (0.810)	**1.473*** ** (0.413)
Issuer EU * CRISIS	**-3.048** (2.463)	**5.746*** ** (1.245)
Constant	**0.120*** ** (0.00429)	**0.0566*** ** (0.00219)
R-squared	0.630	0.562

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix C

Table C.1. The Impact of Securitisations Classified by Credit Ratings: Interaction with Crisis Dummy

The table presents the results from the estimation of the regression equation in (7), with the introduction of an interaction term with a crisis dummy for each explanatory variable. In this way, I estimate the regression equation for the entire sample, without distinguishing a pre-crisis and a crisis period.

VARIABLES	(1) CapRatio	(2) LevRatio_CAP
AAA	**0.572** (0.357)	**-0.446**** (0.191)
AAA * CRISIS	**-1.221***** (0.400)	**0.231** (0.214)
AA & A	**-4.304***** (1.156)	**-0.495** (0.617)
AA & A * CRISIS	**7.931***** (1.480)	**3.820***** (0.790)
BBB	**0.583** (5.572)	**-2.305** (2.976)
BBB * CRISIS	**-14.12**** (6.145)	**-3.240** (3.282)
BB & B	**23.49** (21.27)	**39.14***** (11.36)
BB & B * CRISIS	**-19.31** (21.24)	**-39.86***** (11.34)
CCC	**9.314** (84.44)	**-57.24** (45.06)
CCC * CRISIS	**-6.713** (84.41)	**57.32** (45.04)
CC & C	**-160.3**** (78.78)	**-79.18*** (42.04)
CC & C * CRISIS	**160.4**** (78.81)	**79.81*** (42.06)
D	**-267.1***** (76.62)	**-123.9***** (40.94)
D * CRISIS	**268.5***** (76.46)	**124.3***** (40.86)
Issuer EU	**0.402** (0.742)	**1.674***** (0.396)
Issuer EU * CRISIS	**1.234** (0.915)	**0.412** (0.489)
Constant	**0.125***** (0.00414)	**0.0586***** (0.00221)
R-squared	0.639	0.533

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1