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Determinants of European banks' engagement in loan securitization

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Conference on the Interaction of Market and Credit Risk

6–7 December 2007, Berlin

Thursday, 6 December

8:30 – 9:00	Registration (Harnack Haus)
9:00 – 9:15	**Welcome Address by Hans Reckers (Deutsche Bundesbank)**
Session 1	**Banking and Securitization** **Chair: Myron Kwast (Federal Reserve Board)**
9:15 – 10:15	**Recent Financial Market Developments** **Keynote address by E. Gerald Corrigan (Goldman Sachs)**
10:15 – 11:05	**Banking and Securitization** Wenying Jiangli (Federal Deposit Insurance Corporation) Matthew Pritsker (Federal Reserve Board) Peter Raupach (Deutsche Bundesbank) Discussant: Deniz O. Igan (International Monetary Fund)
11:05 – 11:30	**Refreshments**
Session 2	**Integrated Modelling of Market and Credit Risk I** **Chair: Klaus Duellmann (Deutsche Bundesbank)**
11:30 – 12:10	**Regulatory Capital for Market and Credit Risk Interaction: Is Current Regulation Always Conservative?** Thomas Breuer (Fachhochschule Vorarlberg) Martin Jandačka (Fachhochschule Vorarlberg) Klaus Rheinberger (Fachhochschule Vorarlberg) Martin Summer (Oesterreichische Nationalbank) Discussant: Simone Manganelli (European Central Bank)

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12:10 – 13:00	**An Integrated Structural Model for Portfolio Market and Credit Risk** Paul H. Kupiec (Federal Deposit Insurance Corporation) Discussant: Dan Rosen (R² Financial Technologies Inc.)
13:00 – 14:30	**Lunch**
Session 3	**Integrated Modelling of Market and Credit Risk II** **Chair: Til Schuermann (Federal Reserve Bank of New York)**
14:30 – 15:20	**The Integrated Impact of Credit and Interest Rate Risk on Banks: An Economic Value and Capital Adequacy Perspective** Mathias Drehmann (European Central Bank) Steffen Sorensen (Bank of England) Marco Stringa (Bank of England) Discussant: Jose A. Lopez (Federal Reserve Bank of San Francisco)
15:20 – 16:10	**An Economic Capital Model Integrating Credit and Interest Rate Risk** Piergiorgio Alessandri (Bank of England) Mathias Drehmann (European Central Bank) Discussant: Andrea Sironi (Bocconi University)
16:10 – 16:40	**Refreshments**
16:40 – 18:00	**Panel discussion** **Moderator: Myron Kwast (Federal Reserve Board)** **Panelists: Pierre Cailleteau (Moody's),** **Christopher Finger (RiskMetrics),** **Andreas Gottschling (Deutsche Bank),** **David M. Rowe (SunGard)**
20:00	**Conference Dinner (with Gerhard Hofmann, Deutsche Bundesbank)**

Friday, 7 December

Session 4	**Risk Measurement and Markets** **Chair: Thilo Liebig (Deutsche Bundesbank)**
9:00 – 9:50	**A Value at Risk Analysis of Credit Default Swaps** Burkhard Raunig (Oesterreichische Nationalbank) Martin Scheicher (European Central Bank) Discussant: Alistair Milne (Cass Business School)
9:50 – 10:40	**The Pricing of Correlated Default Risk: Evidence From the Credit Derivatives Market** Nikola Tarashev (Bank for International Settlements) Haibin Zhu (Bank for International Settlements) Discussant: David Lando (Copenhagen Business School)
10:40 – 11:10	**Refreshments**
11:10 – 12:10	**Structural Models and the Linkage between Equity and Credit Markets** **Keynote Address by Hayne Leland (The University of California, Berkeley)**
Session 5A	**Securitization, Regulation and Systemic Risk** **Chair: Hayne Leland (The University of California, Berkeley)**
12:10 – 13:00	**Solvency Regulation and Credit Risk Transfer** Vittoria Cerasi (Milano-Bicocca University) Jean-Charles Rochet (Toulouse University) Discussant: Loriana Pelizzon (University of Venice)
13:00 – 14:30	**Lunch**
14:30 – 15:20	**Determinants of Banks' Engagement in Loan Securitization** Christina E. Bannier (Frankfurt School of Finance and Management) Dennis N. Hänsel (Goethe University Frankfurt) Discussant: Gabriel Jimenez (Bank of Spain)

15:20 – 16:10	**Systemic Bank Risk in Brazil: An Assessment of Correlated Market, Credit, Sovereign and Inter-Bank Risk in an Environment with Stochastic Volatilities and Correlations** Theodore M. Jr. Barnhill (The George Washington University) Marcos Rietti Souto (International Monetary Fund) Discussant: Mathias Drehmann (European Central Bank)
Session 5B	**Credit Dependencies and Market Risk** **Chair: Kostas Tsatsaronis (BIS)**
12:10 – 13:00	**Interaction of Market and Credit Risk: An Analysis of Inter-Risk Correlation and Risk Aggregation** Klaus Böcker (UniCredit Group) Martin Hillebrand (Sal. Oppenheim) Discussant: Rüdiger Frey (University of Leipzig)
13:00 – 14:30	**Lunch**
14:30 – 15:20	**Market Conditions, Default Risk and Credit Spread** Dragon Tang (Kennesaw State University) Hong Yan (University of South Carolina) Discussant: Til Schuermann (Federal Reserve Bank of New York)
15:20 – 16:10	**The Effect of Seniority and Security Covenants on Bond Price Reactions to Credit News** David D. Cho (State University of New York at Buffalo) Hwagyun Kim (Texas A&M University) Jungsoon Shin (State University of New York at Buffalo) Discussant: Joerg Rocholl (European School of Management and Technology in Berlin)
16:10 – 16:30	**Final Remarks by Philipp Hartmann (European Central Bank)**
16:30 – 17:00	**Refreshments**

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Determinants of European banks' engagement in loan securitization*

Christina E. Bannier† Dennis N. Hänsel‡§

January 31, 2008

Abstract

We analyze collateralized loan obligation (CLO) transactions by European banks (1997 - 2004), trying to identify firm-specific and macroeconomic factors influencing an institution's securitization decision. CLO issuance seems to be an appropriate funding tool for large banks with high risk and low liquidity. However, risk transfer turns out to be limited in the extremes. Controlling for fixed effects, we find that fixed costs of securitization are surmountable also for smaller institutions. Interestingly, commercial banks seem to use loan securitization to access capital-market based businesses and the associated fee income. Regulatory capital arbitrage does not appear to have driven the market.

JEL-Classification: G 21

Keywords: Securitization, credit risk transfer, collateralized loan obligations

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Non–technical summary

Despite the recent dramatic growth in the market for credit risk, it is as to yet not entirely clear why banks engage in securitizing their loans. While securitization may help to increase liquidity, augment fee income, reduce credit and interest rate risk and improve leverage ratios, many financial institutions still choose not to securitize any of their loans. Among the disadvantages of loan securitization, a reduction in the tax benefits of "on balance sheet" debt and the fixed costs of setting up a securitization program are frequently mentioned. Also, regulatory capital arbitrage was suspected to be one of the main drivers of credit risk transfer in the early years. Still, we observe that recent growth in credit risk transfer (CRT) activity did not deteriorate despite the introduction of the new regulatory environment of Basel II that will no longer allow for regulatory capital relief via loan securitization.

In our study, we analyze collateralized loan obligation (CLO) transactions by European banks between 1997 and 2004 and try to find an answer to the question which factors drive a financial institution's decision to securitize loans. While we cannot fully reject an influence of banks' incentives to reduce regulatory capital, securitization activity seems to be strongly affected by firm-specific characteristics. As might have been expected, the probability of a bank engaging in loan securitization is found to increase in bank size and to decrease along with the bank's liquidity. Additionally, we observe that banks are more likely to securitize loans the higher the banks' expected credit risk. Securitization hence seems to be used as a risk-transfer tool. However, risk-transfer turns out to be limited, since banks with highest risk are found to reduce their securitization activity along with higher credit risk. For the sub-sample of stock-listed banks, even stronger effects are observed with respect to size, risk, liquidity and performance. We also find a significant ”reverse" regulatory arbitrage effect: banks with low tier 1 capital securitize significantly less than banks with high tier 1 capital. The new regulatory framework of Basel II should therefore not be expected to hamper the future growth of CRT markets. Interestingly, when we control for identical banks entering the database repeatedly, bank size hardly matters for the securitization decision. Obviously, the fixed costs of setting up a securitization program are surmountable also for smaller banking institutions. Particularly for commercial banks this leads us to suspect that loan securitization is also used in order to indirectly access investment-banking related activities and the associated fee income.

Nichttechnische Zusammenfassung

Trotz des rasanten Wachstums des Marktes für Kreditrisikotransfer sind die Motive der Banken für die Verbriefung von Kreditportfolios noch nicht vollständig geklärt. Kreditverbriefungen führen zwar zu höherer Liquidität, einer Reduktion von Kredit- und Zinsrisiken, einer Steigerung von Provisionseinkommen, möglicherweise auch einer Verbesserung der Kapitalstruktur, jedoch entscheiden sich einige Banken trotzdem gegen eine Strukturierung und Weiterreichung ihrer Kreditportfolios. Unter den Nachteilen der Verbriefung werden unter anderem die relativ hohen fixen Kosten der erstmaligen Errichtung einer Verbriefungsstruktur sowie eventuelle Steuernachteile von nicht auf der Bilanz gehaltenen Krediten genannt. Weiterhin ermöglicht das neue Basel-II Regelwerk keine „Arbitrage regulatorischen Eigenkapitals" via Kreditverbriefung mehr, anders als die weniger risikosensitive Eigenkapitalunterlegung unter den alten Basel-Richtlinien.

Unsere Studie analysiert „Collateralized Loan Obligation" (CLO) Transaktionen von Europäischen Banken in den Jahren 1997-2004. Ziel ist es, Faktoren zu isolieren, die die Entscheidung einer Bank, Kredite zu verbriefen, beeinflusst haben. Während wir einen Einfluss regulatorischer Arbitrage nicht vollkommen ausschließen können, zeigt unsere Studie, dass die wesentlichen Bestimmungsfaktoren vielmehr individuelle Faktoren der Banken sind. So ist die Wahrscheinlichkeit, dass eine Bank Kredite verbrieft, umso höher, je größer die Bank, je geringer ihre Liquidität und je höher ihr erwartetes Kreditrisiko ist. Kreditverbriefungen werden offensichtlich als Möglichkeit des Kreditrisikotransfers genutzt. Allerdings zeigt sich, dass Banken mit dem höchsten Kreditrisiko ihre Verbriefungsaktivitäten mit zunehmendem Risiko einstellen, so dass die Risikotransferfunktion nur begrenzt zu nutzen zu sein scheint. Für am Aktienmarkt notierte Banken treffen obige Aussagen noch stärker zu. Interessanterweise zeigt sich hier sogar ein „negativer" regulatorischer Arbitrageeffekt: Banken mit niedrigem regulatorischem Eigenkapital verbriefen weniger Kredite als Banken mit höherem Eigenkapital. Die neuen Eigenkapitalrichtlinien nach Basel II sollten daher das zukünftige Wachstum des Kreditrisikotransfermarktes nicht beeinträchtigen. Bemerkenswerterweise scheint auch die Bankengröße eine weniger wichtige Rolle zu spielen als zunächst gedacht. Auch kleinere Banken sind somit in der Lage, die mit einer Kreditverbriefung verbundenen Fixkosten zu tragen. Es ist zu vermuten, dass gerade traditionelle Kreditbanken die Verbriefung von Kreditportfolios unter anderem auch nutzen, um indirekt dem „investment-banking" verwandte Geschäftsbereiche und die entsprechenden Provisionseinkommen zu erschließen.

1 Introduction

Even though credit risk transfer (CRT) activity has a long history, a market for credit derivative transactions did not develop before the late 1970s.[1] Since then, CRT activity has been growing at a rapid rate. Recent years have been characterized by significant product innovation, an increasing number of market participants and growth in overall transaction volume. The notional amount of credit derivatives outstanding increased from EUR 690 billion at the end of June 2001 to EUR 5,792 billion by the end of December 2005 and is projected to exceed EUR 30,000 billion in 2008 (British Bankers' Association). Between 2000 and 2006 European securitization issuance rose from EUR 78.2 billion to EUR 458.9 billion, paralleling the even more developed US market for asset-backed securities (ABS) that exceeded USD 1,200 billion in 2006.[2] Among the different issuances by collateral type, the sector of collateralized debt obligations (CDO) with EUR 88 billion was the second largest in 2006, accounting for 19 percent of the securitized market in Europe. It was also growing at the fastest rate (up about 80 percent from EUR 48.9 billion one year earlier). Collateralized loan obligations (CLOs) were the leading collateral sector within the CDO market. The market of other ABS securities - commercial mortgage backed securities, credit card receivables, leases, auto loans and receivables - increased to EUR 370 billion in the year 2006. UK securitization totaled EUR 192 billion, representing over 50 percent of all European securitized debt in 2006. Volumes also grew across the other leading countries of collateral - Spain, Netherlands, Italy, Germany, and France.[3]

Despite the dramatic growth in the market for credit risk, it is as to yet not entirely clear why banks engage in securitizing their loans. While securitization may help to increase liquidity, augment fee income, reduce credit and interest rate risk and improve leverage ratios, many financial institutions still choose not to securitize any of their loans (Ambrose et al., 2003). Among the disadvantages of loan securitization, a reduction in the tax benefits of "on balance sheet" debt and the fixed costs of setting up a securitization program are frequently mentioned (Minton et al., 2004). Also, regulatory capital arbitrage was suspected to be one of the main drivers of credit risk transfer in the early years (Duffie and Garleanu, 2001; Calomiris and Mason, 2004). Still, we observe that recent growth in CRT activity did not deteriorate despite the introduction of the new regulatory environment of Basel II that will no longer allow for regulatory capital relief via loan securitization.

In this paper, we try to find an answer to the question which factors drive a financial institution's decision to securitize loans. Our research focus is similar to the one taken by Minton et al. (2004). They test two hypotheses regarding the use of loan securitization: regulatory capital arbitrage versus efficient financial contracting. Regulatory capital arbitrage stems from regulatory distortions in bank capital requirements: in order to save on required regulatory capital under the Basel Capital Accord of 1988, banks may attempt to securitize low-risk assets and hold high-risk assets. The efficient-contracting hypothesis, in contrast, promotes securitization as a financial engineering product that allows to access debt financing without bearing costs of financial distress (Gorton and Souleles,

[1] In the mid-1970s, the Government National Mortgage Association (GNMA) developed mortgage pass-throughs. First Boston introduced asset-backed securities in 1985 (Lockwood et al., 2006).

[2] In the US, the ABS market represents almost one third of the total corporate bond market.

[3] Source: Thomson Financial Securities Data, Bank for International Settlements (BIS), European Securitisation Forum and Securities Industry and Financial Markets Association (SIFMA).

2006). Minton et al. (2004) find support for the latter argument but not for the regulatory arbitrage hypothesis. In particular, they suggest that unregulated financial institutions are more likely to securitize, as - due to their lack of regulatory safety net - they typically bear the costs of financial distress. However, in their sample on US private-sector financial companies, the fraction of financial firms securitizing assets is very small: it rises from 2 percent in 1993 to less than 4 percent in 2002. Their results may therefore be strongly driven by the characteristics of large banks which were the first to adopt securitization activities. In our sample on European financial institutions, in contrast, the proportion of securitizing firms increases from 1.6 percent in 1997 to 27 percent in 2004. Yet, as we do not obtain information on regulatory capital for all banks, we put more emphasis on a detailed test of the efficient-contracting explanation. In this respect, we analyze different firm-specific and macroeconomic variables that may have an impact on the efficiency of the securitization instrument with regard to reducing financial distress costs and therefore influence banks' engagement in that market.

Summarizing our results, we find that while we cannot fully reject an influence of banks' incentives to reduce regulatory capital, securitization activity seems to be strongly affected by firm-specific characteristics. As might have been expected, the probability of a bank engaging in loan securitization is found to increase in bank size and to decrease along with the bank's liquidity. These results are in line with earlier work by Dionne and Harchaoui (2003), Minton et al. (2004) and Uzun and Webb (2006). Additionally, we observe that banks are more likely to securitize loans the higher the banks' expected credit risk. Securitization hence seems to be used as a risk-tranfer tool. However, risk-transfer turns out to be limited, since banks in the highest credit risk decile are found to reduce their securitization activity along with higher credit risk. Interestingly, the "quality" of the banks' risk (approximated by gross interest income divided by gross outstanding accounts) tends to influence the issuing decision positively. This may be taken as a sign of banks' "risk-appetite", leading them to originate a large amount of high-quality loans that may be offloaded via a CLO issuance lateron in order to take on new business.[4] Yet, we also find that well-performing institutions securitize less than banks with low performance. This runs slightly counter to the risk-appetite argument. Among macroeconomic factors, long-term interest rates and yield spreads are found to affect CLO issuances.

For the sub-sample of stock-listed banks, even stronger effects are observed with respect to size, risk, liquidity and performance. We also find a significant "reverse" regulatory arbitrage effect: banks with low tier 1 capital securitize significantly less than banks with high tier 1 capital. The new regulatory framework of Basel II should therefore not be expected to hamper the future growth of CRT markets. Yet, the combination of high credit risk and low equity seems to affect securitization decisions strongly positively. We are therefore not able to fully reject the influence of regulatory capital considerations.

Interestingly, when we control for fixed effects within our sample, i.e. identifying identical banks entering the database repeatedly, bank size hardly matters for the securitization decision. Obviously, the fixed costs of setting up a securitization program are surmountable also for smaller banking institutions. Particularly for commercial banks this leads us to suspect that loan securitization is used in order to indirectly access investment-banking related activities and the associated fee income. This conjecture is strengthened by the

[4]The fact that not all financial institutions in our sample used a CLO for a true-sale but instead acted simply as an intermediary buying and selling securitized portfolios even strengthens this interpretation.

finding that banks with low ratio of fees and commissions over interest revenue are significantly more likely to securitize. We also observe a negative influence of tax considerations and a positive effect of the market-to-book ratio for stock-listed banks.

Our work complements several recent empirical and few theoretical papers on the role of credit securitization. One large strand of the literature focuses on the question of how banks' systematic risk develops in response to issuing asset-backed securities. These papers tend to agree on two fundamental facts. First, the aggregate amount of risk transfer that has been observed so far is small relative to the issuers' overall exposures and also relative to the notional size of the market (Minton et al., 2005). Second, CRT activity is a key part of the ongoing transformation of credit markets (Franke and Krahnen, 2006) and is expected to grow further in the following years. Several studies hence conclude that systemic risk on financial markets may be expected to increase due to credit securitization (Krahnen and Wilde, 2007). A second strand of the literature examines the effect of securitization on banks' lending behavior. These papers typically find that the separation of origination and funding of credit from holding and managing credit risk tends to increase the supply of loans (Loutskina and Strahan, 2006; Hirtle, 2007). The weakened link from bank funding conditions to credit supply is projected to loosen monetary policy's real effects and may also increase banks' overall risk taking (Hänsel and Krahnen, 2007; Instefjord, 2005).

Against the background of this recent literature, our paper contributes to an explanation of the origin of credit securitization. In this respect, our work amends further studies such as by Ambrose et al. (2006), who test whether asymmetric information about the borrowers has driven the market for credit securitization, or Franke et al. (2007), who analyze the influence of issuer characteristics on the specific design of CDOs. Jiangli et al. (2007) additionally link an empirical study of loan securitization with a theoretical model of banks' capital structure decisions and the ensuing moral hazard problems. Their results on US financial institutions support our findings with respect to European banks that risk transfer seems to be the main motivating factor, leading to a "fine tuning" of performance via securitization.

The remainder of the paper is organized as follows. Section 2 gives a brief overview on the securitization process and the main motivating factors influencing banks' decision to securitize their loans. Section 3 delineates the bank sample data and the empirical methodology used to test the variables' influence on banks' decisions. The subsequent section describes the variables and hypotheses. Section 5 presents the results of univariate and multivariate tests that are discussed in section 6. Section 7 concludes.

2 Motivation for securitization transactions

The increasing depth of secondary markets for credit risk in the last few years opened up a new way for financial institutions to separate the origination and funding of credit from the management of associated risks. The strong increase in the cumulative volume of asset-backed securities is often attributed to three main motivating factors: *regulatory capital relief*, *reduction in financial distress costs* and *"risk-appetite"*. Before we turn to these different arguments, we will briefly sketch the construction of instruments.

Generally, the CRT market consists of two major product categories: credit default

swaps (CDS) and CDOs. In a CDS, the investor buys the credit risk associated with a specific reference entity for a fixed time in exchange for a fee. The issuer in essence obtains an insurance against loan default. Within the class of CDOs, cash and synthetic CDOs may be distinguished.[5] In a cash CDO, the originator pools a portfolio of bonds or loans and sells this to a special purpose vehicle (SPV). This separate legal entity issues securities that are collateralized by the bonds. In a synthetic CDO, in contrast, the bank that originates the loans does not actually transfer ownership of the loans; instead, the risk of the portfolio is transmitted through credit derivatives to the SPV. In both cases, a portfolio of credit risk exposures is pooled, segmented into tranches with different seniority and transferred to investors.[6] The tranches display specific risk-return characteristics and obey the principle of strict subordination, i.e. holders of the lowest tranche (equity tranche or first loss piece, FLP[7]) absorb all losses up to the par value of this tranche. If accumulated losses of the portfolio exceed this par value, the next senior tranche will absorb the remaining losses and so forth. Payments therefore follow a waterfall structure through the different (senior, mezzanine and equity) tranches and the FLP bears most of the risk contained in the underlying portfolio.[8]

Particularly in the early years of the CRT market, banks cited their interest in *reducing regulatory capital* as the main motivation for issuing CLOs (Duffie and Garleanu, 2001; Calomiris and Mason, 2004). International regulation in the Basel Capital Accord implemented in 1992 uses the capital-asset ratio to ensure that banks hold sufficient capital buffer to bear default losses. In general, loan pools require regulatory capital of 8 percent of the reference pool's assets. In order to save on regulatory capital, banks may therefore try to remove low-risk assets from their balance sheets and retain high-risk assets. As the required capital is the same, the cost of holding low-risk assets is greater since the incremental capital is not economically justifiable (Ambrose et al., 2003). While the incentives to use regulatory capital arbitrage will shrink under the new framework of Basel II that uses risk-sensitive capital ratios, it may have contributed to the increase in securitization in the early years (Minton et al. 2004).

From the investors' point of view, CDOs generally help to overcome the illiquidity of bonds and loans that stem from market imperfections based on information asymmetries (DeMarzo, 2005). These are a major obstacle to trading debt claims, in particular with regard to claims against small and less well-known debtors (Franke and Krahnen, 2006). As market imperfections of this type are similar to those in the insurance business, protection mechanisms are applied in CDO transactions in the same vein. In particular, the creation and retainment of FLP by the issuer are an important tool to overcome problems of adverse selection and moral hazard. By retaining the FLP, the tranche that is most susceptible to default, the expected default risk of the securitized portfolio remains largely

[5]Recent years have seen a large proportion of German securitizations as synthetic CDOs, whereas in Spain most securitization transactions involve a "true sale" as in a cash security.

[6]For more detailed information on the design of the issued securities and the question why tranching may be beneficial to investors, see also Firla-Cuchra and Jenkinson (2005), De Marzo (2005) and Plantin (2004).

[7]The FLP is not fully equivalent to the actual first loss position if the originator implements credit enhancements in the structure which are subordinated to the FLP. For a detailed description of different types of credit enhancements see Jobst (2002).

[8]For a more detailed description, in particular with respect to credit enhancements underlying the waterfall structure of CDOs, see Hein (2007).

on the balance sheet of the issuing bank and so do monitoring incentives that reduce information asymmetries.[9] At the same time, by selling mezzanine and senior tranches, the risk of *unexpected* losses is transferred from the originator to investors at full compensation and, moreover, is more strongly diversified on the market (Krahnen, 2005; Krahnen and Wilde, 2005; BIS, 2005b). ABS-transactions are therefore claimed to allow a more efficient *economic risk sharing* between issuer and investors, allowing the direct funding of information sensitive assets via the capital markets (DeMarzo, 2005). According to this argument, loan securitization helps to reduce financial distress costs.

Apart from this risk sharing argument directly related to efficient contracting, several other aspects have been mentioned that may affect a financial institution's decision to securitize loans. Most prominent is the *liquidity effect* of securitization transactions that is particularly obvious in cash transactions. Here, the transfer of assets follows a true sale ("off-balance sheet") of the underlying portfolio to an SPV. The SPV then issues notes in order to fund the assets purchased from the originating bank. Obviously, this transaction leads to an inflow of cash and hence a possible restructuring of the bank's balance sheet (Gorton and Pennacchi, 1995), contingent on the reallocation of cash by the originator. With respect to this latter argument it is interesting to note that the funding costs involved with a securitization transaction are mainly related to the credit quality of the underlying portfolio and not to the rating of the originating bank (Krahnen, 2005). This also contributes to the marketability of these instruments since investors do not have to invest in additional research on the issuer but focus solely on the quality of underlying loans.[10]

Additional factors may have an important influence on a financial institution's decision to engage in credit securitization. As setting up a securitization program leads to significant fixed costs, we should expect only relatively *large banks* to securitize their loans.[11] The likelihood of a financial institution being active in CRT markets may also depend on the *bank type* (Minton et al., 2005) - particularly against the background of the ongoing transformation of traditional banking services towards market-based solutions (disintermediation).

Banks may also hope to trigger significant effects on their market equity value. Ayotte and Gaon (2006) show that the structural design of true sale ABS-transactions may have a valuable effect for weak originators in debtor-friendly bankruptcy regimes such as in the US. Here, weak banks have strong incentives towards activities in the securitization market as this may help to reduce inefficient continuation and is rewarded as such by the market. Lockwood et al. (1996), in contrast, find that wealth effects of securitization transactions are significantly related to financial slack of the bank in the quarter preceding the securitization announcement. In their study, financial slack is a proxy for the quality or performance of the bank. Findings are therefore *quality specific*, with wealth increases

[9] Arrow (1971), Townsend (1979) or Gale and Hellwig (1985) give a detailed analysis of incentive effects based on securitized claims.

[10] However, there remains some linkage to the originator's rating, if the SPV also enters into a servicer agreement with the originating bank. In such cases, investors and rating agencies will have to evaluate the servicer risk inherent in the transaction.

[11] Note that in several countries, publicly-sponsored programs exist to promote asset securitization by setting up a platform to be used by several (smaller) financial institutions, thereby making use of economies of scale. In Germany, for instance, the TSI (True Sale Initiative) is active in coordinating specific securitization programs.

for strong banks and wealth losses for weak banks. The authors argue that a securitization transaction by a weak bank results in a negative signal to the capital market in the sense of Myers and Majluf (1994), while strong banks will only engage in the securitization market when they are able to extract a positive net present value from the transaction. Thus, strong banks have a higher incentive to securitize. This result is strengthened by the study of Thomas (2001), who, in a cross-section regression of cumulative abnormal returns, reports that the first entry of a successful originator in the securitization market is associated with significant gains.

Hänsel and Krahnen (2007) furthermore show that credit securitization tends to increase the *systematic risk* of the issuing bank. In a cross-sectional analysis they reveal that the issuer's equity beta rises significantly more if the bank is financially weak and is domiciled in a bank-based financial system. Furthermore, the initial systematic risk of the originator is found to have a significant impact on the change in systematic risk. Hänsel and Krahnen (2007) argue that this may be interpreted as banks' *"appetite for risk"*, leading them to increase their exposure to market risk via loan securitization.

Apart from aspects of equity capital, credit risk and liquidity, further motivation for a bank's decision to be active in the market for loan securitization may therefore come from the bank's performance, its systematic risk, its size and bank type. The following empirical study will scrutinize the impact that these variables and more general macroeconomic factors may have on financial institutions' willingness to engage in loan securitization.[12]

3 Methodology and data

3.1 Sample

Our sample comprises all European banks in Bankscope for the period from January 1997 to December 2004 that satisfy two criteria. First, total bank assets must exceed Euro 150 million and second, the number of loans on each bank's balance sheet must be larger than 800 million. We hence concentrate on relatively large banks,[13] drop all central banks and thus arrive at a final sample of 316 banks that comply with both criteria for at least one year.

Table 1 reports the number of banks for each year in our sample and their country-specific affiliation. The final sample consists of 1948 bank entries with an average of 243 banks per year, ranging from a minimum of 226 banks in 2004 to a maximum of 257 in 1997. Due to massive concentration processes in the banking sector, our sample parallels the generally-observed decrease in the number of banks per year. Overall, our sample comprises banks from 17 different countries. The main part of our sample (about 60%) is made up of financial institutions from Germany, France, UK and Italy.

Table 2 reports the classification of banks with regard to different business areas (taken from the Bankscope database). Commercial banks consistently make up slightly over 40

[12]Note that since we do not dispose of information on the specific characteristics of banks' loans, we cannot test more elaborate hypotheses on risk transfer based on information asymmetries in the sense of Duffie and Zhou (2001).

[13]As the securitization decision is known to depend strongly on bank size, we limit potential endogeneity problems by focussing on a sample that is not too heterogeneous with respect to the size variable.

Table 1: Sample summary statistics: bank origin

Year Country	1997	1998	1999	2000	2001	2002	2003	2004
Belgium	14	12	8	8	8	8	8	8
Denmark	8	9	10	10	7	7	6	6
Germany	64	58	59	60	55	56	54	55
France	33	31	35	34	36	36	34	32
UK	33	35	36	36	35	35	33	33
Ireland	4	6	6	6	7	7	7	7
Italy	31	28	27	27	28	23	23	22
Netherlands	11	11	13	13	13	13	13	13
Austria	4	5	5	6	4	6	6	6
Portugal	7	7	7	6	6	5	4	4
Sweden	7	7	8	8	8	8	8	7
Switzerland	10	8	8	8	8	9	10	9
Spain	18	17	15	14	14	14	14	14
Other	13	13	13	14	15	14	13	10
N	257	247	250	250	244	241	233	226

percent of the final sample and as such account for the largest fraction. Real estate banks, bank holdings and cooperative banks together roughly account for another 40 percent. Note that while the number of commercial banks in our sample has been slightly decreasing over the years (from 118 in 1997 to 95 in 2004), the number of real estate banks, bank holdings and cooperative banks has remained constant or even slightly increasing until 2000 and decreasing only afterwards. The number of other financial institutions has remained relatively stable. Investment banks make up only a very small fraction of less than 4 percent.

3.2 Measures of securitization

Data for individual issuances of securitization transactions stem from three different sources. First, we use the European Securitization Almanac (January, July, October 2004 and February 2005) by Deutsche Bank. Second, we control each originator's securitization activities with the Quarterly CDO Deal List (September 2005) by Standard and Poor's. Finally, we also use the European Securitization Deal List (March 2006) by Computershare Fixed Income Services Limited. All banks without issuance activities in the securitization market are cross-checked with Lexis/Nexis Database.

Table 3 reports the percentage of firms that securitized assets for any given year in our sample period. Panel A sorts the results by year and country of the originating bank, while panel B sorts the results by the originator's type (business area). Panel C finally accounts only for stock-listed banks, as a subsample of the total data set. The fraction of

Table 2: Sample summary statistics: main bank business areas

Year	1997	1998	1999	2000	2001	2002	2003	2004
Bank Type								
Bank Holding	28	29	31	33	32	34	29	28
Commercial Bank	118	111	110	106	104	101	100	95
Cooperative Bank	21	20	21	24	24	22	23	21
Investment Bank	9	10	10	9	9	9	9	9
Medium / Long Term Credit Bank	7	6	6	6	6	6	5	5
Non-banking Credit Institution	8	7	9	9	10	10	10	10
Real Estate / Mortgage Bank	33	32	32	33	29	27	26	26
Savings Bank	17	16	15	14	13	14	16	16
Governmental Credit Institution	16	16	16	16	16	18	15	16
N	257	247	250	250	244	241	233	226

financial institutions securitizing assets increases from 1.6 percent in 1997 to 27 percent in 2004. The largest fraction of securitization transactions is undertaken by banks with headquarters in Germany and the UK. In recent years, also banks in Spain have been active in securitization processes. As can be seen from panel B, most transactions are initiated by commercial banks, to a much lesser extent also by mortgage banks, savings banks and investment banks. Table 3 also shows that the percentage of stock-quoted financial firms securitizing assets has increased. Yet, while in the first years of our sample (1997-2001), stock-listed institutions accounted for more than 50% of all CLO issuances, recent years have seen a significant decrease of this proportion to less than 40%. At the same time, the proportion of stock-listed banks in the full sample has increased from 26% to 36%.

3.3 Methodology

Our empirical approach is two-fold. In a first step, we divide the sample of banks into a group of securitizing banks and into a group not issuing securitized loans. In a univariate analysis, we then test for differences in means of various bank characteristics. The subsequent multivariate approach analyzes how firm-specific and macroeconomic variables influence securitization behavior in a logit framework.[14] With simultaneous consideration of the different data sources we check for each year whether or not a bank in our data set securitized assets. Whenever there is at least one securitization transaction by the bank, the dependent variable in our regression takes on the value 1, otherwise, i.e. if there is no securitization activity, it takes on the value 0.

Within a limited dependent variable model, we adopt a specification that is designed to handle the requirements of binary dependent variables, where the probability of observing a value of one is given by

[14] Probit analyses are available upon request. They deliver the same qualitative results.

Table 3: Summary of securitization activities by financial entities

Frequency of CLO issuance by sample banks; *Overall* indicates number of banks, *N* number of banks which issue a CLO-transaction.

Year	1997	1998	1999	2000	2001	2002	2003	2004
Panel A:	*CLO issuance by year and country*							
Overall	257	247	250	250	244	241	233	226
N	4	7	22	43	45	59	59	61
Percentage of sample	1.6%	2.8%	8.8%	17.2%	18.4%	24.5%	25.3%	27.0%
Belgium	1	1	0	1	2	2	2	2
Denmark	0	0	0	0	0	0	0	1
Germany	0	1	5	10	11	15	12	14
France	0	0	2	4	3	6	6	8
Great Britain	0	2	5	10	6	10	12	12
Ireland	1	0	0	2	0	1	0	0
Italy	0	0	2	4	10	6	5	3
Netherlands	2	1	2	4	3	4	5	5
Austria	0	0	0	0	0	1	0	0
Portugal	0	1	1	1	2	2	2	2
Sweden	0	0	0	0	0	0	0	0
Switzerland	0	0	1	3	3	2	3	3
Spain	0	1	4	4	5	9	11	9
Other countries	0	0	0	0	0	1	1	2
Panel B:	*CLO issuance by type of firm*							
Bank Holding	0	0	0	0	2	1	1	2
Commercial Bank	3	6	13	31	29	38	38	37
Cooperative Bank	1	0	0	1	5	2	3	3
Investment Bank	0	0	1	2	1	3	4	5
Medium / Long Term Credit Bank	0	0	1	1	0	1	0	1
Non-banking Credit Institution	0	0	0	0	0	0	0	1
Real Estate / Mortgage Bank	0	1	3	6	4	8	5	6
Savings Bank	0	0	3	1	2	4	6	4
Governmental Credit Inst.	0	0	1	1	2	2	2	2
Panel C:	*Subsample of stock-listed banks*							
Quoted on the stock exchange	67	71	74	80	81	83	84	82
Percentage of total sample	26.1	28.7	29.6	32	33.2	34.4	36.1	36.3
Number of issuances by quoted banks	2	5	13	22	25	25	24	24
Percentage of sub-sample	3.0	7.0	17.6	27.2	30.5	30.1	28.6	29.3
Percentage of all issuing banks	50.0	71.4	59.1	51.2	55.6	42.4	40.7	39.3

$$Pr(y_i = 1 \mid x_i) = 1 - F(-x_i'\beta). \tag{1}$$

Here, F is a continuous, strictly increasing function that takes on real values and returns a value ranging form zero to one. By choosing a logit function for F, it follows that

$$Pr(y_i = 0 \mid x_i) = F(-x_i'\beta). \tag{2}$$

Given such a specification, we can estimate the model parameters by using the method of maximum likelihood. The likelihood function is given by

$$L(\beta) = \sum y_i ln \frac{exp(x_i'\beta)}{1 + exp(x_i'\beta)} + (1 - y_i) ln \frac{1}{1 + exp(x_i'\beta)}. \tag{3}$$

The first-order conditions for this likelihood are nonlinear, so that obtaining parameter estimates requires an iterative solution. By default, our statistical program uses a second derivative method for iteration and computation of the covariance matrix for parameter estimates. Note that estimated coefficients from a binary model cannot be interpreted as the marginal effect of the independent on the dependent variable. Logit coefficients are, however, considered as the marginal effect of x_i on the log of the "odds", where:

$$\text{"odds"} = \frac{Pr(y_i = 1|x_i)}{1 - Pr(y_i = 1|x_i)} \ . \tag{4}$$

Note that our sample consists of yearly securitization decisions of European banks. Some of them chose to securitize their loans only once, while others continually decided to issue securitized assets. Our empirical approach accounts for this by clustering standard errors by banks following the generalized method based on Huber-White.

4 Definition of variables and descriptive statistics

4.1 Hypotheses and definition of variables

Generally, we test whether different firm-specific and macroeconomic variables have an influence on the probability of a CLO-transaction by banks, i.e.

$$\text{dependent variable} = f(\text{originator-specific variables, macroeconomic variables}) \ .$$

To avoid potential problems of endogeneity, all right-hand-side variables enter the regression equations lagged by one period.

Among the firm-specific variables, different factors are included, based on the arguments presented in section 2. As the main regressors we consider the originator's credit risk, leverage, performance and liquidity. In the following, we will describe each explanatory variable and its expected influence on the regressand in turn. A definition of variables and

a summary of expected regressor signs is given in table 4.

With respect to the regulatory capital relief hypothesis we include two proxies for the equity situation of the originator. *Tier 1*, describing the ratio of tier 1 capital relative to risk weighted assets, and *equity share* are both expected to exhibit a negative influence on a bank's propensity to issue CLOs: according to the regulatory capital relief hypothesis, banks with lower capital ratios should be more likely to securitize assets. This effect should be strongest for banks with capital ratios near the regulatory required minimum. In order to take account of this, we generate a dummy variable (*low tier 1*) that is equal to one for the ten percent of banks with the lowest capital ratios and zero otherwise.[15] We expect a positive sign for this dummy variable. To be consistent, we also test whether tier 1 capital has an effect among the subgroup of banks with lowest capital ratios via the interaction term *low tier 1 * tier 1*. For stock-listed banks, we additionally examine whether there is a significant effect for the group of banks with highest credit risk and lowest equity (*high risk * low tier 1*). A positive sign of this dummy should indicate that in particular banks with problems in fulfilling the regulatory constraints choose to securitize their loans.

The variable *risk* in our data set is supposed to reflect the originator's credit risk situation by measuring the bank's credit risk provision relative to net interest income. Since loan securitization allows a risk transfer of the underlying portfolio to the capital market, we should assume that firms with higher asset risk will have a higher incentive to securitize. There may be two reasons for this particular effect, though: first, banks may have a certain "appetite for risk" in order to increase expected returns. Those banks may be heavily engaged in securitization in order to, e.g., set free capital that can be invested in other risky businesses delivering higher expected returns. Second, banks that "unvoluntarily" bear a lot of risk and hence face a high likelihood of financial distress may try to fund their lending activities by securitization rather than by holding the assets on balance sheet and funding them with debt and equity. In particular for this latter group of banks we expect that the effect should be strongest for firms with highest risk. To test this, we introduce a dummy variable (*high risk*) that is equal to one for the ten percent of banks with highest risk and zero otherwise. Additionally, we test whether the risk variable has an influence on this subgroup (via the additional regressor *high risk * risk*).

In order to capture the "appetite-for-risk" hypothesis, we also tested the influence of the *quality* of risk. This variable describes the ratio of the firm's gross interest income to gross outstanding accounts. The quality variable hence refers to an ex-ante notion of risk that should better correspond to banks' incentives to increase risk-taking in order to generate higher expected returns than the simple risk measure mentioned above. According to the above reasoning, the *quality* variable should be expected to have a positive effect on a bank's propensity to engage in securitization activities. Still, we cannot rule out the case that the *quality* variable also acts as a (negative) proxy for "weak" banks that generate low interest income. In this case, the effect should be negative, since according to the first channel mentioned above, weak banks also have greater incentives to be active in the securitization market.

Furthermore we include a proxy for the liquidity of the originator. As has been ex-

[15] There are potentially two different ways to calculate this dummy and also some others to follow: the decentile may be calculated with respect to the full data set, or for every year individually. In the results displayed in the paper, we chose the latter method. The former, however, does not change our results. Results are available upon request.

plained in section 2, the incentive to engage in securitization should be higher for banks with a shortfall in liquidity. We therefore expect a negative sign for the overall *liquidity* coefficient and a positive sign for the decile of banks with lowest liquidity (regressor *low liquidity* for the dummy variable and *low liquidity * liquidity* for the interaction term).

In line with earlier work on the wealth effects of securitization transactions, we take into account a differential impact of weak versus strong banks. In this respect, we use two variables as proxies for the performance of a bank: return on equity (*RoE*) and cost-income ratio (*CIR*).[16] In the overall sample, both a positive or a negative coefficient may be conceivable due to earlier research results, while a positive sign seems reasonable for the banks with the lowest performance, measured by the decile with the highest value of the CIR variable (regressors *low performance* for the dummy variable and *low performance * CIR* for the effect of performance on the subgroup).[17] In order to give more insight on the "appetite-for-risk" hypothesis, we also include a dummy for the decentile of firms with highest performance. According to the risk-appetite argument, particularly banks with high performance should be active in loan securitization.

Finally, we include some general characteristics of the originating firm as additional regressors. First, we analyze the impact of firm size by taking account of *total assets*. For this variable, a positive sign is expected due to economies of scale following from the fixed costs of setting up a CLO structure. The *tax* variable captures a combination of size and firm quality and therefore should be assigned a positive coefficient. In essence, it comprises the taxes paid relative to earnings before taxes. However, also a negative effect may be conceivable since securitization leads to a potential reduction in tax benefits from keeping the assets on balance sheet. Therefore, institutions with high effective debt burden may securitize less (Minton et al., 2004). A high value of the *business* variable indicates that the bank generates high profits from investment banking or related activities. We expect a positive sign for this regressor. Still, the results with respect to this final variable may be strongly dependent on regulatory mechanisms and may therefore be relatively weak for European data.

Note that the multitude of variables and their various effects may be summed up in three hypotheses. The test of an impact of regulatory capital coincides with testing the regulatory capital arbitrage hypothesis. All variables that may affect a bank's financial distress costs allow for a test of the efficient contracting hypothesis. While the risk, respectively quality, variable certainly belongs to this group of factors, it also contributes to testing the appetite-for-risk hypothesis.

Table 10 in the appendix finally reports the different *macroeconomic variables* that are used as regressors. We employ the following country-specific variables for the total sample: credit default probability, ratio of rating downgrades to upgrades, GDP-growth rate, short- and long-term interest rates and yield on a well-diversified stock index (e.g., CDAX for Germany, Euronext CAC for France, FTSE 350 for UK). Among the dummy variables, we consider *year-dummies, country-dummies* and *industry-dummies* for the banks. In the sample restricted on stock-listed banks, we additionally take into account the *volatility* of stock returns, the market-to-book ratio (*MBR*) and the firm's *beta*. Again, these variables

[16] We also tested for an influence of return on assets (RoA). The results are essentially the same as for RoE.

[17] For stock-listed banks we also include a test for the best-performing banks measured as those in the decile with lowest CIR values with regressors *high performance* and *high performance * CIR*.

Table 4: Definition of firm characteristics

Definition of firm characteristics to be included as regressors in the logit regressions on the probability to securitize assets. Dummy variables are calculated for each year individually. Variable generation is based on Bankscope and Datastream database.

Regressor	Definition	Expected sign
Asset characteristics:		
Risk	credit risk provision / net interest income	(+)
High risk (dummy)	decentile of banks with highest risk	(+)
High risk * risk	high risk (dummy) multiplied by risk variable	(-)
High risk * low tier 1 (dummy, stock-listed firms only)	high risk (dummy) multiplied by low tier 1 (dummy)	(-)
Quality	gross interest income / gross outstanding accounts	(+/-)
Equity characteristics:		
Tier 1	tier 1 capital / risk weighted assets	(-)
Low tier 1 (dummy)	decentile of banks with lowest tier 1 capital	(+)
Low tier 1 * tier 1	low tier 1 (dummy) multiplied by tier 1 variable	(-)
Equity share	equity / total assets	(-)
Performance characteristics:		
RoE	return on average equity	(+/-)
CIR	cost-income ratio	(+/-)
Low performance (dummy)	decentile of banks with highest CIR	(+)
Low performance * CIR	low performance (dummy) multiplied by CIR variable	(-)
Liquidity characteristics:		
Liquidity	money lent to other banks / money borrowed from other banks	(-)
Low liquidity (dummy)	decentile of banks with lowest liquidity	(+)
Low liquidity * liquidity	low liquidity (dummy) multiplied by liquidity variable	(-)
General characteristics:		
Total assets	total assets	(+)
Tax	taxes / earnings before taxes	(+)
Business	net fees & commissions / net interest revenue	(+/-)

may give a hint at firms' risk-appetite, implying that firms securitizing loans in order to increase their performance hope to be awarded by the market for this via a higher market-to-book ratio and increase their beta.

4.2 Descriptive statistics

Table 11 in the appendix presents the general statistics with regard to the different firm-specific and macroeconomic explanatory variables. From the data, it can be seen that banks in our sample are very heterogeneous, in particular with respect to their risk characteristics, but also regarding their performance and equity capital holdings.[18] In particular the large range of tier 1 capital that banks hold is indicative of vastly different business strategies, also stemming - of course - from the different types of banks we are considering. Additionally, the switch from holding capital appropriate for Basel I to the new regulatory requests in Basel II, that should coincide with our sample period, may have led to relatively heterogeneous observations with regard to tier 1 capital. As we cannot infer the exact switching time from our data, we may only hypothesize that large banks tended to change their regulatory capital holdings relatively early compared to smaller banks. Data with respect to the size of total assets also mirror the large disparity of the total sample. The same is true for the additional data on stock-listed banks as can be seen from the large ranges of volatility, market-to-book ratio and beta values.

The statistics of macroeconomic regressors parallel the movement through the economic cycle. This is particularly obvious from the large range of values for GDP-growth rates, interest rates and country-specific stock market indeces. A breakdown of the index' and interest rate's development in different countries can be found in table 13 in the appendix. Our sample hence contains heterogeneous financial institutions that focus on different business models and are observed in different phases of performance and economic (country-specific) business-cycles.

5 Econometric Analysis

5.1 Univariate Results

As a first step in our analysis, we divide the total sample into the group of banks that did not securitize loans and the group that did issue CLOs and examine the differences-in-means in characteristics between the two. Results concerning these univariate tests are given in table 5. It displays the number of observations in each group, the mean and standard deviation of the coefficient. As can already be seen, the smallest number of observations is obtained with regard to the test of tier 1 capital. The last column in table 5 provides the p-values of a test on the equality of the two subsamples' means.

Significant results are derived both with regard to firm-specific and macroeconomic variables. Among the firm-specific regressors it is only the equity share and the return on equity that do not lead to significant differences between the two subsamples. Among the

[18] Further information can be obtained from table 12 in the appendix where descriptive statistics are given for three subgroups of banks: those with highest risk, with highest performance and lowest equity.

macroeconomic variables we observe that only the country specific index yield does not play a significant role. Summarizing the univariate results we find that financial institutions securitizing loans seem to be lowly-performing, large firms with low capital ratios, high risk of lower quality and low liquidity. Additionally, they seem to be engaged more strongly in investment-banking activities that generate fee income. With regard to macroeconomic variables, we observe that a higher probability of credit default and credit rating downgrades (with low yields on credit risk and a high spread), low GDP growth rates and interest rates seem to be conducive to securitization.

Table 5: Univariate tests of differences in firm-specific and macroeconomic characteristics - all banks

N denotes the number of entries in the respective category. *Mean* refers to the mean value of the respective variable in the two sub-groups. p-values of the tests on equality of means are reported in the last column. *, **, ***: significance at the 10%-, 5%- and 1%-level, respectively.

	securitization			no securitization			
Regressor	N_{sec}	mean	std. dev.	N_{nosec}	mean	std. dev.	p-value
Risk (in %)	278	21.37	25.75	1362	17.55	34.80	0.083*
Quality (in %)	290	9.86	6.03	1395	11.11	8.24	0.015**
Tier 1 (in %)	220	7.80	2.24	825	9.51	8.33	0.003***
Equity share (in %)	296	4.62	2.20	1426	5.16	7.11	0.196
RoE (in %)	296	9.94	11.40	1420	10.62	10.92	0.334
CIR (in %)	290	63.98	15.86	1408	58.99	22.35	0.000***
Liquidity (in %)	278	86.06	92.47	1343	115.85	124.29	0.000***
Total assets (in bn EUR)	296	198.077	208.904	1,426	95.906	125.239	0.000***
Loans (in bn EUR)	296	91.554	91.422	1,424	46.194	56.041	0.000***
Tax (in %)	288	26.82	16.41	1364	30.23	16.34	0.001***
Business (in %)	286	49.99	85.66	1400	36.83	49.79	0.000***
CDP (in %)	296	2.51	0.87	1426	2.06	1.00	0.000***
DUR	296	2.40	0.99	1426	2.06	1.00	0.000***
GDP Rate (in %)	296	2.26	1.65	1426	2.50	1.68	0.028**
Index (Basis 1995)	294	220.40	60.15	1327	219.30	71.88	0.807
Short interest (in %)	296	3.71	1.18	1426	4.01	1.47	0.001***
Long interest (in %)	294	4.78	0.60	1381	5.05	0.78	0.000***
Credit risk spread (in %)	296	1.60	0.41	1426	1.31	0.58	0.000***

As table 14 (in the appendix) shows, the ratio of firms using securitization versus those that did not is increasing over the years. Various dummy variables also account for significant differences between securitizing and non-securitizing financial institutions. Particularly in France, UK and Spain there are significant differences between the sub-groups. Also, we find that commercial banks are much more likely to choose securitization while real estate banks are less likely to do so. Combined with the fact that securitizing banks derive significantly higher fee income, this points to an interesting first conclusion: by issuing CLOs, commercial banks possibly try to (indirectly) increase their stake in investment banking by using new instruments (of securitization) in their traditional business field of bank lending.

Tables 6 and 15 (in the appendix) deliver the results of the same univariate analysis on the sub-sample of stock-listed banks. While the results are similar with regard

to macroeconomic variables, firm-specific regressors lead to slightly different conclusions. Stock-listed financial institutions using securitization have a higher market-to-book ratio and beta than non-issuing firms, a lower capital ratio, a higher cost-income-ratio, much lower liquidity and only slightly higher total assets than firms that are not using CLOs. Overall, among stock-listed firms, the differences between securitizing and non-securitizing financial institutions are much smaller than in the total sample. In particular, risk characteristics do not seem to drive the difference between the two groups of banks. Interestingly, the stock-return volatility does not account for a significant difference. In this respect, our results differ from Minton et al. (2004), who find that issuing firms have a significantly lower stock return volatility.

Table 6: Univariate tests of differences in firm-specific and macroeconomic characteristics - stock-listed banks only

N denotes the number of entries in the respective category. *Mean* refers to the mean value of the respective variable in the two sub-groups. p-values of the tests on equality of means are reported in the last column. *, **, ***: significance at the 10%-, 5%- and 1%-level, respectively.

	securitization			no securitization			
Regressor	N	mean	std. dev.	N	mean	std. dev.	p-value
Risk (in %)	138	22.02	14.00	402	21.23	33.95	0.791
Quality (in %)	138	9.72	3.03	404	9.40	5.41	0.499
Tier 1 (in %)	117	7.32	1.59	281	7.95	2.42	0.010***
Equity share (in %)	138	4.66	1.69	404	5.16	2.50	0.030**
RoE (in %)	138	11.14	8.52	404	11.18	12.43	0.970
CIR (in %)	138	64.37	16.12	401	60.95	14.37	0.020**
Liquidity (in %)	138	76.23	54.63	399	110.89	107.4	0.000***
Total assets (in bn EUR)	138	11.81	1.25	404	11.26	1.14	0.000***
Loans (in bn EUR)	138	11.17	1.10	404	10.64	1.08	0.000***
Tax (in %)	138	26.73	16.41	401	29.48	14.41	0.062*
Business (in %)	138	56.98	41.96	401	45.21	29.36	0.000***
CDP (in %)	138	2.44	0.88	404	2.13	1.01	0.001***
DUR	138	2.30	0.99	404	2.13	1.02	0.078*
GDP Rate (in %)	138	2.48	1.87	404	2.67	1.99	0.319
Index (Basis 1995)	138	231.24	56.88	366	215.40	73.74	0.023**
Short interest (in %)	138	3.71	1.15	404	4.22	1.84	0.003***
Long interest (in %)	138	4.83	0.61	392	5.13	0.90	0.000***
Credit risk spread (in %)	138	1.54	0.43	404	1.36	0.58	0.001***
Volatility	138	12.41	7.59	404	12.50	9.39	0.914
MBR	135	2.57	1.58	386	2.27	1.72	0.070*
Beta	133	0.67	0.21	392	0.57	0.28	0.000***

5.2 Multivariate Results

Table 7 presents the results of a multivariate logit regression on the likelihood of issuing securitized assets via a CLO by all sample banks as delineated in section 3.3. Three different model types are tested. Models I und II include firm-specific regressors, year-, country- and business-dummy variables. As information about tier 1 capital is only obtainable for a subgroup of firms in our sample, it is included only in model I, so that model II -

otherwise identical to I - allows for a larger sample size. Models Ia and IIa include the above-mentioned additional firm-specific dummy variables and interaction terms, whereas models Ib and IIb contain only the interaction terms, but not the dummies. Model III allows for macroeconomic variables as additional explanatory variables.

Among the firm-specific variables, the magnitude of total assets has a significantly positive influence on the likelihood of securitization. In all models, a larger bank is hence more likely to engage in securitization. Also the riskiness of loans increases the likelihood of securitization (in all but model III). A bank's liquidity, in contrast, reduces the probability of issuing a CLO. An increasing effect is finally also found for the cost-income ratio. Interestingly, tier 1 capital does not have a generally significant impact on a bank's decision to issue CLOs.

From models Ia,b and IIa,b we can additionally infer that banks in the decile of highest risk have a significantly positive propensity to engage in loan securitization. Still, for those banks the probability of issuing CLOs decreases along with more credit risk as can be seen from the significantly negative sign of the interaction term *high risk * risk*. Interestingly, paralleling the behavior of the risk variable, we also observe that the liquidity regressor reverses its sign in the extreme decile. The dummy for banks with lowest liquidity moreover does not turn out to be significant any more. As such, we may conclude that particularly large banks seem to use loan securitization to transfer risk and increase liquidity but that both functions appear to be limited in the extremes. For banks with lowest tier 1 capital, we find a negative, but not significant effect, while the interaction term turns out to be significantly positive. Regulatory capital hence does not play the expected role.

With regard to the further dummy variables, we find significantly positive effects for all year dummies because of the increase in overall securitization activity. The country dummies for Germany, Italy and the UK are mainly significantly positive, for France the dummy is always negative. With respect to the bank type dummies we obtain highly significant and positive effects for almost all business types except for investment banks. Banks' securitization decisions moreover seem to be positively influenced by the yield spread between high-quality and low-quality corporate bonds, but are negatively affected by long-term interest rates. Inclusion of macroeconomic variables does not, however, seem to increase the explanatory power of the regression over the basic model I.

Results from the regressions on stock-listed financial institutions are given in table 8. They are fairly similar to the total sample and even more pronounced in absolute magnitude. Again, bank size, credit risk and liquidity seem to be main drivers of the securitization decision. The surrounding macroeconomy and stock-market dependency appear to play a lesser role, though. As before, we find that regulatory concerns hold only within the group of banks with lowest tier 1 capital. It is very obvious here, that the ten percent of banks with lowest tier 1 capital display a generally low likelihood of securitizing their loans. This contrasts with the usual intuition of securitization transactions being used in order to save on regulatory capital. Similarly to the total sample, we find that the probability of issuing CLOs in this subgroup increases along with tier 1 capital. This may imply that loan securitization can help banks to fulfill their regulatory requirements; however, this function is limited such that it may not be used as a last resort. Yet, results with regard to the tier 1 variable are not very straightforward to interpret, because securitization activity in our sample increased over the years, while tier 1 capital gradually

Table 7: Logit analysis - all banks

Logit regression estimates of the likelihood of issuing assets via a CLO-transaction. The dependent variable equals one if a bank accomplishes an CLO-transaction and zero otherwise. Coef. is the coefficient estimate. Standard errors are clustered by banks. Log likelihood is the maximized value of the log likelihood function $l(\hat{\beta})$. Pseudo R^2 is an analog to the R^2 reported in linear regression models. *, **, ***: significance at the 10%-, 5%- and 1%-level, respectively.

	Model I	Model Ia	Model Ib	Model II	Model IIa	Model IIb	Model III
Regressor	Coef.	Coef.	Coef.	Coef	Coef.	Coef.	Coef.
Constant	-13.862***	-15.224***	-14.481***	-13.460***	-13.804***	-13.807***	-10.756***
Risk	0.012*	0.059***	0.042***	0.007*	0.037***	0.032***	0.005
Quality	0.033*	0.035	0.033	-0.002	0.002	0.003	-0.003
Tier 1	-0.035	0.046	0.032				
Equity Share	0.123	0.066	0.077	0.004	0.003	0.000	0.001
RoE	0.003	0.003	0.002	0.007	0.004	0.003	0.008
CIR	0.013	0.024*	0.020	0.015*	0.024*	0.022*	0.012
Liquidity	-0.003	-0.002	-0.002	-0.004**	-0.004*	-0.004*	-0.004**
LN (Total Assets)	0.554***	0.515***	0.521***	0.597***	0.543***	0.568***	0.581***
TAX	-0.006	-0.004	-0.007	0.003	0.003	0.001	0.002
Business	-0.002	-0.001	-0.002	-0.000	0.000	0.000	0.000
Year dummies	yes	yes	yes	yes	yes	yes	no
Country dummies	yes	yes	yes	yes	yes	yes	yes
Bank type dummies	yes	yes	yes	yes	yes	yes	yes
GDP rate							0.015
Index							0.002
Long interest							-0.363**
Credit risk spread							0.927***
Low tier 1		-0.469					
Low tier 1*tier 1		0.249	0.162**				
High risk		2.099***			0.890**		
High risk*risk		-0.063***	-0.031***		-0.038***	-0.026***	
Low performance		-0.357			2.801*		
Low performance*cir		-0.002	-0.006		-0.037*	-0.006	
Low liquidity		0.644			-0.396		
Low liquidity*liquidity		0.002	0.039		0.055*	0.035	
N	952	952	952	1509	1509	1509	1410
Log pseudo-likelihood	-378.47	-363.34	-369.22	-529.22	-517.83	-520.83	-518.62
Wald statistic	184.84	189.44	183.24	204.96	223.75	210.61	177.76
Pseudo R^2	0.25	0.28	0.27	0.25	0.26	0.26	0.24

decreased.

Similarly to the results on the total bank sample, we find that banks in the highest-risk decile have a high propensity to engage in loan securitization but that the probability of issuing CLOs in this subgroup decreases along with credit risk. Again, this may point to a certain limit to use this instrument as a risk-transfer tool. Models IVc,d finally show that banks with high risk and low equity have a high propensity to issue CLOs as given by the positive coefficient of the *high risk * low tier 1* regressor.

Note that table 8 includes the dummy *high performance* (and the respective interaction term) instead of the dummy on the 10% of banks with lowest performance as in the test on the total sample.[19] It is interesting to note that performance plays a much stronger role for a stock-listed bank than for an average bank. In contrast to risk and liquidity variables, the performance variable keeps its negative impact on CLO issuance also in the extremes. At the same time, both extremely well-performing and extremely poorly-performing banks are unlikely to securitize their loans. Combined with the univariate result that stock-listed banks issuing CLOs display a slightly lower performance than non-issuing banks, loan securitization may hence be conjectured to be a weak instrument to fine-tune banks' performance rather than a consequence of "risk-appetite".

With regard to dummy variables, we find slightly less significant and also more ambiguous effects as compared to the total sample. In particular, the country dummies display less constant impacts: only for UK and Spain we do obtain significantly positive coefficients. While we also observe positive (and mostly significant) effects for commercial, cooperative and real estate banks, the dummy for other banks - including investment banks - now displays a significantly negative coefficient.

[19]The dummy *low performance* and the corresponding interaction term turned out be insignificant. Results are available upon request.

Table 8: Logit analysis - listed banks only

Logit regression estimates of the likelihood of issuing assets via a CLO-transaction. The dependent variable equals one if a bank accomplishes an CLO-transaction and zero otherwise. Standard errors are clustered by banks. Log likelihood is the maximized value of the log likelihood function $l(\hat{\beta})$. Pseudo R^2 is an analog to the R^2 reported in linear regression models. *, **, ***: significance at the 10%-, 5%- and 1%-level, respectively.

	Model IV	Model IVa	Model IVb	Model IVc	Model IVd	Model V	Model Va	Model Vb	Model VI
Regressor	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
Constant	-13.118***	-20.791***	-22.349***	-20.812***	-22.226***	-14.098***	-18.976***	-19.682***	-9.232**
Risk	0.025**	0.083***	0.053**	0.082***	0.056**	0.019*	0.054**	0.035*	0.014
Quality	-0.011	-0.040	0.009	-0.036	0.002	-0.001	-0.018	0.009	0.005
Tier 1	-0.067	-0.107	-0.097	-0.114	-0.113				
Equity Share	0.157	0.273	0.335	0.279	0.335	0.106	0.192	0.220	0.083
RoE	0.004	0.009	0.042	0.009	0.046	0.031	0.017	0.046**	0.025
CIR	-0.015	0.043	0.048*	0.041	0.047*	0.020	0.056***	0.065***	0.015
Liquidity	-0.003	-0.003	-0.005	-0.003	-0.005	-0.004	-0.006**	-0.007**	-0.006**
LN (Total Assets)	0.775**	1.080***	1.149***	1.087***	1.140***	0.622***	0.737***	0.739***	0.660***
TAX	-0.011	-0.005	-0.003	-0.006	-0.003	0.003	0.009	0.008	0.002
Business	-0.003	-0.002	0.003	-0.001	-0.003	-0.004	-0.001	-0.003	-0.006
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	no
Country dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bank type dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Volatility	0.017	-0.017	0.006	-0.011	0.013	-0.007	-0.005	0.006	-0.003
MBR	0.248	0.318	0.207	0.339	0.229	0.098	0.211	0.118	0.095
Beta	0.146	0.251	-0.239	0.120	-0.359	0.222	0.109	0.034	-0.310
GDP rate									-0.066
Index									0.005
Long interest									-0.736**
Credit risk spread									0.331
Low tier 1		-6.542		-5.901*					
Low tier 1*tier 1		1.444*	0.137	1.252*	0.064				
High risk		6.876***		7.635***			4.245**		
High risk*risk		-0.154***	-0.018	-0.179***	-0.026		-0.089**	-0.011	
High performance		-2.775		-3.671			-4.340		
High performance*cir		0.187*	0.122***	0.212*	0.119***		0.214**	0.099***	
Low liquidity		2.784		2.240			0.759		
Low liquidity*liquidity		-0.086	0.005	-0.075	0.001		-0.012	0.016	
High risk*low tier 1				2.556*	2.295 *				
N	365	365	365	365	365	498	498	498	460
Log likelihood	-156.30	-136.40	-143.54	-135.50	-142.48	-194.28	-176.94	-181.81	-188.55
Wald statistic	81.31	182.97	116.08	173.44	123.86	120.11	167.00	159.47	102.71
Pseudo R^2	0.31	0.39	0.36	0.40	0.37	0.32	0.38	0.37	0.31

5.3 Robustness analyses

Several auxiliary analyses have been conducted in order to improve the robustness of our results. With regard to regressors we tested different variables, in line with our informal arguments of section 4, for inclusion into the model. In order to capture an institution's credit risk, for instance, we also used the ratio of credit risk provision over gross outstanding accounts, or the ratio of nonperforming loans over assigned loans. Both did not deliver significantly different results in the multivariate analysis. However, since data on nonperforming loans were not available for German banks, this measure decreased our sample size considerably. With respect to other firm characteristics, we also used the number of assigned loans to approximate bank size, return on assets as a proxy for performance and various different measures for liquidity. Inclusion of these variables did not change the results displayed in tables 7 and 8. We also tested the influence of additional decentile-dummies based on the various firm-specific variables values, e.g. a dummy for the 10% of banks with lowest risk.[20]

To mitigate the problem of multi-collinearity, we excluded highly-correlated regressors. Correlation coefficients for each possible combination of two regressors are given in tables 16 and 17 in the appendix. Overall, five combinations of highly correlated coefficients were observed and led to the exclusion of variables *loans*, *short interest*, *credit risk spread, performance AAA* and *performance BBB* in the multivariate analyses.

Furthermore, we considered different model specifications in order to take account of the data reduction following from individual variable arrangements. This is particularly obvious for models accounting for equity characteristics that were not available for all banks. We therefore constructed one individual model (model I for the full sample, model IV for the sample on stock-listed banks) that entails variable *tier 1* capital, which reduced the number of observations to 952 in the full sample and to 365 in the test on stock-listed banks. In models II, III, V and VI we disregarded this variable in order to increase the number of eligible observations.

Finally, we also accounted for the fact that large banks typically enter the group of "securitizers" much more frequently than small banks. This may have an effect on our results as the characteristics of these banks are then observed more often than those of smaller banks that chose to issue CLOs less often, if at all. We take account of this effect in a panel analysis where we control for fixed effects. The results are given in table 9. Models VIIa,b and VIII are run on the total sample, models IXa-c and X on the subsample of stock-listed banks only. Interestingly, we find that bank size hardly influences the securitization decision any more. Obviously, also smaller institutions are able to surmount the fixed costs associated with setting up a loan securitization program. Risk and liquidity concerns also do not seem to be as important any more, while the equity share gains in importance. Its positive influence runs slightly counter, however, to the significantly negative effect of tier 1 capital.

For stock-listed banks, we also find that the market-to-book ratio influences the securitization decision significantly positive. This may, at least, be a hint a banks' risk-appetite leading them to increase their market exposure via loan securitization. Interestingly, also the tax and the business variable have a significant effect in the panel study. As both are

[20] Results are available upon request.

negative, we may conclude that banks with higher tax payments are more reluctant to engage in loan securitization, which will reduce the benefits of "on balance-sheet" debt. In contrast, the negative coefficient of the business variable is not very straightforward to interpret. It may be a sign that banks with high income from credit lending and relatively low income from investment banking, e.g. commercial banks, are more likely to securitize loans.

Table 9: Panel analysis - all banks (models VII and VIII) and listed banks only (models IX and X)

Logit panel analysis (fixed effects) of the likelihood of issuing assets via a CLO-transaction. The dependent variable equals one if a bank accomplishes an CLO-transaction and zero otherwise. Models VII and VIII use the total sample of all banks, models IX and X only the subsample of listed banks. Standard errors are clustered by banks. Log likelihood is the maximized value of the log likelihood function $l(\hat{\beta})$. *, **, ***: significance at the 10%-, 5%- and 1%-level, respectively.

	Model VIIa	Model VIIb	Model VIII	Model IXa	Model IXb	Model IX c	Model X	
Regressor	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.	
Risk	0.041	0.011**	0.003	0.063	0.062	0.036	0.045	0.023
Quality	-0.049	-0.022	-0.049	0.058	0.043	0.142	0.069	-0.022
Tier 1	0.180	0.151		-0.716	-0.767*	-0.780*	-0.834*	
Equity share	0.207	0.253	0.444**	1.559***	1.623***	1.576**	1.679***	0.687*
RoE	0.007	0.009	0.008	0.016	0.041	-0.037	0.027	0.026
CIR	0.000	0.000	0.022	-0.027	-0.047	-0.060	-0.069	0.008
Liquidity	-0.003	-0.003	-0.003*	-0.004	-0.005	-0.004	-0.005	-0.008
LN (Total Assets)	0.525	1.031	2.375***	4.574*	3.260	4.858*	3.212	4.099**
Tax	-0.011	-0.012	-0.006	-0.041*	-0.034*	-0.051**	-0.040**	-0.008
Business	0.004	0.002	0.002	-0.019	-0.030*	-0.007	-0.022	- 0.022*
Year dummies	yes	yes	no	yes	yes	yes	yes	no
Country dummies	no	no	no	no	no	no	no	no
Bank type dummies	no	no	no	no	no	no	no	no
Volatility				0.058	0.076	0.088	0.105**	0.022
MBR				0.800**	0.748**	0.821**	0.758**	0.326
Beta				1.506	0.820	1.941	0.901	0.059
GDP rate			0.280					0.588**
Index			0.001					0.000
Long interest			-0.394					-0.393
Credit risk spread			1.172***					0.867*
Low equity	1.384			-6.903		-7.165		
Low equity*tier 1	-0.004	0.187*		1.339	0.038	1.040	-0.250	
High risk	3.153**			4.021		6.825		
High risk*risk	-0.071**	-0.006		-0.114	-0.024	-0.203	-0.045	
High performance				14.754		8.733		
Low performance	-1.687							
High performance*CIR				0.585*	0.569*	0.623*	0.602**	
Low performance*CIR	0.0196	-0.001						
Low liquidity	4.515*			5.334		6.099*		
Low liquidity*liquidity	-0.235*	-0.018		-0.125	0.038	-0.148	0.038	
High risk*low tier 1						5.947*	4.774	
N	440	440	582	193	193	193	193	240
Log likelihood	-116.13	-121.03	-170.79	-43.02	-45.12	-40.82	-43.54	-69.16
Prob > Chi^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

6 Discussion of results

Our results point to a refinement of the efficient contracting hypothesis regarding the use of loan securitization. Generally, we find that a bank is more likely to issue CLOs the larger the bank (more assets), the higher the bank's credit risk exposure, the lower its liquidity and the lower its performance (measured by cost-income ratio). Interestingly, equity capital - or, more precisely, tier 1 capital - does not seem to influence banks' securitization decisions very strongly. We also observe that banks in different countries display different propensities to engage in securitization activities, while we can hardly discriminate between banks' business types. With regard to macroeconomic factors, particularly yields on long-term government bonds seem to affect a bank's securitization decision.

In order to differentiate between securitization being used as an instrument of reducing financial distress costs or in order to feed banks' risk-appetite, we looked particularly at the risk effects in more detail. We find that the generally positive risk impact also holds for the 10% of banks with highest risk. Yet, among these, the influence of the risk variable is reversed. The propensity to transfer risk thus seems to be limited in the extreme. A similar (but less significant) reversal effect is observed with respect to liquidity, but not with regard to performance. Particularly for stock-listed banks, a persistently negative influence of performance on securitization decisions is observed. Given that according to the risk-appetite hypothesis, banks should try to securitize in order to increase their performance, we may conjecture that securitization seems to be used only as a weak instrument to fine-tune performance rather than a mechanism to feed banks' risk-appetite.

Correcting for potential fixed effects in our sample, we find that bank size is not necessarily a decisive factor for securitizing loans. In other words, the fixed costs associated with setting up a securitization program seem to be surmountable also for smaller banking institutions. The panel analysis also shows that the origin of revenue generation (the *business* variable) is no longer negligible. Combined with the fact that particularly commercial banks seem to be active in the CLO market, we may therefore conclude that loan securitization appears to offer an attractive way to indirectly tap the market for investment banking activities (and the associated gains) without directly crossing the traditional border to investment bank businesses.

While our general results are not in favor of the regulatory capital arbitrage hypothesis, we cannot reject an influence for stock-listed banks. Particularly in combination with high credit risk, a shortage in equity capital has a strongly positive impact on loan securitization. Hence, we cannot totally decline regulatory capital arbitrage, but it does not seem to hamper the growth in credit risk transfer in the years to come.

Taken together, our findings are indicative of securitization transactions mainly being used as a risk-transfer and funding tool that allows a more efficient risk-sharing and liquidity transformation. Still, as the reversal of the regressors' effects in the extreme deciles shows, both functions seem to be limited. This result coincides with observations from CRT markets that banks tend to retain the highest-risk CLO tranches and therefore risk-transfer is (still) small relative to notional size.

7 Conclusion

Based on recent research on the markets for credit risk transfer, this study examined firm-specific and macroeconomic factors that drive financial institutions' decisions to engage in loan securitization transactions. While we cannot reject the hypothesis that banks use loan securitization to save on regulatory capital, we find that the main factors driving banks' securitization decisions are bank size, credit risk, liquidity and performance. Particularly large banks seem to use securitization transactions to reduce exposure to default risk and increase liquidity. Still, risk-transfer and funding capacity seem to be limited: firms in the lowest decile of liquidity do not show a significant inclination towards loan securitization; for firms in the highest credit risk decile, the variable's effect even gets reversed.

As a conclusion we may state that the market for credit risk transfer does not seem to be hampered by the new Basel II framework that will no longer allow for regulatory capital arbitrage. Rather, it seems that loan securitization is mainly used as a financial engineering instrument, reducing financial distress costs related to bank lending. In this respect, credit risk transfer appears to be conducive to the ongoing disintermediation process in the traditionally bank-based European financial system. Particularly commercial banks are given - and seize - the opportunity to access market-based banking activities and possibly also try to feed their risk-appetite in order to increase expected returns via CLO transactions.

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Appendix

Table 10: Definition of macroeconomic and dummy variables

Regressor	Definition
Macroeconomic variables:	
CDP	credit default probability
DUR	rating downgrade-upgrade-ratio
GDP Rate	GDP-growth rate
Index	country specific yield of a well diversified stock index (Germany = CDAX, France = CAC40, UK = FTSE 350)
Short interest	Libor 3 month
Long interest	long-term interest rate of country specific government bonds
Credit risk spread	difference between yield of AAA- and BBB-rated risk indices
Performance AAA	yield of AAA-rated credit risk index (MSCI Overall)
Performance BBB	yield of BBB-rated credit risk index (MSCI Overall)
Dummy variables:	
LIST	1 if bank is listed, 0 otherwise
Year 1997	1 in 1997, 0 otherwise
Year 1998	1 in 1998, 0 otherwise
Year 1999	1 in 1999, 0 otherwise
Year 2000	1 in 2000, 0 otherwise
Year 2001	1 in 2001, 0 otherwise
Year 2002	1 in 2002, 0 otherwise
Year 2003	1 in 2003, 0 otherwise
Germany	1 if bank registered in Germany, 0 otherwise
France	1 if bank registered in France, 0 otherwise
UK	1 if bank registered in UK, 0 otherwise
Spain	1 if bank registered in Spain, 0 otherwise
Italy	1 if bank registered in Italy, 0 otherwise
Other country	1 if bank not registered in countries above, 0 otherwise
Commercial	1 if commercial bank, 0 otherwise
Cooperative	1 if cooperative bank, 0 otherwise
Real	1 if real estate bank, 0 otherwise
Investment	1 if investment bank, 0 otherwise
Savings	1 if savings bank, 0 otherwise
Other type	1 if bank not registered in classification above, 0 otherwise
For stock-listed banks only:	
Volatility	stock return volatility
MBR	market-to-book ratio
Beta	beta coefficient calculated via market model

Table 11: Descriptive statistics - firm-specific and macroeconomic variables

Descriptive statistics for banks in our sample in the time period 1997 to 2004. Calculations are based on the full sample of 1948 banks.

Regressor	N	mean	std. dev.	median	range
Firm specific:					
Risk (in %)	1640	18.19	334.66	130.40	[-238.76; 724.94]
Quality (in %)	1685	10.89	79.19	91.17	[0.00; 97.08]
Tier 1 (in %)	1045	9.15	7.50	7.80	[1.80; 87.00]
Equity share (in %)	1722	5.07	6.54	4.35	[0.27; 86.59]
RoE (in %)	1716	10.50	11.00	10.44	[-110.04; 115.51]
CIR (in %)	1698	59.84	21.46	61.84	[0.71; 441.33]
Liquidity (in %)	1621	110.74	119.94	77.56	[0.00; 995.80]
Total assets (in billion)	1722	113.47	148.17	50.74	[0.17; 994.97]
Loans (in billion)	1720	53.99	65.78	26.86	[0.00; 419.41]
Tax (in %)	1652	29.64	16.40	29.28	[0.00; 99.84]
Business (in %)	1686	39.06	57.66	31.19	[0.00; 868.86]
Macroeconomic:					
CDP (in %)	1722	2.14	1.00	2.16	[0.66; 3.82]
DUR	1722	2.12	1.00	2.06	[0.85; 4.16]
GDP Rate (in %)	1722	2.46	1.68	2.00	[-1.10; 11.70]
Index (Basis 1995)	1621	219.50	69.88	206.50	[114.10; 778.70]
Short interest (in %)	1722	3.96	1.43	3.56	[0.33; 13.97]
Long interest (in %)	1675	5.00	0.76	4.91	[2.63; 9.92]
Credit risk spread (in bp)	1722	136	57	150	[27;226]
Performance AAA (in bp)	1722	8	12	10	[-15;22]
Performance BBB (in bp)	1722	9	12	16	[-7;20]
For quoted banks only:					
Volatility	542	0.12	0.09	0.11	[0.01; 1.25]
MBR	521	2.35	1.69	2.13	[-14.48; 9.99]
Beta	564	0.59	0.46	0.53	[-1.26;3.64]

Table 12: Descriptive statistics - sub-groups

General and descriptive statistics with regard to firm-specific variables for three subgroups of banks: banks in the decile of highest credit risk (highest risk)of lowest cost-income ratio (highest performance) and of lowest equity (lowest tier 1 capital).

Banks with highest risk							
General statistics:			Number of securitizations = 46				
Year	1997	1998	1999	2000	2001	2002	2003
N	14	22	16	26	19	37	31
Country	Germany	France	UK	Spain	Italy	Other country	
N	89	30	3	26	3	14	
Bank	Commercial	Cooperative	Real	Investment	Savings	Other type	
N	68	16	17	4	2	58	
Firm specific regressors:							
	Mean	Std. dev.	Median	Range			
Risk	74.46	78.65	51.41	[37.20;724.94]			
Quality	11.98	8.83	10.3	[0.00;83.42]			
Tier 1	7.81	4.95	6.4	[4.30;44.92]			
Equity Share	4.25	6.84	0.46	[0.46;86.59]			
RoE	1.41	16.95	5.54	[-110.04;32.63]			
CIR	57.78	24.3	60.95	[14.59;172.42]			
Liquidity	85.36	94.43	65.67	0.40;692.47]			
Total assets	120,364	124,619	69,970	[12,452;526,452]			
Tax	20.43	18.87	18.54	[0.00;70.20]			
Business	51.49	101.01	23.85	[0.00;868.86]			
Banks with best performance							
General statistics:			Number of securitizations = 9				
Year	1997	1998	1999	2000	2001	2002	2003
N	31	28	21	26	21	19	19
Country	Germany	France	UK	Spain	Italy	Other country	
N	69	14	4	17	6	55	
Bank	Commercial	Cooperative	Real	Investment	Savings	Other type	
N	50	69	0	1	0	45	
Firm specific regressors:							
	Mean	Std. dev.	Median	Range			
Risk	24.32	35.12	17.67	[-41.36;239.53]			
Quality	10.53	7.43	8.18	[0;46.49]			
Tier 1	18.56	19.03	11.10	[5.10;84.30]			
Equity Share	5.11	11.10	2.99	[0.46;86.59]			
RoE	9.90	11.41	10.24	[-110.04;33.25]			
CIR	21.80	8.37	24.21	[0.71;32.48]			
Liquidity	159.01	200.05	79.97	[0.00;973.66]			
Total assets	52,730	52,641	35,858	[593.7;301,777]			
Tax	30.30	16.40	31.71	[0.00;70.81]			
Business	5.14	10.48	0.36	[0.00; 56.58]			
Banks with low equity							
General statistics:			Number of securitizations = 25				
Year	1997	1998	1999	2000	2001	2002	2003
N	24	21	15	17	12	9	6
Country	Germany	France	UK	Spain	Italy	Other country	
N	53	15	0	28	2	6	
Bank	Commercial	Cooperative	Real	Investment	Savings	Other type	
N	49	8	12	3	1	31	
Firm specific regressors:							
	Mean	Std. dev.	Median	Range			
Risk	39.72	80.46	25.02	[-12.36;724.94]			
Quality	10.50	3.83	9.87	[0.46;21.69]			
Tier 1	5.02	0.67	5.15	[1.80;5.70]			
Equity Share	3.52	1.95	2.98	[0.30;9.15]			
RoE	7.24	17.34	7.54	[-71.24;115.51]			
CIR	63.98	14.92	66.28	[22.45;109.95]			
Liquidity	89.00	74.02	73.82	[12.52;595.61]			
Total assets	117,610	125,281	76,944	[10,325;695,344]			
Tax	33.92	18.50	38.69	[0.00;75.25]			
Business	40.71	45.81	32.42	[0.00;282.40]			

Table 13: Country-specific separation of macroeconomic variables *index* and *long interest*

	1997	1998	1999	2000	2001	2002	2003
Index							
Germany	173.8	234.7	249.8	332.9	262.5	195.5	149.4
France	147.3	197.6	242.9	334.8	268	202.6	166.5
UK	139.9	168.1	187.5	190.1	165.9	137.3	120.8
Italy	139.6	219.7	241.4	316.4	249.5	190.8	170.6
Spain	194	284.2	309.8	336.5	271	217.8	206.5
Long Interest							
Germany	5.64	4.57	4.49	5.26	4.8	4.78	4.07
France	5.58	4.64	4.61	5.39	4.94	4.86	4.13
UK	7.13	5.6	5.01	5.33	5.01	4.91	4.58
Italy	6.86	4.88	4.73	5.58	5.19	5.03	4.25
Spain	6.4	4.83	4.73	5.53	5.12	4.96	4.12

Table 14: Univariate tests of differences in dummy variables - all banks

Overall, 1722 observations are included, with 296 securitizations and 1426 no-securitizations. N denotes the number of entries in the respective category, e.g. 257 bank entries in year 1997 of which 7 belonged to banks securitizing loans (N_{sec}) and 250 to banks not issuing CLOs, N_{nosec}. p-values refer to the respective χ^2-Test. *, **, ***: significance at the 10%-, 5%- and 1%-level, respectively.

	overall	securitization		no securitization		χ^2-Test	
Regressor	N	N_{sec}	(in %)	N_{nosec}	(in %)	Pearson χ^2	p-value
Year 1997	257	7	0.02	250	0.18	44.41	0.000***
Year 1998	247	22	0.07	225	0.16	13.90	0.000***
Year 1999	250	43	0.15	207	0.15	0.00	0.996
Year 2000	250	45	0.15	205	0.14	0.14	0.713
Year 2001	244	59	0.2	185	0.13	9.76	0.002***
Year 2002	241	59	0.2	182	0.13	10.47	0.001***
Year 2003	233	61	0.21	172	0.12	15.30	0.000***
Germany	406	68	0.23	338	0.24	0.07	0.788
France	239	29	0.1	210	0.15	4.98	0.026**
UK	243	57	0.19	186	0.13	7.81	0.005***
Spain	106	43	0.15	63	0.04	43.36	0.000***
Italy	187	29	0.1	158	0.11	0.42	0.519
Other country	541	70	0.24	471	0.33	10.01	0.002***
Commercial	750	193	0.65	557	0.39	68.14	0.000***
Cooperative	212	33	0.11	179	0.13	0.45	0.504
Real	155	14	0.05	141	0.1	7.96	0.005***
Investment	106	20	0.07	86	0.06	0.22	0.636
Savings	65	16	0.05	49	0.03	2.62	0.106
Other type	434	20	0.07	414	0.29	64.52	0.000***

Table 15: Univariate tests of differences in dummy variables - stock-listed banks only

Overall, 542 observations are included, with 138 securitizations and 404 no-securitizations. N denotes the number of entries in the respective category, e.g. 67 bank entries in year 1997 of which 5 belonged to banks securitizing loans (N_{sec}) and 62 to banks not issuing CLOs, N_{nosec}. p-values refer to the respective χ^2-Test. *, **, ***: significance at the 10%-, 5%- and 1%-level, respectively.

	overall	securitization		no securitization		χ^2-Test	
Regressor	N	N_{sec}	(in %)	N_{nosec}	(in %)	Pearson χ^2	p-value
LIST	542	138	0.47	404	0.28	38.02	0.000***
Year 1997	67	5	0.04	62	0.15	13.05	0.000***
Year 1998	71	13	0.09	58	0.14	2.20	0.138
Year 1999	74	22	0.16	52	0.13	0.82	0.364
Year 2000	81	25	0.18	56	0.14	1.46	0.226
Year 2001	82	25	0.18	57	0.14	1.29	0.257
Year 2002	83	24	0.17	59	0.15	0.62	0.432
Year 2003	84	24	0.17	60	0.15	0.51	0.477
Germany	98	35	0.25	63	0.16	6.63	0.010***
France	46	14	0.1	32	0.08	0.66	0.418
UK	77	17	0.12	60	0.15	0.54	0.462
Spain	93	21	0.15	72	0.18	0.49	0.484
Italy	38	23	0.17	15	0.04	26.48	0.000***
Other country	190	28	0.2	162	0.4	17.73	0.000***
Commercial	295	114	0.83	181	0.45	59.28	0.000***
Cooperative	43	12	0.09	31	0.08	0.15	0.701
Real	40	6	0.04	34	0.08	2.49	0.115
Investment	7	2	0.01	5	0.01	no test possible	
Savings	13	0	0	13	0.03	no test possible	
Other type	144	4	0.03	140	0.35	53.17	0.000***

Table 16: Correlation matrix of regressors - I

	Risk	Quality	Tier 1	Equity share	RoE	CIR	Liquid.	Total asset	Loans	Tax	Busi.
Risk	1.00	0.01	-0.15	-0.05	-0.33	0.03	-0.03	0.08	0.06	-0.14	0.21
Quality	0.01	1.00	-0.02	-0.11	0.01	0.06	0.13	0.10	-0.20	0.01	0.11
Tier 1	-0.15	-0.02	1.00	0.36	0.02	-0.38	0.02	-0.22	-0.21	-0.09	-0.14
Equity share	-0.05	-0.11	0.36	1.00	0.00	-0.09	-0.09	-0.24	-0.14	-0.09	-0.04
RoE	-0.33	0.01	0.02	0.00	1.00	-0.26	-0.04	-0.04	0.00	-0.03	0.05
CIR	0.03	0.06	-0.38	-0.09	-0.26	1.00	-0.08	0.19	0.09	-0.06	0.26
Liquidity	-0.03	0.13	0.02	-0.09	-0.04	-0.08	1.00	-0.05	-0.12	0.10	-0.05
Total asset	0.08	0.10	-0.22	-0.24	-0.04	0.19	-0.05	1.00	**0.87**	-0.10	0.14
Loans	0.06	-0.20	-0.21	-0.14	0.00	0.09	-0.12	**0.87**	1.00	-0.07	0.03
Tax	-0.14	0.01	-0.09	-0.09	-0.03	-0.06	0.10	-0.10	-0.07	1.00	-0.06
Business	0.21	0.11	-0.14	-0.04	0.05	0.26	-0.05	0.14	0.03	-0.06	1.00
CPD	0.00	-0.07	-0.01	-0.01	-0.06	0.04	-0.05	0.13	0.13	-0.12	0.02
DUR	0.06	-0.10	0.00	0.00	-0.10	0.05	-0.02	0.11	0.11	-0.09	0.02
GDP Rate	-0.13	0.06	0.04	0.01	0.26	-0.07	-0.06	-0.15	-0.15	-0.11	0.04
Index	-0.06	0.04	0.03	0.04	0.07	-0.09	0.00	-0.10	-0.10	0.00	-0.01
Short interest	-0.08	0.09	-0.02	0.04	0.18	0.00	0.06	-0.09	-0.05	0.04	-0.02
Long interst	-0.06	0.09	-0.01	0.03	0.15	-0.04	0.00	-0.13	-0.10	0.09	-0.06
Volatility	0.13	0.10	0.02	-0.04	-0.17	0.14	0.09	0.09	0.06	-0.12	-0.06
MBR	-0.17	0.18	0.05	0.13	0.30	-0.06	0.04	0.07	0.05	-0.01	0.10

Table 17: Correlation matrix of regressors - II

	CPD	DUR	GDP Rate	Index	Short inter.	Long inter.	Vola	MBR	Cr spread	Perf. AAA	Perf. BBB
Risk	0.00	0.06	-0.13	-0.06	-0.08	-0.06	0.13	-0.17	0.04	-0.06	-0.08
Quality	-0.07	-0.10	0.06	0.04	0.09	0.09	0.10	0.18	-0.12	0.13	0.10
Tier 1	-0.01	0.00	0.04	0.03	-0.02	-0.01	0.02	0.05	0.00	-0.01	0.00
Equity share	-0.01	0.00	0.01	0.04	0.04	0.03	-0.04	0.13	-0.01	0.01	0.01
RoE	-0.06	-0.10	0.26	0.07	0.18	0.15	-0.17	0.30	-0.09	0.08	0.09
CIR	0.04	0.05	-0.07	-0.09	0.00	-0.04	0.14	-0.06	0.05	-0.02	-0.03
Liquid.	-0.05	-0.02	-0.06	0.00	0.06	0.00	0.09	0.04	-0.04	0.02	0.01
Total asset	0.13	0.11	-0.15	-0.10	-0.09	-0.13	0.09	0.07	0.16	-0.12	-0.10
Loans	0.13	0.11	-0.15	-0.10	-0.05	-0.10	0.06	0.05	0.16	-0.12	-0.10
Tax	-0.12	-0.09	-0.11	0.00	0.04	0.09	-0.12	-0.01	-0.14	0.08	0.08
Business	0.02	0.02	0.04	-0.01	-0.02	-0.06	-0.06	0.10	0.04	-0.01	0.00
CPD	1.00	0.46	-0.18	0.32	-0.04	-0.25	-0.05	-0.04	0.76	-0.04	0.01
DUR	0.46	1.00	-0.39	-0.14	-0.32	-0.45	0.10	-0.16	**0.87**	**-0.60**	**-0.66**
GDP Rate	-0.18	-0.39	1.00	0.35	0.31	0.34	-0.09	0.28	-0.35	0.46	0.43
Index	0.32	-0.14	0.35	1.00	0.05	-0.01	-0.05	0.20	0.09	0.34	0.36
Short interest	-0.04	-0.32	0.31	0.05	1.00	**0.80**	0.09	0.26	-0.31	0.46	0.30
Long interest	-0.25	-0.45	0.34	-0.01	**0.80**	1.00	0.07	0.19	**-0.55**	**0.64**	0.44
Volatility	-0.05	0.10	-0.09	-0.05	0.09	0.07	1.00	-0.04	0.02	-0.07	-0.15
MBR	-0.04	-0.16	0.28	0.20	0.26	0.19	-0.04	1.00	-0.14	0.19	0.20
Credit risk spread	**0.76**	**0.87**	-0.35	0.09	-0.31	**-0.55**	0.02	-0.14	1.00	**-0.58**	**-0.53**
Performance AAA	-0.04	**-0.60**	0.46	0.34	0.46	**0.64**	-0.07	0.19	**-0.58**	1.00	**0.86**
Performance BBB	0.01	**-0.66**	0.43	0.36	0.30	0.44	-0.15	0.20	**-0.53**	**0.86**	1.00

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