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

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Abstract

The paper analyses how banks manage their capital position when they securitise, by focusing on the issuances sponsored by European banks before and after the financial 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 changes in the risk-based capital ratios and in the leverage ratios of securitiser banks, for different classes of products. In the pre-crisis period, banks observed an increase in their risk-based capital ratios particularly from the transfer of risky assets. In the crisis time, securitiser banks improved their risk-weighted solvency ratios but without reducing their actual leverage: across products, this increase in the risk-based prudential ratios was larger for the issuances of asset-backed securities eligible as collateral for monetary policy, which banks could retain and pledge in central bank liquidity operations. Also, across banks, institutions in weaker liquidity conditions exploited the regulatory arbitrage opportunities of the securitisation framework to obtain larger increases in their prudential solvency ratios. 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.

JEL Classifications: G21, G23, G28, E58

Key-words: Securitisation, Risk-weighted Capital Ratio, Leverage Ratio, Bank Liquidity, 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 (SPV) 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 credit 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 were able to shrink their risk-weighted assets. Consequently, they could either free up regulatory capital or – by keeping capital constant – they 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 to retain the credit risk of the underlying assets may have relevant implications for the capital position of originator banks. Indeed, banks offering credit enhancement or retaining structured tranches have to keep some capital buffer for the retained risk; also, banks providing ex post implicit recourse to their securitisation vehicles need to readjust their capital base after the support.

The scope of this study is to investigate how banks conducting securitisation manage their capital position, when they transfer or when they retain the underlying credit risk. In particular, the empirical analysis focuses on the issuances of securitisation sponsored by European banks in the period between 1999 and 2010. Stylised facts suggest that, at the time of the crisis, European banks changed the main purpose of their securitisation activity: before they had used securitisation mostly as a credit risk transfer technique, to remove the credit risk of risky assets out of their balance sheets; while, from the beginning of the crisis, they started to retain on balance sheet most of their issuances of asset-backed securities, mainly to increase the amount of eligible collateral in repo operations for liquidity purposes. These facts offer the empirical motivation for the study. Indeed, the change in the securitisation strategy of European banks provides the opportunity to analysis the management of bank balance sheets and capital position both under risk transfer and under risk retention.

First, I explore the variations in the capital position of securitiser banks, by considering the changes in the risk-weighted capital ratios and in the leverage ratios following the issuances. I compare the variations in the two capital ratios to investigate whether and how banks exploited potential regulatory arbitrage opportunities of the prudential framework, due to the system of risk weights or to the definition of capital instruments. I find that, on average, securitiser banks registered some significant increases in their risk-weighted capital ratios, so they obtained some improvements in their prudential ratios from the regulatory point of view; while in fact they were not changing or were even worsening their actual solvency (i.e. leverage ratios remained unchanged or even decreased).

Second, I analyse the differences in the capital management of securitiser banks before and during the crisis. In general, we would suppose that banks transferring the credit risk should obtain an improvement in their risk-based capital ratios (because they have decreased their risk-weighted

assets), while banks retaining the credit risk should not significantly change their prudential solvency (as they have kept the exposures on their balance sheet). In practice this may hold, in a capital framework based on risk-weighted solvency ratios, only if the risk weights on the retained securitisation positions are equal to the risk weights on the underlying securitised assets.

In fact, the prudential regulation in place during the crisis period - based on the Basel II agreement - disciplined the securitisation framework such that, in some peculiar cases, the risk weights for high-rating securitisation positions could be lower than the risk weights on the underlying assets. This means that banks could securitise their assets, retain the issued products on balance sheet and still decrease their risk-weighted assets. The empirical analysis shows that banks involved in securitisation obtained larger increases in their risk-weighted capital ratios particularly during the crisis period, at the time when they were actually retaining the vast majority of the issued asset-backed securities. Also, when distinguishing various classes of structured products, larger increases in the risk-based capital ratios¹ in the crisis time were observed for the issuance of securitisation tranches receiving a more favourable prudential treatment, as subject to low risk weights in capital regulation.

Third, I investigate whether different ex-ante balance sheet conditions of originator institutions could explain differences in their management of securitisation operations, as observed from the ex-post variations in the banks' capital position after the issuances. Indeed, the existing 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 conducting a securitisation operation, banks with lower liquidity exploited the regulatory arbitrage opportunities offered by the prudential framework relatively more than banks with higher liquidity. Moreover, when classifying the structured products by distinct classes, I find that the largest increases in the risk-based capital ratios of less-liquid securitiser banks - during the crisis - were observed for the issuances of products eligible as collateral for central bank liquidity operations, like high-rating asset-backed securities backed by residential mortgages or home equity loans.

In order to understand the key role of bank funding liquidity for the issuance of collateraleligible securitisation products, as documented in the empirical analysis, we need to consider some details of the institutional and regulatory framework. This is useful to clarify the key economic incentives for which European banks started to retain most of their issuances of asset-backed securities during the crisis.

The empirical study analyses 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 European banks did not transfer completely the credit risk in structured deals and actually, from the beginning of the crisis, they pursued a strategy of risk retention.

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¹ While no or small changes in the leverage ratios

In particular, we observe that, from the last quarter of 2007 and until mid-2010, European banks retained almost all the issuances of asset-backed securities (ABSs) 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 was different 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 $0\%^2$.

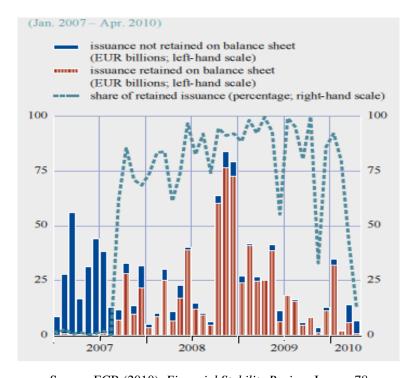


Figure 1: Retained Issuances of Asset-Backed Securities by Euro Area Banks

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. Indeed, it is true that some concerns for the creditworthiness of securitisation could have induced some reduction in the market demand for these products in several jurisdictions. However, while in the US such confidence crisis determined a substantial decline in the issuance volumes of securitisation, in Europe banks continued to issue structured products but by retaining them on balance sheet. Then, some peculiar features of the overall regulatory framework in Europe may suggest some explanations about the incentives for risk retention of securitiser banks. I focus on one key aspect, the collateral framework of the Eurosystem.

A key motivation for this retention behaviour was related to the possibility of using securitisation products as collateral in the liquidity operations with central banks: indeed, the monetary policy collateral framework of the Eurosystem allowed for a broad set of eligible instruments, including asset-backed securities. This was important for banks interested in obtaining

² 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).

central bank liquidity, particularly during the crisis. Indeed, banks could not directly pledge loans as collateral (at least until some revisions of the collateral framework introduced at the end of 2011), but they could collect various loans in a pool of assets to set up a securitisation operation and then retain the tranches on balance sheet. These products could then be posted as collateral in the refinancing operations with the Eurosystem. In this perspective, banks potentially interested in obtaining central bank liquidity had the incentive to increase the amount of eligible collateral assets on balance sheet, since the availability of adequate collateral was a pre-requisite for banks to participate in liquidity operations. This underlines the importance of the collateral eligibility of structured products for the management of securitisation operations, during the period analysed in this work.

In order to develop the empirical analysis, I have constructed a new dataset of more than 17,000 securitisation tranches issued by European banks between 1999 and 2010 and I have combined the tranche-level information on structured products with the bank balance sheet data for the corresponding originator banks, on a quarterly basis. The empirical analysis is structured in two parts.

In the first part, I estimate the variations in the capital ratios of securitiser banks, for the overall issuances of structured products. The results of the baseline specification show that, on average, for 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, when distinguishing different time samples, I find that this divergence between the risk-based capital ratio and the leverage ratio was also more relevant during the crisis period (due to the larger magnitude of the marginal increase in the risk-based capital ratios).

Then I explore bank heterogeneity and in particular I investigate the role of bank liquidity position. Funding liquidity may be an important factor in the securitisation operations of credit institutions (Loutskina, 2011; Almazan, Martin Oliver and Saurina, 2015). Banks subject to funding constraints may be interested in undertaking securitisation operations, either to obtain directly liquidity from external investors (who purchase the structured products placed on the market), or to increase the availability of liquid assets pledgeable as collateral in repo operations (if the issued products are eligible for this purpose).

The results of the empirical analysis show that the ex-post variation in the capital position of securitiser banks was indeed different across institutions, depending on their ex-ante funding liquidity conditions. For a given increase in the securitisation activity, less-liquid banks observed larger increases in their risk-weighted capital ratios and eventually wider decreases in their leverage ratios, compared with more-liquid banks. This is documented for various measures of funding liquidity, such as the liquid assets ratio, the loans to deposits ratio and the short-term borrowing ratio.

This evidence, based on the estimation for the overall amount of issuances, suggest that – during the crisis period - banks in a weaker liquidity position exploited the regulatory arbitrage opportunities offered by prudential regulation more than banks in stronger liquidity conditions. Indeed, the interaction between liquidity and securitisation was significant to explain the capital variation of securitiser banks only for the crisis period; while, in the pre-crisis time, the change in the capital ratios of originator banks was not dependent on their existing funding liquidity position.

Based on these results, liquidity constraints seem to be relevant for the capital management of securitiser banks and then for the potential incentives to regulatory arbitrage only when credit institutions were retaining most of their issuances of asset-backed securities. Given this observation, I propose and explore a potential explanation for the link between liquidity shortage and regulatory arbitrage: banks subject to stronger liquidity pressures, and then potentially more interested in retaining asset-backed securities as eligible collateral for central bank liquidity operations, could have been also more interested in conducting securitisation in such a way to minimise the impact of this risk retention on bank capital requirements.

To investigate this hypothesis in more detail, I conduct the second part of the analysis on a more granular basis, by classifying the outstanding amounts of structured products either by asset type or by credit rating. In this way, I can distinguish – both for asset types and for credit ratings – whether a given class of products was eligible as collateral for central bank liquidity operations. Then I study whether the issuances of different classes of securitisation were associated with different variations in the bank capital position, before and during the crisis. The results reveal that the observed increases in the risk-based capital ratios of securitiser banks were actually driven by the issuances of different types of products in the pre-crisis and in the crisis period.

In the pre-crisis period, the improvements in prudential solvency ratios were mainly due to the issuances of complex and risky products, not eligible as collateral, such as CBOs (Collateralised Bond Obligations) and CDOs (Collateralised Debt Obligations). This is consistent with the fact that banks were using securitisation to transfer the risk related to the underlying assets, and indeed the increase in the prudential solvency ratios was proportional to the amount of risk transferred out of the balance sheets. Also, when considering the specific classes of products, the variation in the capital position of securitiser banks – in the pre-crisis period - was not dependent on the existing funding liquidity position of the originator banks.

On the contrary, during the crisis, the largest increases in risk-based capital ratios for securitiser banks were observed following the issuances of less-risky products, eligible as collateral and subject to low risk weights: in particular, regarding asset types, for the issuances of ABSs (Asset-Backed Securities) backed by residential mortgages and by home equity loans; concerning credit ratings, for the issuances rated as AA or A. In particular, for a given increase in the securitisation issuance of these specific classes, the improvement in prudential solvency ratios was actually larger for banks in an ex-ante weaker liquidity position.

This wider increase in prudential solvency ratios, registered for products eligible as collateral, means that banks interested in retaining ABSs for collateral purposes were also – at the margin – more active in exploiting the regulatory arbitrage opportunities of the prudential framework; indeed, they wanted to minimise the implications of risk retention on their capital requirements. Also, the fact that this effect was actually larger for less-liquid banks confirms that the rationale of this conduct was to improve the access to central bank operations for credit institutions in weaker funding liquidity conditions, through the increase of eligible collateral.

The paper contributes to the literature on various aspects. First, it analyses the variations in the capital position of securitiser banks, not only when they transfer the credit risk, but in particular 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 such exposures 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 management of the securitisation deal by originator banks, potentially by reinforcing the incentives for regulatory arbitrage. Fourth, the analysis investigates the interaction between the collateral eligibility criteria for monetary policy and the prudential requirements for securitisation and illustrates the implications of such interaction for the incentives of banks.

The results of the paper may be relevant in a policy perspective for various 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, for the potential incentives regarding the risk management and the capital position of originator banks. The retention of eligible asset-backed securities – in the process of securitisation - may affect the capital position and the composition of bank balance sheets, with potential implications for prudential supervisors. This confirms the strong interaction between monetary policy and prudential supervision within the current mandate of many central banks, including the European Central Bank in the Euro Area (since the creation of the Single Supervisory Mechanism in November 2014).

Second, the work offers insights for the global reforms of prudential regulation. Indeed, in the aftermath of the financial crisis, the regulatory framework for credit intermediaries has come under scrutiny for its potential contribution – in the pre-crisis time - to incentivise the growth of the shadow banking sector and the increase in bank leverage. For this reason, the international standard-setter bodies have adopted some proposals to address the incoming risks for financial stability: in particular, we can think about the introduction of the retention requirements for securitisation (implemented) and of the new leverage ratio (in course of implementation).

The regulatory initiatives in the area of securitisation addressed the potentially negative impact of the originate-to-distribute model on bank monitoring and lending standards: 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, suggest that their effectiveness would strongly depend on their actual 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 investors³. 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.

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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)

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 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 investors⁴ (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 tranches⁵, interest-only strips⁶, over-collateralisation⁷, credit guarantees⁸ or liquidity lines⁹. 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"

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.

securitisers, while a risk-increasing effect for "large scale" securitisers, depending on the fraction of the assets that banks decide to securitise.

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 intervention¹⁰. Cases of implicit recourse¹¹ 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 was subject to a peculiar regulatory framework, for the accounting regime, the prudential requirements on capital adequacy and the collateral eligibility criteria 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 accounting reforms introduced in the US after the crisis. The accounting regime established by the IFRS implies a two-stage evaluation process.

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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.

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 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 consolidation¹². In such cases, the amount of bank total assets might not always reflect full consolidation of sponsored entities¹³.

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 Various solutions were exploited by banks in different jurisdictions. For instance, 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 However, this may be relevant for the empirical analysis only in the case of complete risk transfer for securitisation. On the other hand, this problem doesn't arise 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, according to the rule on "Significant Risk Transfer", 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, 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 collateral 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, including asset-backed securities. As explained 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 Area¹⁴ 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 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.

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

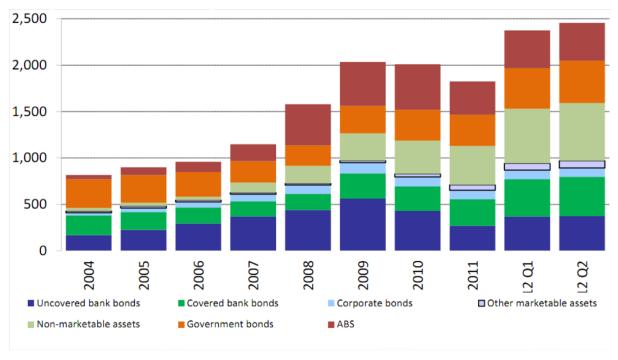


Figure 2. Use of Collateral with the Eurosystem by Asset Type (Euro billions)

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

Then, in the following years, the above collateral requirements were subject to some technical refinements¹⁵. However, they did not change the main collateral requirement in terms ofcredit 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 collateral instruments, 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 only in December 2011, when - in order to ensure the availability of sufficient collateral to counterparties at the peak of the sovereign debt crisis - the ECB Governing Council

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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.

allowed national central banks, as a temporary solution, to accept as collateral performing credit claims subject to specific eligibility criteria¹⁶. After that, the main rationale for the "securitise-to-repo" strategy was substantially removed.

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. A complete transfer of credit risk in securitisation may imply some risks for financial stability, if – under asymmetric information - banks are induced to originate and distribute loans with a very high credit risk and special purpose vehicles issue structured products with high ratings but based on assets of poor quality. In such case, 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. Indeed, 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 regulation¹⁷, 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 assets¹⁸.

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 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.

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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.

4. Conceptual Framework

The aim of the paper is to investigate how banks manage their capital position after securitisation, both when they transfer and when they retain the credit risk of the underlying pool of assets. To tackle this question, I introduce some hypotheses about the possible changes in bank balance sheets which may follow a securitisation operation - in case of risk transfer or retention - and then I consider the variations in bank solvency, as measured by two different ratios, 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 – are relevant for the capital position of credit institutions, since their capital buffer is determined as a function of the credit risk of bank assets. The theoretical literature (Dewatripont and Tirole, 1994; Freixas and Rochet, 2008) has extensively investigated why and how much capital banks should hold for their exposures and why capital regulation would be desirable for credit institutions.

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.

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. For this reason, to cover for unexpected losses of bank activities¹⁹, prudential regulation defines a minimum target for bank capital ratios and also risk-sensitive criteria to compute the solvency requirements. In this way, regulation provides an indication of the minimum size of the capital buffer that a bank should hold, relative to the risks of bank exposures.

In practice, the actual capital ratios of banks may be different from the minimum requirements set in the Basel framework (see Berger, DeYoung, Flannery, Lee and Oztekin, 2008). On average, banks tend to keep an amount of risk-based capital which is higher than the minimum required by the Basel rules, for various reasons. Banks may want to hold additional capital to satisfy some market expectations²⁰, or to protect against specific risks, which are not taken into account in the existing prudential regulation, but which can affect bank balance sheets.

All the operations which change the credit risk of bank activities may imply some variation in the capital position of credit institutions. In particular, a securitisation operation may induce some changes in the balance sheets and also in the capital ratios of originator banks. I discuss this by using a simple illustration. I consider an originator bank which securitises some credit claims previously existing on its balance sheet.

²⁰ Market expectations could be based, for instance, on the credit rating assigned to the institution, or on a target rating that the bank would like to achieve.

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.

Figure 3 presents the balance sheet of such a hypothetical bank²¹: 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.

ASSETS LIABILITIES Cash Deposits Loans Debt CAPITAL Securities RECEIVABLES 100 100 SPV **ASSETS** LIABILITIES ABS ABS Loans INVESTORS 10 10 CASH CASH COUPON PAYMENTS LOAN PAYMENTS **DEBTORS**

Figure 3. A stylised representation of the securitisation process

Source: Author's elaboration

I use this simple example to formulate some hypotheses about the changes in the capital position of a securitiser bank, both when it transfers and when it retains the credit risk on the underlying assets. In particular, I consider the variations in two measures of bank solvency, the risk-weighted capital ratio and the leverage ratio. The risk-weighted capital ratio is defined, as in the traditional Basel framework, as the ratio of total regulatory capital to risk-weighted assets. For this illustration, I define the leverage ratio as the ratio of total regulatory capital to total assets²². In this way, since the two ratios present the same numerator but different denominators, I can compare the two capital ratios and attribute their differences to the system of risk weights, as set in the Basel prudential framework.

The creation of a SPV sponsored by the banking group and the transfer of some assets from the bank to the SPV are regulated by the accounting principles for the consolidation of bank holdings. These are relevant in order to determine the amount of total assets, which is considered in

²¹ 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.

²² For the terminology used in section 6.1 (on the empirical specification), this definition of leverage ratio corresponds to the so called "regulatory capital leverage ratio". This measure has a larger numerator than the "common equity leverage ratio" (i.e. regulatory capital is larger than common equity). However, for the purpose of this example, focusing on the (regulatory capital) leverage ratio allows for easier comparability with the risk-based capital ratio.

the computation of the leverage ratio. Indeed, it is measured with respect to all the assets of the consolidated banking group, both on balance sheet and off balance sheet.

Given the accounting framework implemented in the EU²³ through the IFRS principles, the SPV – if it is controlled by the parent bank - 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 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 composition of assets and liabilities in the bank balance sheet (indirect effect of securitisation).

In this paragraph I focus on the direct effects of securitisation. Then I consider the changes in the capital position which are directly determined by the decision of the originator banks to transfer or to retain the credit risk on the underlying assets. Then, in the following section, I extend the discussion to the indirect effects of securitisation and I consider all the possible variations in the balance sheet composition.

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 variations in the risk-based capital ratio after securitisation 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

17

²³ 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.

securitisation. Instead, if the risk-weighted value of the securitisation position is lower than the risk-based amount of the securitised assets²⁴, 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 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 sometime²⁵.

4.3 Securitisation Issuances, 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 ratio²⁶, 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 debt²⁷: in all

²⁴ 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).

²⁵ 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.

²⁶ 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.

²⁷ 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.

Figure 4. Securitisation Issuances, 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<sub>ASSETS Or if bank increases capital</rwa<sub>
	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	\bigcup	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

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 change²⁸. 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

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²⁸ 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 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.

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.

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 requirements²⁹. 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

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²⁹ 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.

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, provided that the bank holding is headquartered in Europe³⁰. 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, asset type 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).

21

³⁰ In my definition, Europe refers to the geographical continent. Then I include not only the member states of the European Union, but also Switzerland.

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 asset type, issuer nationality and credit rating.

6. Securitisation Issuances and Bank Capital Position

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

6.1 The Empirical Specification

In the baseline empirical specification, I estimate the following panel regression 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, to exclude the effects of 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 equity³¹ 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 consideration³². This has two implications. On one side, the analysis of the potential variations in such measures of leverage ratio can be useful to compare the trends in

³¹ 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.

³² 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 on 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.

different solvency ratios, following the same securitisation operation. ³³. This may be relevant 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 exercise 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 regulation³⁴.

The main explanatory variable is defined as the ratio of the outstanding amounts of securitisation sponsored by a bank i 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 be correlated with bank capital in a potentially different way, depending on the considered period and on the degree of market distress³⁵. 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 securitisation³⁶. 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. For this reason, the analysis has to be conducted by controlling for bank-specific characteristics. However, bank balance sheet controls may not completely account for all the unobserved fixed characteristics, regarding the bank's policy for the management of credit risk management, which may matter for the decisions about risk transfer or retention after securitisation. This explains the rationale for a

³³ An interpretation of these results in a potential counterfactual perspective may be subject to a key caveat: the provision of a compulsory leverage ratio could have affected bank incentives in a different way with regard to their securitisation behaviour

³⁴ 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.

³⁵ 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 lower capital ratios.

³⁶ The retention requirements for securitisation were introduced in the EU and in the US only in 2011.

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 discussed in the conceptual 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 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 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 the change of the banks' capital position after securitisation. Then I run the following panel regression 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 liquid assets 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 liquidassets 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 retained securitisation as collateral 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 defined 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 framework³⁷, 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.

³⁷ 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.

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.

6.2.1 The Variations in Risk-Based Capital and Leverage Ratios

First, following the specification in equation (1), I estimate the changes in bank capital ratios after securitisation, for the overall amount of structured products issued by (the subsidiaries of) each institution. Table 2 presents the results of this baseline specification. In particular, I consider the variations in the risk-weighted capital ratio, in the (regulatory capital) leverage ratio and in the (common equity) leverage ratio. Moreover, to gauge the economic size of these results, I compute the marginal effect 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 general variations in bank capital ratios after securitisation. This doesn't exclude that banks may display different variations in their capital ratios following the issuances of different classes of securitisation products ³⁸, given the heterogeneous characteristics of the products, and the distinct treatments of regulation.

The evidence suggests that the choice of one or another definition of bank capital ratios is particularly relevant to explain the changes in the bank capital position after securitisation: 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, for a one-standard-deviation increase in the securitisation ratio, we observe: an increase 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)³⁹.

³⁹ 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.

³⁸ The results obtained in this regression reflect some compositional issues, as they are determined as the weighted average of the marginal effects observed for different types of products, whereas the sign may be positive for some and negative for others.

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. 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. This may reflect the coexistence of marginal effects of opposite sign for distinct classes of products.

In the crisis time, banks expanding their securitisation activity registered a substantial increase in their risk-weighted capital ratios, but no significant change in their leverage ratios. In particular, a one-standard-deviation increase in the securitisation ratio was associated with 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 (Loutskina, 2011), 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 differences in bank liquidity position can explain potential differences in the management of securitisation operations across banks. 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 banks increasing their issuances of securitisation registered an increase in their risk-based capital ratios, but that this effect was larger for banks with weaker liquidity position (i.e. with lower liquid assets ratio). I compute the marginal effect of a one-standard-deviation increase in the securitisation ratio for different values of the liquid assets ratio. Considering both the coefficients of the main explanatory and of the interaction term, I find that an increase in the securitisation ratio is associated with an increase in the risk-weighted capital ratios, for all values of the liquid assets ratio below 1.5⁴⁰. Also, within the distribution of this variable, a decrease in the liquid assets ratio (a weakening in the bank's funding liquidity) from the 75th percentile to the 25th percentile would increase the positive change in the risk-based capital ratio from +0.676 to +1.209. This means that banks with weaker funding liquidity, when implementing a structured finance operation, obtained larger improvements in their risk-based capital ratios than other banks. A possible explanation could 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 could be functional to such purpose.

At the same time, as observed in Table 2, the evidence shows that banks increasing their securitisation issuances observed a reduction in their (common equity) leverage ratio. For banks with an average liquid assets ratio, a one-standard deviation increase in the securitisation ratio was associated with a decrease in the (common equity) leverage ratio by -0.367 (-9.3% with respect to the mean ratio). The funding liquidity position of a bank has a substantial role in explaining this effect: a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile increased 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 to a larger extent than more-liquid banks.

Also, we may argue that this increase in leverage was mainly due to a reduction in the common equity relative to total assets. Indeed, the coefficient for the (common equity) leverage ratio is negative and significant, while the coefficient for the (regulatory capital) leverage ratio is marginally positive but non-significant. Provided that both leverage ratios have the same denominator (total assets) but different numerators (capital base), this difference in the coefficient would be explained by changes in the composition of the capital base. Then we may suppose that banks reduced common equity - more loss-absorbing but also more costly – while they increased other sources of capital - less loss-absorbing but possibly more affordable for weaker banks.

This liquidity-induced source of regulatory arbitrage may be captured from comparing the marginal effects on the risk-weighted capital ratio and on the (common equity) leverage ratio, for

27

⁴⁰ 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.

banks with low (25th percentile) and high (75th percentile) liquidity. Both the increase in the risk-based capital ratio and the decrease in 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. Then I explore whether this effect may work differently, in distinct sub-periods.

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 variation in the capital ratios of securitiser banks. I observe only some minor and non-significant effects for the main explanatory and for the interaction term: this is consistent with the non-significant effects for the pre-crisis time in Table 2.

For the crisis time, the evidence reveals a substantial role of liquidity in explaining the differences – across banks - in the capital management of securitisation operations. For a bank with an average liquid assets $\operatorname{ratio}^{41}$, a one-standard-deviation increase in the securitisation ratio increased the risk-based capital ratios by 1.98 points (+14.6% with respect to the mean ratio), the (regulatory capital) leverage ratios by 0.29 points (+6.4% with respect to the mean ratio) while it did not imply significant changes in the (common equity) leverage ratios. However, less-liquid banks obtained from securitisation larger gains in terms of prudential solvency ratios than more-liquid banks. Indeed, the marginal increase in the risk-based capital ratios becomes larger for banks in a weaker liquidity position: a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile enlarges the marginal effect from +1.70 to +3.17.

In this period I don't observe statistically significant decreases in the (common equity) leverage ratio. But the gap between the increase in the risk-based capital ratio and the null effect 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 marginal (positive) effect of securitisation on the risk-weighted capital ratio from +0.754 to +1.084, but it also augments the marginal (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 variations of the risk-weighted capital ratios during the crisis time.

28

 $^{^{41}}$ For the crisis period, the mean value of the liquid assets ratio is equal to 0.80, while the 25^{th} 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 negative variation in the (common equity) leverage ratio 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 variation in 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. The key rationale for banks to retain ABSs during that period was to enlarge the availability of eligible collateral, in order to be able to participate in the liquidity operations of central banks. Indeed, credit institutions in a weaker liquidity position, being more involved in central bank liquidity operations, were also potentially more interested in increasing - through ABS retention - the amount of eligible collateral for central bank repos⁴².

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

⁴² 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. In this perspective, the liquid assets ratio may be considered as a good indicator of funding liquidity also with respect to the availability of eligible assets, given that most eligible assets are actually marketable instruments held as trading securities (and then included in the amount of liquid assets). For this reason, 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 were subject to lower risk weights or, more precisely, which presented 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, since they are subject to different regulatory regimes, both for collateral criteria, and for prudential requirements. Indeed, only some products are eligible as collateral for central bank liquidity operations and also different securitisation exposures 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 issuances of structured products in various classes and I analyse the changes in the capital position of originator banks after the issuance of different types of securitisation products. In this way, I take into account the potential differences in the regulatory treatment of distinct classes of securitisation products.

7.1 Financial Regulation and Distinct Classes of Securitisation

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 it has different impacts on other categories of instruments. For this reason, different rules imply different treatments for 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 be relevant for the decisions of originator banks for risk transfer or retention after securitisation.

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 claims⁴³.

Given this multiplicity of treatments, I have two objectives for the analysis: 1) investigate – without distinction across banks - the changes in the capital ratios following the issuance of different classes of securitisation, subject to distinct regulatory regimes; 2) analyse the changes in the bank capital position after securitisation for given types of issuance and explore whether this variation may be different across banks with heterogeneous characteristics (in particular for funding liquidity). Then I follow two different specifications.

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

$$(3) \ \ y_{it} = \ \alpha_i + \delta_t + \beta_1 SECUR_X_{it-1} + \beta_2 SECUR_Y_{it-1} + \dots + \beta_n SECUR_Z_{it-1} + + \gamma \ CONTROLS_{it-n} + u_{it}$$

In this way, I investigate whether the issuances of distinct categories of products are associated with different variations in bank capital ratios, in terms of sign and magnitude..

In a second specification, reported as equation (4), I consider the various categories of securitisation products separately in each regression. So I estimate the variations in the banks' capital position following the issuance 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 strategy of banks, following the issuance of specific categories of product.

⁴³ 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.

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 subsample 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 Securitisation Issuances Backed by Different Asset Types

In equation 5, I classify the outstanding amounts of structured products by asset type, in order to analyse and compare the variations in the capital ratios following the issuances of securitisation backed by different assets.. 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 type⁴⁴, over bank total assets.

⁴⁴ In particular, I consider various types of assets: Collateralised Bond Obligations, Collateralised Debt Obligations, Collateralised Loan Obligations, Commercial Loans, Home Equity Loans, Personal Loans, Residential Mortgages, Credit Card Receivables, Mixed Receivables.

Table 6 presents the results for securitisation issuances backed by different asset types⁴⁵. To illustrate the economic relevance of the results, I report also the estimates of the marginal 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 CBOs⁴⁶, 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 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 negative variation 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*, banks increasing their issuances of ABSs backed by residential mortgages and home equity loans registered substantial improvements in their risk-weighted capital ratios, but no change or eventually an increase in 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 was related to an increase in the risk-based capital ratio by +0.76 and no significant change on the (common equity) leverage ratio.

⁴⁶ CBOs stand for Collateralized Bond Obligations. They are structured products backed by high-risk and high-yield bonds.

⁴⁵ In the appendix, Table B.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.

This positive variation in the 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 changes in the capital position for 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 the capital management of securitiser banks, effects - for the issuances backed by specific asset types.

(6)
$$y_{it} = \alpha_i + \delta_t + \beta_1 SECUR_ASSET_TYPE_{it-1} + \beta_1 SECUR_ASSET_TYPE_{it-1} * FUNDING_{it-1} + \gamma BANKCONTROLS_{it-1} + u_{it}$$

The dependent variable y_{it} can be, depending on the specifications, either the risk-weighted capital ratio (CapRatio) or the (common equity) leverage ratio⁴⁷ (LevRatioCE).

The results reported in Table 7 suggest that the funding liquidity position may have played a substantial role in affecting the capital management of securitiser banks, in particular for some particular categories of products (mostly eligible as collateral for monetary policy operations). This result may be different across distinct types of underlying assets as well as across different time periods.

For this reason, I distinguish two broad categories of products: the asset-backed securities (backed directly by various types of loans, like residential mortgages, home equity loans, commercial loans) and the collateralised debt obligations in a broad sense⁴⁸ (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. The empirical analysis shows that bank liquidity may have a role particularly for the issuances of asset-backed securities (backed by credit claims) and only to a minor extent for 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,

⁴⁸ 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.)

⁴⁷ 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.

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 I 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 was considerably larger than the variation 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.

On the other hand, in the *crisis 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. The issuance of (fewer) CBOs was associated with a still positive but smaller change in the risk-based capital ratios: the marginal effect decreased from +1.029 in the pre-crisis time to +0.627 (on average) during the crisis.

Also, within the fewer issuances of CBOs⁴⁹ 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 weakening in the funding liquidity position (i.e. a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile) would have increased the size of the marginal variation in risk-weighted capital ratios from +0.45 to +1.38, with no significant change in the leverage ratio. This means that, also in the relatively few cases where banks were transferring the credit risk during the crisis time⁵⁰, a weaker liquidity position was a relevant incentive to exploit the regulatory arbitrage opportunities related to securitisation⁵¹.

Now I consider the issuances of *asset-backed securities*, backed by residential mortgages, home equity loans and commercial loans. The results for the overall sample period reveal that the ex-ante funding liquidity position was relevant to explain the ex-post variation in the capital ratios for securitiser banks.

In general, banks increasing their issuances of asset-backed securities registered an increase in their risk-based capital ratios and a decrease in their (common equity) leverage ratio: then banks were improving their prudential solvency ratios but in fact they were raising their leverage. For a bank with an average liquid assets ratio, a one-standard-deviation increase in the securitisation of residential mortgages would have increased the risk-weighted capital ratio by +0.774 and decreased 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 divergence of sign in the marginal variations of the two capital ratios is even more

⁴⁹ 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 variations in bank capital.

⁵⁰ Since these products could not be pledged as collateral, there wouldn't have been any point in retaining them.

⁵¹ 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.

pronounced – following the securitisation of these loans – for banks with a weaker liquidity position. For the issuances of ABSs backed by residential mortgages, a weakening in the funding liquidity position of banks (i.e. a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile) would have increased both the size of the (positive) marginal effect in the risk-based capital ratio – from +0.614 to +1.073 – and the magnitude of the (negative) marginal effect in 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 I investigate 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 variations in 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 were associated with an increase in the risk-based capital ratios. This variation was smaller – in magnitude - than the one observed for CDOs and CBOs but it was still significant (at the 10% level). This 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 was accompanied by a larger decrease in the risk-weighted assets and a wider increase in the risk-based capital ratio.

During the *crisis period*, banks expanding their issuances backed by residential mortgages, home equity loans and commercial loans observed substantial improvements in their risk-based solvency ratios, but no change in their (common equity) leverage ratios. This was particularly relevant for banks with lower liquid assets ratios. Indeed, a decrease in the liquid assets ratio from the 75th to the 25th percentile would have increased the (positive) marginal effect 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 variations in capital ratios for the issuances of securitisation products of different credit ratings.

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 Securitisation Issuances with Different Credit Ratings

In equation (7), I classify the outstanding amounts of securitisation products by credit ratings and I run the following regression:

(7)
$$y_{it} = \alpha_i + \delta_t + \beta_1 AAA_{it-1} + \beta_2 AA_{-1} + \beta_3 BBB_{it-1} + \beta_4 BB_{-1} + \beta_5 CCC_{it-1} + \beta_6 CC_{-1} + \beta_7 D_{it-1} + \gamma CONTROLS_{it-1} + u_{it}$$

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 and compare the variations in the capital position for the issuances of structured products of different ratings⁵². I also report the estimates of the marginal effects 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 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 assets⁵³, 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)

⁵³ 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.

⁵² 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.

leverage ratio highlights even an increase in bank leverage. This can be interpreted as the combination of two aspects: the system of risk weights (which would explain the difference between the risk-based ratio and the regulatory capital ratio); and the compositional changes in regulatory capital, with the potential substitution of common equity with other eligible capital instruments (which would illustrate 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 their (regulatory capital) leverage ratio and a relevant decrease in their (common equity) leverage ratio. In particular, a one-standard-deviation increase in the issuance of AA and A rated products was associated with an increase in the risk-weighted capital ratio by +0.82 and a decrease in the (common equity) leverage ratio by -0.41. So banks were improving their prudential solvency ratios while in fact they were increasing their leverage.

These products were eligible as collateral and banks had incentives to retain them on balance sheet during the crisis. So the increase in the risk-weighted capital ratios for securitiser banks can be explained in relation to a more 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 could possibly explain why the regulatory capital ratio did not display any significant change while the common equity ratio showed 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 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 decrease in bank capital ratios for securitiser banks. 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 could be induced to provide some implicit support to securitisation vehicles. This would explain the negative variation in risk-based capital ratios, which was observed both before and after the crisis.

Also, the magnitude of this (negative) marginal effect increases substantially from the precrisis 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 is 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 weight⁵⁴, with the implication 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 investigate the variations in the capital position for the issuances of securitisation belonging to different rating buckets and I investigate whether the ex-ante funding liquidity position may have played some role in the capital management of securitiser banks. I estimate the following regression:

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(8) 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}
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The dependent variable y_{it} can be, depending on the specifications, either the risk-weighted capital ratio (CapRatio) or the (common equity) leverage ratio⁵⁵ (LevRatioCE).

The results reported in Table 9 focus on high-rating products, namely the tranches rated as 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*, banks issuing high-rating securitisation registered opposite variations for distinct measures of prudential solvency, i.e. an increase in the risk-weighted capital ratios and a decrease in the (common equity) leverage ratios. For a bank with an average liquid assets ratio, a one-standard-deviation increase in the securitisation ratio for AAA products increased the risk-weighted capital ratio by +0.2 and decreased the (common equity) leverage ratio by -0.196. Also, a corresponding increase 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 average risk-weighted capital ratio was equal to 11.16 and the average (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

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⁵⁴ 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.

⁵⁵ 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.

their leverage.

Moreover, the results suggest that the funding liquidity position of banks was relevant to explain the size of the variations in the banks' 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 decreases in their (common equity) leverage ratios, compared to more-liquid banks. A weakening in the funding liquidity position of banks (i.e. a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile) meant – for the issuances of AAA products - an increase in the (positive) variation for the risk-weighted capital ratio from +0.061 to +0.461, and an increase in the (negative) variation forn 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 marginal effect on the risk-based capital ratios from +0.188 to +0.49 and of the negative marginal effect 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 I consider the results for the two sub-sample periods.

In the *pre-crisis time*, the funding liquidity position doesn't appear to be relevant to explain the change in the banks' capital position, as the coefficients for the interaction term are not significant.

For the *crisis period*, the heterogeneity in the funding liquidity position is important to explain the potential differences in the capital management of securitiser institutions. I focus on two cases, with effects of opposite sign but with a common factor: banks in a weaker liquidity position tend to manage their securitisation operations in such a way either to improve their prudential solvency ratios, or to minimize their reduction.

Because of the downgrades in AAA tranches during the crisis, an increase in the issuances of AAA-rated products was associated with a decrease in the risk-based capital ratios. The marginal effect of a one-standard-deviation increase in the securitisation ratio was larger for more-liquid banks than for less-liquid banks. Institutions with a liquid assets ratio at the 75th percentile (0.80) would have reduced their risk-weighted capital ratios by -0.978, while intermediaries with a liquidity ratio at the 25th percentile (0.30) would have decreased their risk-based capital ratios by -0.324. This effect could be explained 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

ratios⁵⁶.

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 funding liquidity position of banks was relevant for the capital management of securitiser banks. For a bank with an average liquid assets ratio, a one-standard-deviation increase in the securitisation ratio increased the risk-weighted capital ratio by 0.347, while it did not imply significant change in the leverage ratio. Then, a decrease in the liquid assets ratio from the 75th percentile to the 25th percentile increased this positive marginal 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 products⁵⁷.

8. Conclusions

This paper analyses how credit institutions manage their capital position when they conduct securitisation operations. The analysis focuses on the issuances sponsored by European banks in the period between 1999 and 2010, before the introduction of the retention requirements in 2011. The study is developed on a new dataset, which combines tranche-level information for more than 17,000 securitisation products with bank-level balance sheet data for the corresponding originator institutions.

The empirical analysis is motivated by the change in the risk transfer strategy of European banks at the time of the crisis, when credit institutions under financial pressure started to retain most of their issuances of asset-backed securities, especially to pledge them as collateral in central bank refinancing operations. I investigate the changes in the capital position of securitiser banks before and during the crisis and I explore whether this effect was different across banks, depending on their ex-ante balance sheet conditions, or across products, depending on their collateral eligibility status.

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⁵⁶ 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).

⁵⁷ 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.

I find that, for the overall sample period, securitiser banks observed in general an increase in their risk-based capital ratios, while in fact they did not change or even reduced their leverage ratios. This means that banks were improving their prudential solvency, from the regulatory point of view, while in practice they were possibly increasing their balance sheet leverage. This evidence suggests that the definition of capital ratios may change significantly the sign and the size of the observed variation in bank solvency.

This has also policy implications for prudential regulation, in particular for the discussion about the measures of capital adequacy: the analysis 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 leverage ratio is complementary to the risk-weighted capital ratio, as it reveals some additional information not observable from risk-adjusted ratios. This implies that, 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.

I present the results of the empirical analysis separately for the pre-crisis and the crisis periods and I observe some relevant differences across banks and across securitisation products. In the pre-crisis period, the increase in the risk-based capital ratios for securitiser banks was concentrated on the issuances of products backed by more risky (and not collateral-eligible) assets, like CBOs and CDOs. This was because banks were transferring the credit risk of the underlying assets, so the increase in prudential solvency was proportional to the risk transferred on the underlying assets. Moreover, this variation was homogeneous across banks, so it was not dependent on the funding liquidity position of banks.

On the contrary, in the crisis period, the largest increases in the risk-based capital ratios - against no variation in the corresponding leverage ratios - were observed for the issuances of less-risky and collateral-eligible products: in particular, ABSs backed by residential mortgages and home equity loans. Moreover, such improvement in prudential solvency ratios was heterogeneous across banks, as a function of their funding liquidity position: institutions with ex-ante weaker liquidity conditions – when securitising – obtained larger increases in their risk-based capital ratios.

This evidence suggests that those banks subject to stronger liquidity constraints - and then possibly more interested in using retained asset-backed securities as eligible collateral - exploited relatively more, at the margin, the regulatory arbitrage opportunities offered by the prudential framework when conducting their securitisation operations. The reason would be that banks retaining structured products for collateral eligibility purposes had to fulfill some capital requirements on such exposures and then could be interested in minimising the additional capital burden coming from that.

This result puts forward two main takeaways of the analysis. First, it reveals – in the specific context of securitisation – that the banks' funding liquidity position may have a significant role in the capital management of originator institutions, potentially by reinforcing the incentives for regulatory arbitrage. This may be important to understand the interaction between bank solvency and liquidity: in the situation analysed by this study, banks interested in improving their liquidity positions showed to have stronger incentives to engage in capital regulatory arbitrage.

Second, the analysis suggests – based on the evidence for the crisis period - that the eligibility of ABSs as collateral for monetary policy operations may have some relevant

implications for the incentives of banks in conducting securitisation deals and possibly also other operations. This highlights the relevance of the collateral framework as a key policy tool for central banks, and then as a potentially effective instrument to affect the behaviour of the credit institutions acting as central bank counterparties⁵⁸.

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⁵⁸ See for example Nyborg (2015); Fecht, Nyborg, Rocholl and Woschitz (2016)

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. (2015), *Securitisation and Banks' Capital Structure*, Review of Corporate Finance Studies, Vol. 4, Issue 2, pp. 206-238
- 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
- Fecht F., Nyborg K. G., Rocholl J. and Woschitz J. (2016), *Collateral, Central Bank Repos and Systemic Arbitrage*, Working Paper, University of Zurich
- 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.
- Nyborg K. G. (2015), *Central Bank Collateral Framework*, Working Paper Series No.15/10, Swiss Finance Institute
- 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 Ratio	S				
Total Capital Total Common Equity Total Assets Risk Adjusted Assets Risk-Weighted Capital Ratio Risk-Weighted Common Equity Ratio Leverage Ratio (Total Capital) Leverage Ratio (Common Equity) Return on Assets Non Performing Loans Ratio Loans Deposits Ratio Trading Investment Ratio	504	38341.19	21890.39	1820	117964.6
	696	31083.08	18597.17	1601	101406.7
	665	836242	508183.9	21119	2638365
	537	304664.6	168403.4	10862	881222.1
	499	.1271365	.0232583	.0816162	.2190018
	537	.1116344	.0302366	.0491629	.2354243
	504	.048	.0175857	.0152542	.0904294
	665	.0418814	.0156491	.0073446	.1124575
	653	.0013137	.0014968	0109709	.009844
	507	.0109395	.0085998	.000651	.0651184
	427	1.169953	.8513491	.4024901	8.660161
	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		.1291329
By Asset Type					
Credit Card Secur. Amount	816	64.15883	288.2885	0	1559.43
Credit Card Secur. Ratio	665	.0000681	.0002944		.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		.0009163
CDO Secur. Amount	816	409.0203	1221.922	0	7828.518
CDO Secur. Ratio	665	.0005934	.001516		.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		.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		.0073791
Non-EU Issuer Secur. Amount	816	5979.559	15567.21	0	105194.9
Non-EU Issuer Secur. Ratio	665	.0060849	.0160191		.1277045

Continued

Variable	Obs	Mean	Std. Dev.	Min	Max
Bank-Level Outstanding Securitisation A	mounts d	and Ratios (over T	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		.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 \mathfrak{E} 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. Securitisation Issuances, Risk-Based Capital and Leverage Ratios

		1999Q1-2010Q)4		2003Q1-2007Q)2	2	007Q3-2010Q4	ļ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(6)	(9)
VARIABLES	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	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	+0.439***	+0.248***	-0.151**	+0.116	+0.096	+0.02	+1.204**	+0.167	-0.072
in Total Secur_1	10.10	10.210	0.101	10.110	10.090	10.02	11.201	10.107	0.072
m Total Seedi_1									
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***
20110	(0.0123)	(0.00594)	(0.00483)	(0.00872)	(0.00510)	(0.00308)	(0.00985)	(0.00229)	(0.00343)
	(0.0120)	(0.000)	(0.00.00)	(0.000,2)	(0.00210)	(0.00200)	(0.00)00)	(0.0022)	(0.000.10)
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

Table 3. Securitisation, Risk-Based Capital and Leverage Ratios: Interaction with the Liquid Assets Ratio Regression Results

		1999Q1-2010Q4	1		2003Q1-2007Q	2		2007Q3-2010Q4	4
	(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
_ 1 _	(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

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

	1999Q1-2010Q4 Values of the LiqAssetsRatio			2003Q1-2007Q2			2007Q3-2010Q4		
Dependent Variables				Valu	Values of the LiqAssetsRatio			Values of the LiqAssetsRatio	
	Mean	25 th Perc.	75 th Perc.	Mean	25 th Perc.	75 th Perc.	Mean	25 th Perc.	75 th 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**
(Regulatory Capital) Leverage Ratio	0.136	0.039	0.160	0.034	-0.007	0.009	0.200	0.490	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. Securitisation, 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

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

	1999Q1-2010Q4			2003Q1-2007Q2			2007Q3-2010Q4		
Dependent Variables	Values of the LoanDepoRatio			Values of the LoanDepoRatio			Values of the LoanDepoRatio		
	Mean	25 th Perc.	75 th Perc.	Mean	25 th Perc.	75 th Perc.	Mean	25 th Perc.	75 th Perc.
Risk Weighted Capital Ratio	1.035*1	0.754* ¹	1.084* ¹	0.236	0.147	0.268	6.426** ³	4.367 ** ³	6.464** ³
	$[0.761^{2}]$	$[0.480^{2}]$	$[0.810^{2}]$				$[4.043^{4}]$	$[1.984^{4}]$	$[4.081^{4}]$
(Regulatory Capital) Leverage Ratio	-0.073***	0.183***	-0.117***	0.427* ⁵	0.427* ⁵	0.427* ⁵	0.774	0.320	0.782
				$[0.030^{6}]$	$[0.125^{6}]$	$[-0.004^{6}]$			
(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. Securitisation, Risk-Based Capital and Leverage Ratios: Interaction with the Short-Term Borrowing Ratio

Regression Results

		1999Q1-2010Q)4		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

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

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

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. Securitisation Issuances Classified by Asset Type

Regression Results

		1999Q1-2010Q4			2003Q1-2007Q2	2		2007Q3-2010Q	4
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	CapRatio	LevRatioCAP	LevRatioCE	Cap_Ratio	LevRatioCAP	LevRatioCE	CapRatio	LevRatioCAP	LevRatioCE
CD 0 4		4.0.00	0.474	co chibibi	00 55 to to to		25.44		10.15
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

Table 6. Continued

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio¹

VARIABLES		2003Q1-2007Q2			2007Q3-2010Q4	ı
	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. 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*** (17.67)	3.560 (9.928)								
CBO_1*LiqAssetsRatio_1	-23.08 (15.60)	1.160 (8.880)								
CDO_1	,	,	9.416*** (3.345)	4.928*** (1.688)						
CDO_1*LiqAssetsRatio_1			-3.578 (2.723)	-1.856 (1.414)						
CommLoans_1			(=1, =5)	(-1.1-1)	1.996*** (0.710)	-1.154*** (0.371)				
Com_1*LiqAssetsRatio_1					-1.608** (0.625)	0.886*** (0.332)				
HomeEquity_1					((3.2.2.)	1.943*** (0.590)	-1.215*** (0.313)		
HoEq_1*LiqAssetsRatio_1							-1.504*** (0.492)	0.895*** (0.264)		
ResidMort_1							(=		1.627*** (0.433)	-0.717*** (0.237)
Resid_1*LiqAssetsRatio_1									-1.058*** (0.391)	0.537** (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

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
, i i i i i i i i i i i i i i i i i i i	Cupituis	<u> </u>	Сиртино	<u> LevranoeL</u>	Сиртино	<u> </u>	Сиртино	LevitatioeL	Сиртино	<u> Levranoel</u>
CBO_1	78.87***	-0.986								
CDO 1*Lig Assets Detic 1	(15.09) -7.088	(8.412) 11.48								
CBO_1*LiqAssetsRatio_1	(12.66)	(7.057)								
CDO_1	(12.00)	(7.057)	7.330*	-0.516						
			(4.044)	(1.684)						
CDO_1*LiqAssetsRatio_1			-1.933	1.469						
CommLoans_1			(2.898)	(1.290)	2.430*	0.857				
CommLoans_1					(1.323)	(0.615)				
Com_1*LiqAssetsRatio_1					-0.927	-0.750				
•					(1.192)	(0.552)				
HomeEquity_1							-0.197	-0.239		
HoEq_1*LiqAssetsRatio_1							(0.717) -0.270	(0.317) 0.248		
Hold_i EldAssetsRatio_i							(0.519)	(0.237)		
ResidMort_1							(====,	(21 2 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

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*** (42.42)	7.350 (15.25)								
CBO_1*LiqAssetsRatio_1	-104.5** (39.67)	-8.407 (14.27)								
CDO_1	(,		10.16 (6.464)	1.267 (2.206)						
CDO_1*LiqAssetsRatio_1			-4.221 (5.291)	0.275 (1.818)						
CommLoans_1			,	,	1.753* (0.997)	-0.130 (0.361)				
Com_1*LiqAssetsRatio_1					-2.031** (0.793)	0.0600 (0.287)				
HomeEquity_1						,	3.165*** (0.969)	-0.125 (0.355)		
HoEq_1*LiqAssetsRatio_1							-2.337*** (0.798)	0.0871 (0.292)		
ResidMort_1									2.594*** (0.620)	0.154 (0.234)
Resid_1*LiqAssetsRatio_1									-1.954*** (0.538)	-0.217 (0.203)
Bank Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Bank Fixed Effects Quarter Fixed Effects	YES YES	YES YES	YES YES	YES YES	YES YES	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

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio¹

Table 7. Continued

		19	99Q1-2010Q4	ļ	2003Q1-2007Q2		Q2	2	2007Q3-2010Q	<u>4</u>
A T-		Values o	of the LiqAsset	sRatio	Values	of the LiqAss	etsRatio	Values	of the LiqAsse	etsRatio
Asset Ty	/pes	Mean	25 th Perc.	75 th Perc.	rc. Mean 25 th Perc. 75 th Perc.		75 th Perc.	Mean	25 th Perc.	75 th Perc.
СВО	CapRatio	0.986*** 2	0.986*** 1	0.986*** 1	1.029*** 1	1.029*** 1	1.029*** 1	0.627**	1.38**	0.451**
		$[0.812]^3$	$[0.936]^2$	$[0.746]^{2}$	$[0.979]^2$	$[1.013]^2$	$[0.949]^{2}$			
	LevRatioCE	0.058	0.052	0.062	0.069	0.013	0.117	0.009	0.070	-0.005
CDO	CapRatio	1.427*** 1	1.427*** 1	1.427*** 1	0.939* 4	0.939* 3	0.939* 3	1.447	1.892	1.343
	•	$[1.134]^2$	$[1.343]^2$	$[1.023]^2$	$[0.803]^{5}$	$[0.896]^{4}$	$[0.724]^{4}$			
	LevRatioCE	0.747*** 1	0.747*** 1	0.747*** 1	0.037	-0.033	0.098	0.317	0.288	0.323
		$[0.595]^2$	$[0.703]^2$	$[0.537]^{2}$						
Commercial	CapRatio	0.505***	0.783***	0.357***	0.658* 3	0.658* 3	0.658* 3	0.094**	0.804**	-0.072**
Loans					$[0.521]^{4}$	$[0.615]^{4}$	$[0.440]^{4}$			
	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. Securitisation Issuances Classified by Credit Ratings

Regression Results

	1999Q	21-2010Q4		2003Q	1-2007Q2		20070	Q3-2010Q4	
	(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

Table 8. Continued

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio¹

		2003Q1-2007Q2			2007Q3-2010Q4	ļ
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. Securitisation Classified by Credit Ratings: Interaction with the Liquid Assets Ratio

Regression Results

Panel A: 1999Q1-2010Q4

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	CapRatio	LevRatioCE	CapRatio	LevRatioCE	CapRatio	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

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	CapRatio	LevRatioCE	CapRatio	LevRatioCE	CapRatio	LevRatioCE
	0.610	0.0610				
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			(2.071)	(0.507)	-11.19*	-0.895
_					(6.648)	(3.157)
A_1* LiqAssetsRatio_1					-0.680	2.175
ri_i Eiqrissetsitatio_i					(5.971)	(2.841)
					(3.571)	(2.0+1)
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
Zum tot 1 iAcu Eliceto	110	125	125	113	115	120
R-squared	0.351	0.596	0.366	0.600	0.388	0.599

Panel C: 2007Q3-2010Q4

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	CapRatio	LevRatioCE	CapRatio	LevRatioCE	CapRatio	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)
5 . 6 .	*****	******	******	*****	******	*****
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

The Economic Effect of 1-Standard-Deviation Increase in the Securitisation Ratio¹

		1999Q1-2010Q4		20	2003Q1-2007Q2			2007Q3-2010Q4		
Rati	ing Groups	Values	of the LiqAss	etsRatio	Values of the LiqAssetsRatio			Values of the LiqAssetsRatio		
IXati	ing Groups	Mean	25 th Perc.	75 th Perc.	Mean	25 th Perc.	75 th Perc.	Mean	25 th Perc.	75 th Perc.
	CapRatio	0.2***	0.461***	0.061***	0.373	0.373	0.371	-0.854**2	-0.324**1	-0.978**1
AAA								$[-0.854]^3$	$[-0.324]^2$	$[-0.978]^{2}$
	LevRatioCE	-0.196***	-0.312***	-0.135***	-0.005	-0.027	0.015	-0.0007	-0.057	0.014
	CapRatio	0.293**	0.49**	0.188**	-0.285	-0.202	-0.357	0.347*	0.827*	0.235*
AA										
	LevRatioCE	-0.198**	-0.304**	-0.142**	0.010	-0.021	0.037	-0.007	-0.080	0.011
	CapRatio	0.813** 4	0.813** 3	0.813** 3	-0.487 * ⁵	-0.487* ⁵	-0.487 * ⁵	1.746**	1.746**	1.746**
A		$[0.627]^{5}$	$[0.759]^4$	$[0.557]^{4}$	$[-0.503]^{6}$	[-0.492] ⁶	[-0.513] ⁶	[1.032]	[1.475]	[0.928]
	LevRatioCE	-0.385* ⁶	-0.385* ⁵	-0.385* ⁵	0.013	-0.023	0.043	-0.170	-0.085	-0.190
		$[-0.237]^{7}$	[-0.342] ⁶	[-0.180] ⁶						

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%				
A	12%	20%	35%			
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. 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
СВО	38.66*** (11.60)	6.517 (5.741)
CBO * CRISIS	, ,	40.41 ***(7.604)
	14.26 (15.00)	` ,
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

Appendix C

Table C.1. 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.

	(1)	(2)
VARIABLES	CapRatio	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