

Credit Risk Transfer Practices in US Commercial Banks

Mascia Bedendo^a, Brunella Bruno^{*,b}

^a*Bocconi University and Carefin, Department of Finance Via Roentgen 1, 20136 Milan (Italy), Ph. +39 0258365973, Fax +39 0258365920*

^b*Bocconi University, Department of Finance Via Roentgen 1, 20136 Milan (Italy), Ph. +39 0258365954, Fax +39 0258365920*

Abstract

Building on the main theoretical motivations for credit risk transfer (CRT), we compare, from an empirical perspective, the use of loan sales, securitization and credit derivatives for a sample of US commercial banks over the period 2001 - 2008. First, we investigate how intensively different CRT instruments have been used in practice. Second, we analyze whether certain bank characteristics can be associated with a preference expressed by the institution for a specific tool over the others. In line with the prevailing theoretical predictions, the main features considered are: bank capitalization and liquidity; bank size and reputation; business model; loan portfolio composition; loan portfolio quality; profitability. Using both univariate analysis and panel econometric tools, we attempt to identify which of the above elements are more closely related to the use of loan sales / securitization and credit derivatives. We find that the main theoretical predictions are generally fulfilled: banks with riskier loan portfolios, liquidity constraints and higher asymmetric information issues prefer to use traditional CRT tools, while large and well capitalized banks with less risky portfolios resort to credit derivatives when experiencing capital shocks.

1. Introduction

Credit risk transfer (CRT) techniques such as loan sales, securitization and credit derivatives are forms of financial innovation which have produced crucial effects on the banking business as well as on the financial sector in general. By making credit risk easier to trade and hedge, those instruments have enabled banks to reduce their credit risk exposure, lower regulatory capital requirements, access additional lending channels and increase liquidity. Over the years, several banks have increasingly reduced their traditional banking function of providing non-standardized

*Corresponding author

Email addresses: mascia.bedendo@unibocconi.it (Mascia Bedendo),
brunella.bruno@unibocconi.it (Brunella Bruno)

credit and holding it in the form of non-tradable assets against capital resources, in favor of an originate-to-distribute approach (Llewellyn, 1999).

Recently, the widespread use of CRT instruments has been held partly responsible for the market turmoil that has been shaking financial markets since summer 2007. According to recent reports by the Financial Stability Forum (2008) and the Bank for International Settlements (2008), the financial crisis has been exacerbated by an exceptional boom in credit growth and financial leverage spurred by CRT structured products.

As the financial crisis has unfolded and the role played by CRT activities has become clearer, most market agents (regulators, depositors, investors) have called for a tighter regulation of CRT activities. However, in order to maximize the efficiency of regulatory policies aimed at constraining CRT activities, it is essential to gain a deep understanding of both the way banks have been using CRT instruments in practice in the years leading to the crisis, and the motivations behind the usage of CRT techniques. In this respect, it is important to identify links between certain bank characteristics (which typically define the business model adopted by the bank) and the preference expressed for a particular CRT instrument (outright loan sales, internal securitization or credit derivatives) over the others. To date, rigorous empirical evidence on the topic is very limited and this paper aims at providing a contribution in this direction.

Existing literature has formulated and empirically verified alternative theoretical reasons for accessing individual CRT instruments. Most studies focus on traditional CRT tools, such as loan sales and securitization. Greenbaum and Thakor (1987) motivate those activities with the need to overcome informational asymmetries and finance profitable projects. Avoidance of underinvestment and improvement of risk sharing are suggested by Benveniste and Berger (1987) as motivations for securitization and by James (1988) for loan sales. Berger and Udell (1993) review an exhaustive set of theories behind loan sales. Further empirical support for funding and liquidity management motivations for securitization in U.S. banks is provided by Thomas and Wang (2004), and Vickery (2007). The comparative advantage hypothesis in originating loans under funding and capital constraints has been proposed by Pennacchi (1988), Carlstrom and Samolyk (1995), and empirically verified by Pavel and Phillis (1987) and Demsetz (2000). Pennacchi (1988) considers bank regulation as an additional reasons for selling / securitizing loans. However, the regulatory arbitrage theory has gained little empirical support, although Calomiris and Mason (2004) find securitization to be negatively linked to risk-weighted capital ratios.

The usage of credit derivatives has been theoretically motivated with the desire to improve

the management of credit portfolios in order to reduce credit risk (Das, 1998; Minton, Stulz and Williamson, 2009). From an empirical perspective, Minton, Stulz and Williamson (2009) investigate the motivations behind the use of credit derivatives by a sample of U.S. bank holding companies from 1999 to 2005. They conclude that banks that normally act as protection buyers in the credit derivative market usually engage in asset securitization and loan sales as well, have risky loan portfolios, and are typically poorly capitalized.

Theoretical models aimed at comparing different CRT tools have recently been proposed by Duffee and Zhou (2001), Thompson (2007), and Parlour and Winton (2008). According to these contributions, the choice among CRT instruments depends on some bank characteristics such as the intensity of information asymmetries, the severity of credit risk, and the cost / level of bank capital. Specifically, under the assumption of no information asymmetries in the credit derivatives market, Duffee and Zhou (2001) conclude that credit derivatives can help alleviate the lemons problem that affects the loan sales market. By relaxing this assumption, Thompson (2007) suggests that well capitalized banks will prefer loan insurance contracts, whereas poorly capitalized banks will be forced into the loan sales market. Parlour and Winton (2008) claim that loan sales dominate credit derivatives when credit risk is high, defaults have negative signalling effects, and monitoring is crucial. If credit risk is relatively low and the cost of retaining capital reserves is high, credit derivatives and loan sales may coexist. Almost no empirical tests of those theories explaining what drives the choice among various CRT tools can be found in the literature, which has focussed exclusively on individual instruments considered independently from alternative tools.¹

In this paper we aim at providing contributions to the existing literature along two directions. First of all, we provide some empirical tests of the theoretical predictions regarding how to choose among different CRT instruments. We do so by comparing the features of: 1) CRT users and non-users; 2) banks that only sell, securitize or insure their assets, among CRT users. Focussing on the characteristics and motivations of users of one single CRT tool helps avoid the confounding effects of the joint usage of different instruments, and better isolates the motivations behind each individual CRT tool (with respect to the alternatives). This represents a significant improvement on the existing literature on individual instruments whose results may, in fact, be biased when the analysis of the drivers behind one specific CRT activity does not account for the role played by

¹Some limited empirical comparison of the activity in loan sales and credit derivatives for a sample of European banking groups is provided by Bedendo and Bruno (2009).

those drivers in explaining simultaneous activities in other tools. Secondly, we contribute to the empirical literature on traditional CRT instruments, i.e. loan sales and securitization. Although this literature is well consolidated, very little work has been done to assess whether the classic motivations behind loan sales or securitization still hold following the introduction of new CRT tools such as credit derivatives.

Our investigation is performed as follows. We first analyze how a sample of commercial US banks have been using CRT instruments (loan sales, securitization and credit derivatives) in practice over the period June 2002 - June 2008. This information is then cross-matched with balance-sheet data in order to investigate whether the use of different CRT tools can be significantly linked to some measurable features such as: 1) bank's liquidity and capitalization; 2) bank's lending opportunities; 3) bank's size and reputation; 4) quality of the loan portfolio; 5) bank's profitability. Using both univariate t-tests on the mean and multivariate techniques, we attempt to identify which features are more closely related to the usage of credit derivatives and loan sales / securitization. Where appropriate, we control for bank's size, as it turns out to be the strongest driver behind the choice among various tools.

In general, we find robust evidence supporting the theoretical explanations regarding how banks choose the most appropriate CRT instruments. We observe that smaller banks with a large deposit base, lower credit risk and higher proportion of loans with asymmetric information issues prefer loan sales. Large banks with riskier loan portfolios, larger capitalization and liquidity constraints tend to securitize internally. Very large, international, and well-capitalized banks with less risky portfolios resort instead to credit derivatives when experiencing capital shocks.

The rest of the paper is structured as follows. Section 2 discusses the basic features of the CRT tools investigated in this work. Section 3 presents the dataset and the variables employed. Section 4 illustrates the empirical findings of our analysis. Section 5 concludes.

2. Credit Risk Transfer Tools

Traditional CRT instruments such as loan sales and securitization have been available for some time, while new varieties of CRT mechanisms such as credit derivatives have developed over the last decade and quickly expanded. The theoretical and practical differences between different CRT techniques are crucial in setting the preference for one particular instrument over the others for the purpose of transferring credit risk.

A typical loan sale contract is the simplest CRT mechanism through which the loan originator

sells all or part of the payments from the underlying loan to a third party. Unlike securitization, loan sales involve no creation of new securities. In some cases, the debtor-creditor relationship is entirely shifted from the originator to the loan buyer, who becomes responsible for monitoring the borrower. Loan sales can occur with or without recourse: in the first case, the originator guarantees (in full or in part) the loan payments in case of default of the obligor.

Securitization is the process of transferring loans to third parties through the issuance of new securities whose cash-flows are collateralized by the original loan pool. In a securitization deal, the originator usually provides some forms of credit enhancement (e.g. by retaining the equity tranches of the issue). Furthermore, the originating bank often acts as a servicer, by collecting and transferring cash flows from the underlying obligor to final investors. In this way, the originator retains the relationship with the borrower.

Despite some technical differences, loan sales and securitization provide similar benefits. In both cases, banks use loan transfers as a source of funding (for financing new loans) and a tool for credit risk management as well as for reducing regulatory capital constraints. In addition, the opportunity to quickly transfer loans enables banks to better focus on core skills such as origination, servicing, and management of loan portfolios.

Selling / securitizing loans without recourse give rise to agency problems, in terms of both moral hazard and adverse selection (Akerlof, 1970). Different mechanisms can be conceived in order to avoid lemon problems (Pennacchi, 1988). Possible solutions include selling only a fraction of the original contract, modeling incentive-compatible contracts, or providing some form of recourse / credit enhancement (Gorton and Pennacchi, 1995). Clearly, the higher the proportion of loans retained or the recourse / credit enhancement provided by the originating bank, the lower the proportion of credit risk transferred away from the bank and capital relief obtained.

Credit derivatives are over-the-counter financial instruments whose payoffs are linked to a specific credit related event such as default, debt restructuring, or credit downgrade of the obligor. In essence, when used for hedging, they resemble an insurance on a particular credit and represent an easy and efficient way of quickly transferring credit risk and gain capital relief.² In a credit derivative contract the relationship between the bank purchasing credit risk insurance (protection buyer) and the obligor is unaffected since the original credit contract stays with the protection buyer who,

²In fact, to qualify for hedge accounting treatment, a derivative position must be highly correlated with the underlying exposure: this is hardly the case for credit derivative hedges, as credit derivatives are marked-to-market, while the underlying loans or securities in the banking book are not (Yarish, 2003).

however, may lose the incentive to monitor the borrower. To reduce the resulting agency problems, the majority (around 60%) of underlying obligors in credit derivative contracts are rated investment grade (BBA, 2006). Unlike loan sales and securitization, credit derivatives are unfunded instruments, as they simply transfer credit risk, without generating liquid financial resources.

3. Data and Methodology

The data employed in the analysis are taken from the *Consolidated Reports of Condition and Income* (Call Reports), whose quarterly filing is compulsory for all insured commercial banks and trust companies operating in the U.S. Our sample is limited to domestic commercial banks having total assets greater than one billion USD at the reporting date, over the period June 2002 - June 2008.³ We exclude smaller institutions as their activity in CRT markets turned out to be minimal. Since bank data are reported on a consolidated basis, we exclude majority-owned subsidiaries of other reporting commercial banks in order to avoid duplications. To minimize the potential impact of sample outliers, we also remove all banks which have been formally classified as commercial banks, but do not possess the typical features of commercial banks, such as those institutions with no commercial or industrial loans outstanding, zero deposits, or zero equity capital.

Given that theoretical work on CRT is based on its usage for hedging the loan portfolio, rather than for trading purposes, we need to identify those banks that use CRT instruments (loan sales, securitization, credit derivatives) for hedging. As far as credit derivatives are concerned, this is not straightforward, as banks are required to report the gross notional amounts of credit protection bought and sold, but not what part is separately attributable to hedging or trading activities.⁴ In an attempt to overcome this limitation, we compute the net credit protection purchased as the ratio between net credit protection (gross protection bought - gross protection sold) and the gross protection purchased. If the ratio is greater than 0.5 (i.e. the protection bought is at least twice as much as the protection sold), we label the bank as *net protection buyer*. Analogously, we define *net protection seller* a bank whose ratio between net credit protection and gross protection sold is less than -0.5.⁵ The remaining credit derivative users are classified as *dealers*.

We believe this approach to be more robust in classifying credit derivative users than simply

³Data for some of the variables selected for the analysis were not available prior to 2002.

⁴See section RC-L of the Call Reports.

⁵Both net buyers and sellers may use credit derivatives for hedging and managing the overall credit risk of the loan portfolio. However, in order to run a comparison with alternative means of CRT, here we focus primarily on net credit derivative buyers, as we do not possess information on the positions of loans / securitization tranches purchased on the secondary market.

looking at the sign of the net credit protection, since a bank can have a net long / short position purely as a result of its dealer activities, especially when the gross amounts of protection bought and sold are very similar.⁶ To check whether our approach is helpful in distinguishing hedgers from dealers, we compare the values of derivatives (ex-credit derivatives) trading and hedging ratios computed for both credit derivative hedgers (buyers or sellers) and dealers, defined according to our measure. The derivative trading ratio is computed as the ratio of the gross notional amount of other derivatives used by the bank for trading over total assets, while the derivative hedging ratio is the ratio of the gross notional amount of other derivatives used for hedging over total assets. In relative terms, if banks are consistent in their usage of derivative products, we expect our net credit derivative hedgers to use a higher (lower) proportion of other derivative instruments for hedging (trading) purposes compared to credit derivative dealers. The average values of the derivative trading ratios are equal to 11.38 and 1.81 for banks qualified, respectively, as credit derivative dealers and hedgers according to our methodology. The average figures for the derivative hedging ratios are 0.33 and 0.29, respectively. These results seem to confirm that our methodology labels as dealers (hedgers) those institutions more actively involved in using derivatives for trading (hedging) purposes, with a notional amount of derivatives used for trading around 34 (6) times as large as the amount of derivatives used for hedging.

Information on banks' activity in loan sales and securitization are available from Schedule RC-S of the Call Report. In fact, the only data available refer to asset sales and asset securitization activities with some type of recourse or credit enhancement.⁷ Since the vast majority of securitizations involve some form of credit enhancement, the data provide an accurate representation of the securitization activity of the banks in the sample. On the other hand, the available data on asset sold and not directly securitized may underestimate the overall loan sales activity of the sample, since the proportion of loans sold without recourse can be significant.⁸ As an alternative,

⁶Previous empirical studies on credit derivatives (Shao and Yeager, 2007; Minton, Stulz and Williamson, 2009) defined net protection buyers and sellers simply on the basis of the sign of their net credit derivative positions.

⁷More specifically, banks are required to report: 1) Bank Securitization Activities, i.e. the "outstanding principal balance of assets sold and securitized with servicing retained or with recourse or other seller-provided credit enhancements"; 2) Bank Asset Sales, i.e. "assets sold with recourse or other seller-provided credit enhancements and not securitized by the reporting bank". In practice, most assets sold on the market are then securitized by the buyer. This is the case, for example, of residential mortgages sold to Fannie Mae or Freddie Mac. Data on loan sales and purchases without recourse was collected only until the end of 1993. The asset sale and securitization activities reported is not of trading nature.

⁸In our sample, on average, the residual credit exposure of the bank from securitization is between 5% and 10% of the outstanding notional amount of the loan securitized, while the residual exposure from loan sales is around 60%-70% of the outstanding notional sold on the market.

one could derive a proxy of loan sales activity from the loans held for sale included in the Call Reports. Specifically, one may assume that all loans available for sale at a generic reporting date t will be sold between t and $t + 1$. This proxy, however, would overestimate the loan sale activity as not all loans available for sale are then placed on the secondary market. Also, this measure would not provide separate information on the loans sold directly on the market and those securitized by the originator. Hence, we prefer to work with loan sales and securitization with recourse or credit enhancement. This can partly affect our results, as we can expect weaker support for the motivations related to credit risk transfer and capital relief for loan sales and securitizations.⁹

3.1. Banks' Characteristics

The purpose of our analysis is to investigate what motivates the usage of CRT instruments and what drives the choice of a commercial bank amongst different tools. In particular, we explore whether and how some banks' characteristics (such as profitability, riskiness, liquidity, capitalization) and their dynamics can affect the decision to sell or insure part of the loan portfolio. In the following we provide a list of the indicators used to measure banks' characteristics, most of which are well consolidated in the relevant literature. It is worth noticing that some indicators can capture multiple features and may be highly correlated with other measures. However, this does not introduce a bias in our analysis, since all indicators are used in the univariate framework, but only a selection of low correlated measures is employed in the multivariate exercise.

Liquidity

Liquidity constraints and funding needs have been traditionally identified as key drivers of the process behind loan sales and securitizations. Banks with one or more of the following characteristics: 1) limited access to interbank funding or other non-traditional funding opportunities; 2) high funding costs; 3) thin positions in liquid assets; are more likely to sell or securitize loans. These CRT tools allow banks to transform loans into cash that can be readily used to generate new loans and maintain loan growth at competitive levels, even under liquidity constraints. Clearly, the funding motivation does not apply to credit derivatives, given that the insured credit is not removed from the loan portfolio.

We investigate the role of liquidity motivations using both asset and liability liquidity measures.¹⁰ To measure asset liquidity we use a liquidity ratio defined as the amount of liquid assets

⁹Some robustness checks performed on the loans held for sale have confirmed that most of our results hold. The findings are available from the authors upon request.

¹⁰Asset liquidity refers to the ease of converting an asset into cash with a minimum loss. Liquidity liability refers

(i.e. cash, Fed funds sold, securities purchased under agreement to resell, securities issued by the U.S. treasury or U.S. government agencies) over total assets. We exclude all other securities as well as asset-backed securities from our definition of liquid assets, as recent experience has shown that they may in fact become hard to liquidate during uncertain market conditions.¹¹ As funding liquidity measures we use the following indicators: 1) an overall customer deposit ratio, given by the ratio of total deposits (excluding interbank funding) over total assets; 2) a core deposit ratio, measured as the ratio of core deposits (defined as insured deposits only) over total assets; 3) an interbank ratio, measured as the sum of Fed funds purchased and other interbank funding over total assets; 4) the proportion of all non-deposit funding sources on total assets; 5) a measure of funding cost, computed as the ratio of interest expenses over interest-bearing liabilities.

Capitalization

Closely related to funding constraints is the issue of bank's capitalization. Under regulatory capital requirements, banks with limited equity capital are more likely to engage in CRT activities in order to: 1) improve their existing capital ratios by transferring credit risk away from their balance sheets; 2) release resources which cannot be easily obtained on capital markets, due to either general economic or idiosyncratic conditions. In our analysis, we expect capital shocks to have a stronger impact on the choice to insure loans rather than to sell or securitize them, given that we only consider sales and securitizations with recourse. In an asset sale with recourse, the originator normally retains (or provides guarantees for) the riskiest part of the asset sold or securitized and therefore, the capital relief is only marginal.

Here we consider two measures of capitalization: the Tier 1 capital ratio (both unadjusted and risk-adjusted) and the total capital ratio (unadjusted).

Lending Opportunities

Strong lending opportunities (usually associated with funding issues) provide banks with an incentive to move away from the originate-to-hold intermediation model towards a more sophisticated originate-to-distribute approach, where new loans are continuously generated and placed on the secondary market. Among various CRT instruments, banks with significant advantages in loan origination will prefer funded tools (such as loan sales and securitization) to credit derivatives.

As proxies of a bank's lending opportunities, we use the following indicators: 1) loan prof-

to the ease of raising funds at a competitive cost.

¹¹In fact, the liquidity of asset-backed securities has recently increased, since they are now accepted as collateral for repurchase agreements.

itability, measured as interests on loans over total loans; 2) net interest income (over total assets); 3) loan ratio, calculated as total loans over total assets; 4) loan to deposit (both overall and core) ratios. Higher loan or loan to deposit ratios and higher proportions of income from traditional intermediation are used as measures of stronger lending opportunities.

Size and reputation

Bank's size (measured as the natural logarithm of total assets) may affect the intensity of usage of CRT instruments in various ways. Large banks may have a comparative advantage in lending opportunities with respect to small banks. Similarly, the significant fixed costs associated with some CRT techniques (in particular, securitization and credit derivatives), as well as the high expertise required for pricing sophisticated CRT instruments, tend to favor large banks. On the other hand, the funding motivation to CRT activities suggests that small banks may have a relatively bigger advantage in selling or securitizing loans as they are more likely to suffer from funding constraints and are more exposed to liquidity shocks.¹²

An additional variable commonly linked to (and proxied by) bank's size is the reputation that a bank enjoys in the CRT market. Given the asymmetric information issues associated with most CRT transactions (especially loan sales and securitization), the reputation of the originating bank is of crucial importance when accessing CRT markets. Besides bank's size, a widely used proxy of credit quality reputation is the net issuance of standby letters of credit, measured as standby letters of credit (financial and performance) minus standby letters of credit conveyed to others, divided by total assets.

Lending quality

Riskier banks are expected to use CRT tools more intensively than less risky institutions for credit risk management purposes. As far as the choice among various instruments is concerned, most theoretical contributions agree on the superiority of loan sales / securitization over credit derivatives when: a) the bank's credit risk is high; b) informational asymmetries are more intense and monitoring becomes crucial.

We use two variables to measure a bank's credit risk: 1) the ratio of total risk weighted assets over total assets, as a measure of the overall credit riskiness of the bank's assets; 2) the net charge-off ratio, computed as charge-offs on loans (minus recoveries) divided by total assets, as a measure of riskiness of the loan portfolio.¹³

¹²In this respect, see Kashyap and Stein (2000).

¹³The net charge-off ratio has also been used in previous studies as an indicator of information asymmetries (see

Profitability

Overall bank's profitability may affect participation to the CRT markets as hedging various sources of risk (and particularly credit risk) becomes relevant for the survival of less profitable banks (see Smith and Stulz, 1985). Here we use two measures of overall bank's profitability: return on assets (ROA) and return on equity (ROE). More specific indicators of performance of traditional and non-traditional banking activities include the net interest income ratio and a non-interest income ratio, both calculated over total assets.

Loan portfolio composition

We expect the composition of the loan portfolio to be significantly linked to the choice among loan sales, securitization and credit derivatives. Some types of loans (e.g. mortgages and retail, small business) have specific features (standardization, small size, or asymmetric information issues) that make them particularly suitable for securitization (in the case of more standardized loans such as retail and mortgages) or loan sales (in the case of more opaque loans to SME). On the contrary, loans to large commercial and industrial borrowers with good credit rating and low asymmetric information issues can be easily hedged using credit derivatives.

Loan composition is measured as follows: 1) percentage of loans secured by real estate on total loans; 2) percentage of commercial and industrial loans on total loans; 3) percentage of loans to individuals on total loans. We also calculate the percentage of loans to small business companies on total loans, which represents a useful indicator of information asymmetries in the loan portfolio.¹⁴ Where available, we use the proportion of medium (three to five year expiry) and long (over five year expiry) term loans on total loans as further indicators of information asymmetries in the loan portfolio.

4. Empirical Findings

4.1. Credit Risk Transfer Usage: Summary Statistics

Table 1 reports annual summary statistics on the usage of CRT instruments by the commercial banks in our sample, which includes between 400 and 500 banks depending on the year. The most striking evidence is that only about 35% of the banks in the sample use at least one of the tools under investigation.

Demsetz, 2000).

¹⁴Business loans with original amounts of 1,000,000 USD or less. The information is provided only with the June Call Report. Figures for other reporting dates are obtained through linear interpolation.

INSERT TABLE 1 HERE

In line with our expectations, commercial banks are more actively involved in CRT in times of financial distress (2002 and 2007-2008), when the need for hedging credit risk becomes more compelling. We observe that, over time, the percentage of banks which securitize internally has nearly halved from 22% to 13%, while the percentage of banks selling loans on the market has increased from 19% to 29%.¹⁵ In line with previous evidence (see Minton, Stulz and Williamson, 2009), we observe that the percentage of credit derivative users has increased in the last years starting from around 5.75% in 2002, but it remains very low at about 9% of the total sample in 2008. Among credit derivative users, the percentage of net credit protection buyers (according to our definition) has been quite stable over the years, between 35% and 43%. Credit derivative dealers usually account for 25%-35% of credit derivatives users, with the exception of the period 2003-2004, when the number of institutions reporting similar gross amounts of protection bought and sold increased significantly. On average, less than 3% of the banks in the sample use all three CRT instruments.

The banks in our sample are very heterogeneous in terms of size. Table 2 illustrates how the distribution of the usage of various CRT instruments differs across classes of asset size for year 2007.¹⁶

INSERT TABLE 2 HERE

We define four size classes according to the bank's total assets: from one to five billion USD (small), from five to 20 billion (medium), from 20 to 100 billion (large), and above 100 billion (extra-large). Around 90% of the banks belong to the first two groups. However, they only account for about 16% of the total assets in the sample, which highlights a strong concentration in the sector. As expected, large banks are the most active users of CRT tools (nearly 70% of the extra-large banks use all three instruments). A large proportion of small banks (75%) do not lay off credit risk, while those which choose to do it, mainly use loan sales. Securitization becomes a more popular tool as bank's size increases. Credit derivatives are almost exclusively used by large and extra-large banks. For the latter, in particular, the majority of banks act as credit derivative dealers, rather than net hedgers.

¹⁵In part, this can be explained with the sample composition. As it will be shown in the next section, internal securitization is normally carried out by medium and large banks: some of these have been involved in merger activities during the sample period and, therefore, their proportion on the total number of banks in the sample has decreased.

¹⁶Similar tables are available for all years from the authors upon request.

4.2. Credit Risk Transfer Tools and Banks' Characteristics

4.2.1. Univariate Analysis

The first step in analyzing what drives commercial banks when deciding whether to access the CRT market and, if so, how to choose among different tools, is to compare the features of: 1) users and non-users; 2) banks that only sell, securitize or insure their assets (among CRT users). In our exercise, we need to control for bank's size. As shown in Table 2, the banks in our sample differ significantly in terms of size and the usage of CRT seems to be significantly correlated with bank's size. If we compared the characteristics of CRT users and non-users without controlling for this feature, we would simply capture the size effect, since small banks tend to be non-users while large banks extensively use CRT tools. Hence, we split the banks in our sample into three groups, following the classification outlined in the previous paragraph for small and medium banks, while we label as large banks all institutions with total assets larger than 20 billion USD.¹⁷ The classification according to banks' size also ensures that banks belonging to the same group enjoy similar opportunities to access the various segments of CRT markets.

Table 3 reports the mean values of various bank's characteristics (calculated at annual intervals over the sample period) for those institutions which do not use any CRT tools and for those which use at least one instrument, grouped by bank's size. Figures in bold indicate mean values significantly different at 95% confidence level according to a simple t-test on the mean (with unequal variances).

INSERT TABLE 3 HERE

The comparison between users and non-users when the bank's size is small highlights some interesting findings. Small banks are usually constrained on the funding side, as they cannot easily access funding on the interbank or capital markets (Kashyap and Stein, 2000). As previously emphasized, funded CRT instruments can help alleviate such constraints. Therefore, we would expect to observe significant differences between users and non-users in term of liability composition and/or and availability of liquid assets. Instead, we find the two groups not to differ significantly in terms of asset liquidity or liability composition. There is some evidence, however, of a funding constraint motivation behind the access of small banks to CRT markets, as users have higher funding costs than non-users. Also, CRT users tend to be the largest banks in the group, with

¹⁷The grouping of large and extra-large banks is necessary to ensure an acceptable sample size in all groups.

lower capital ratios and a higher proportion of income coming from activities other than classic intermediation.

As bank's size increases and we focus on medium and large banks, the difference between the characteristics of CRT users and non-users becomes more significant. We find support for the motivations concerning funding constraints and lending opportunities, especially for large banks accessing the CRT markets. This is highlighted by the fact that users display lower deposit ratios (and higher funding costs), higher loan to deposit ratios and higher profitability from traditional intermediation. Such features are consistent with a business model more orientated towards an originate-to-distribute approach, which has been increasingly adopted in recent years by medium and, especially, large banks. Interestingly, risk-unadjusted capital ratios are not significantly different between users and non-users. We also find that CRT activity is more common among banks with high credit risk, as users turn out to be much riskier than non-users: the net charge-off ratio is four times (twice) larger for CRT users than for non-users for large (medium) banks, and the overall risk weighted asset ratio is also significantly higher.¹⁸ Again, the largest institutions in the groups are those actively involved in CRT activities, hence there is a residual size effect that we are unable to eliminate. Some significant differences also arise in terms of loan composition, as medium and large CRT users hold larger proportions of consumer loans which are, by nature, easier to sell or securitize.

Focusing on the users, we compare in columns 2 to 3 of Table 4 the average characteristics of large banks using funded instruments, such as loan sales or securitization but not credit derivatives (57% of the overall users of funded instruments), to those of banks that transfer credit risk through long positions in credit derivatives, but do not use loan sales or securitization (61% of the overall net protection buyers). This choice enables us to better emphasize the features of those banks expressing an exclusive preference for one instrument over the others, and helps avoid the confounding effects in the mean values of the joint usage of different instruments. We run the comparison across large banks only, as the number of net protection buyers among small and medium-sized banks is tiny.¹⁹

¹⁸These findings are somehow consistent with Purnanandam (2008), who finds that participants in the originate-to-distribute market generated inferior quality mortgages over the period prior to the crisis. Also, Kashyap, Rajan and Stein (2008) confirm that most of the credit risk was actually held on the balance sheet.

¹⁹One may argue that if banks sell or securitize a significant proportion of their loan portfolios on a continuous rolling basis (this may be the case, for example, of credit card institutions), total assets may in fact underestimate the bank's activities, since assets sold or securitized are removed from the originator's balance sheet. As a consequence, for those banks, some of the indicators measured as a fraction of total assets might be biased. This does not seem to

INSERT TABLE 4 HERE

Most of the theoretical predictions explaining what drives the choice between selling or insuring loans find significant support in our preliminary results. In line with Thompson (2007) and Parlour and Winton (2008), we observe that when credit risk is high, in relative terms, and a larger proportion of the loan portfolio suffers from significant asymmetric information issues (i.e. higher percentages of loans to SME, and medium or long term loans), loan sales or securitization are preferred to credit derivatives. On the contrary, banks with a large capital buffer, high liquidity and a higher proportion of commercial and industrial loans to high quality borrowers are net buyers of credit derivatives.²⁰ In line with previous literature on the motivations behind classic CRT instruments, loan sales and securitization are used by banks experiencing liquidity constraints and good lending opportunities, which favor the adoption of an originate-to-distribute business model. Credit derivatives instead seem to be the most appropriate CRT tool for those large banks which are less active in the traditional banking intermediation segment, and more orientated towards innovative banking activities, as shown by the significant proportion of trading assets recorded on the balance sheet.

Finally, we contrast the features of banks that only securitize internally to those of banks that only sell their assets on the secondary market in columns 4 to 7 of Table 4. Since small banks tend to sell loans while large banks prefer to securitize directly, we attempt to limit the impact of the size effect by performing our analysis on two groups, the first including small and medium banks and the second including large banks only. Large banks tend to be active in both loan sales and securitization, hence our criteria restrict the sample of single-instrument users to 30% of the large banks engaged in loan sales and 42% of those engaged in securitization. Small and medium sized banks, instead, tend to be more specialized, hence we keep in our sample 88% of the total number of banks selling assets on the secondary market and 74% of the banks that securitize internally.

Loan sales and loan securitization share several common features. The comparison amongst banks that exclusively use one of the two instruments reveals that, in general, institutions with: a)

represent a significant problem in our sample: the distribution of the ratio of outstanding balances of assets sold or securitized over total assets reveals that the median value is around 0.01, and that in 90% of the cases the ratio is below 0.3. For robustness, we remove from our sample the banks in the top 10% of the distribution and repeat the analysis. Our main findings from both univariate and multivariate analysis are unaffected.

²⁰Some of our findings are in contrast with those reported by Minton, Stulz and Williamson (2009), who find that protection buyers engage in risky loans and are poorly capitalized. This is mainly due to the fact that their sample includes protection buyers that also engage in other CRT techniques, hence their characteristics cannot be uniquely associated with the purchase of credit protection via credit derivatives.

a larger customer deposit base; b) less risky assets; c) portfolios more concentrated on mortgages and commercial / industrial loans, and more affected by asymmetric information issues; prefer to sell their loans on the secondary market. Banks which only securitize internally are characterized by: a) lower customer deposit ratios; b) stronger lending opportunities; c) riskier assets; d) higher profitability from both interest and non-interest income sources; e) larger percentages of highly securitizable retail loans in the portfolio.²¹

In general, if we attempt to associate the usage of specific CRT tools to particular business models, we could say that small commercial banks do not normally turn to CRT markets and, when they do, they prefer to sell directly their assets on the secondary market. Larger banks with strong lending opportunities that have adopted the originate-to-distribute approach are more inclined to securitize part of their loan portfolio internally. Very large banks that have diversified their activities towards more innovative segments beyond banking intermediation, express a preference for credit derivatives.

4.2.2. *A Multinomial Logit Approach*

So far, we have provided some evidence of a significant association between certain bank's characteristics and the preference expressed for a given CRT instrument over others. The simple univariate comparison presented in the previous section is insightful, but not sufficient to draw clear conclusions on the matter. First of all, some variables can be significant on a univariate basis, but lose their explanatory power when joined with stronger determinants in a multivariate setting. Second, some bank's characteristics themselves could have been affected by the usage of specific CRT tools and, therefore, the analysis could be biased by endogeneity issues.

In an attempt to address these problems, we replicate the comparative analysis of Table 4 using multinomial logit models. By creating mutually exclusive groups according to the usage of specific CRT tools, multinomial logit models enable us to estimate the effects of certain bank characteristics on the probability that a bank belongs to a certain group relative to the probability that the same bank is in the control (base) group.²² We estimate the models on semiannual data to enlarge the sample size and we use lagged values of the independent variables, in an attempt to control for endogeneity issues.²³ Yearly dummies are included to control for time effects on CRT activities.

²¹In general, we observe that retail loans normally have been securitized internally, while residential and commercial mortgages typically have been sold to agencies such as Fannie Mae or Freddie Mac to be later securitized.

²²A related application of the multinomial logit model can be found in Demsetz (2000).

²³Since we work on lagged variables we correct for mergers or acquisitions by excluding the semesters before and after the event for all banks involved in the operation. The same correction is applied to the panel study presented in

We only include as independent variables those measures with a coefficient of correlation below 25%, in order to avoid distortions induced by multicollinearity issues.

INSERT TABLE 5 HERE

A first analysis of the variables that affect the choice between selling or insuring loans is performed by dividing large banks into four groups: (1) no activity in loan sales, securitization, or credit derivatives; (2) net protection buyers only; (3) users of loan sales or securitization only; (4) users of both. We choose group (2) as our control group and we only present results for group (3), relative to the base group, in Table 5, columns 2 to 3. Basically, we investigate whether certain bank characteristics at a generic time t can affect the probability that six months later (time $t + 1$) the bank belongs to the group that only sells or securitizes assets rather than to the group that purchases net protection via credit derivatives. As expected, we find that when pooling various indicators together, some variables lose explanatory power. However, the main findings from the univariate analysis are confirmed: banks that only sell or securitize are smaller and less capitalized than pure net protection buyers. The loan portfolio of the former is also significantly riskier and more concentrated on consumer loans than the portfolio of the latter.

A second analysis aimed at identifying the variables that drive the choice between direct sale and securitization is performed by grouping banks as follows: (1) no activity in loan sales or securitization; (2) loan sales only; (3) securitization only; (4) users of both loan sales and securitization. The analysis is carried out separately on two samples including small/medium-sized banks and large banks, respectively. We choose loan sellers (group 2) as our control group and we present results for banks that only securitize internally (group 3), relative to the base group, in Table 5, columns 4 to 5 for small / medium banks and columns 6 to 7 for large banks. For small / medium banks, as expected, we find bank size to be a major discriminant between direct loan sale and securitization. Also, banks that only securitize are more capitalized, have higher funding costs and larger income from non-interest margins, as previously highlighted by the univariate analysis. For the sample of large banks, we observe that larger institutions with liquidity constraints, smaller proportion of loans secured by real estate and larger income from non-interest margins are more likely to securitize internally rather than to sell their loans on the secondary market.

the following section.

4.3. *The Dynamics of Credit Risk Transfer Activity: A Panel Study*

The multinomial logit analysis illustrated in the previous section does not fully solve the problem of endogeneity, since the values of some bank's characteristics may have been affected by the previous usage of CRT instruments.²⁴ In addition, it provides insights on the probability that some features are associated with the usage of a particular tool as opposed to others, but it does not shed light on which changes in bank's characteristics translate into an increase or a decrease of activity in CRT markets.

In order to better isolate those variables that play a significant role in explaining changes in the asset sales / securitization and in the credit derivative activity we use a dynamic panel approach. Specifically, we verify how changes in the loan sales / securitization activity, as well as changes in the credit derivative position of net protection buyers, are related to variations in bank's characteristics.

Loan sales and securitization activities are pooled together since the two CRT instruments have similar features in terms of loan types to be sold and asymmetric information issues, are both funded tools and, in our sample, are both with recourse or credit enhancements. The loan sales / securitization activity is measured as the ratio of the notional amounts of loans sold or securitized over total assets. Analogously, the activity of net protection buyers is measured as the ratio of the net credit protection position (gross amount of protection purchased minus gross amount of protection sold) over total assets. This indicator is computed only for net protection buyers, according to our definition given in Section 3.

Semi-annual changes in the activity ratios of both loans sales / securitization and credit derivatives are separately regressed on lagged changes in the potential drivers.²⁵ The rationale behind our analysis is that variations in bank's riskiness or profitability, capitalization or funding shocks occurring in one period should drive future changes in CRT activity. In particular, we test whether the impact of changes in the variables is different across the two CRT groups.

To avoid multicollinearity issues in the regressors, we only variables with correlation coefficients not greater than 25%. The results of the panel regressions for both changes in loan sales /

²⁴The best solution to this problem would be to analyze the features of banks that have started using CRT tools during the sample period, and had not used them before. However, restricting the analysis to those banks would greatly reduce the sample size.

²⁵A six month time period represents a reasonable compromise between an annual time frame, which is more prone to endogeneity issues, and a three-month period, which is often too short to capture significant lagged effects. Working with lagged regressors helps avoid endogenous effects that changes in the CRT activity may have on the variables.

securitization and changes in net credit derivative protection are displayed in Table 6. The panel analysis has been performed using the Arellano-Bond linear dynamic approach, which ensures consistent estimates of the parameters in the dynamic panel framework. Yearly dummies have been included to account for seasonal effects in CRT activities.

INSERT TABLE 6 HERE

Given the significant heterogeneity of users of traditional CRT tools in terms of asset size, we perform separate panel regressions for small / medium sized banks (with total assets not greater than 20 billion USD) and large banks. This is not necessary for investigating the motivations driving CD net protection buyers, as they are mostly concentrated in the large segment.

Looking at the drivers of the loan sales / securitization activity for small and medium banks, we find an increase in the loan to deposit ratio, associated with tighter funding constraints (represented by an increase in the cost of funds and a decrease in the interbank ratio) to play a significant role. A more intense recourse to loan sales / securitization is also associated with an increase in bank's size. As expected, our findings are in line with the predictions arising from the classic theories of both the originate-to-distribute approach and the funding constraints. Again, funding and lending opportunity motivations seem to be the main drivers behind the recourse of large banks to funded CRT instruments.²⁶

The analysis of the main drivers of the credit derivatives activity reveals that an increase in net protection purchased typically follows a capital shock, i.e. a decrease in the capitalization ratio (in line with the predictions of Thompson, 2007 and Parlour and Winton, 2008). We also observe a negative relation between this period's net protection purchased and last period's one, which seems to suggest that the activity in credit derivatives follows a mean reverting patterns.²⁷

5. Concluding Remarks

Building on the main theoretical motivations for choosing among different CRT instruments, we compare, from an empirical perspective, the use of loan sales, securitization and credit derivatives for a sample of US commercial banks over the period 2002-2008.

²⁶Limitedly to this subsample, the yearly dummy for 2003 is significant with negative sign, reflecting the drop in the number of banks performing internal securitization occurred during that year.

²⁷It is worth emphasizing that the findings for credit derivatives should be interpreted with care, given the small sample size of the panel for net protection buyers compared to the size of the panels for loan sales / securitization, which may yield weaker results.

We first perform an analysis of how banks have been using traditional and innovative CRT instruments. In fact, we find that, on average, more than 60% of the banks in our sample do not use CRT tools. Most CRT users prefer more traditional instruments and only very large banks resort to credit derivatives.

Second, we analyze the main drivers in the choice among different CRT tools, by comparing the features of those banks that prefer to sell, securitize or insure their assets. Contrary to some previous empirical evidence, but in line with most theoretical predictions, we observe that large and well capitalized banks with less risky portfolios and lower profitability buy credit derivative protection when experiencing capital shocks. Again, in line with the theory, banks with riskier loan portfolios, liquidity constraints and higher asymmetric information issues prefer to sell or securitize loans. In fact, their activity in loan sales / securitization intensifies as their loan activity strengthens and funding constraints tighten, providing support for both liquidity and lending opportunities motivations behind CRT.

Our findings allow for a better understanding of the usage of CRT tools and have some policy implications. In particular, an intense activity in securitization and loan sales turns out to be more common for those banks showing a higher dependence upon monetary and capital (bond) markets as source of funding. A dysfunction in the interbank market associated with the freezing of the loan secondary market, as recently experienced in the present financial crisis, may therefore undermine not only banks liquidity but also their solvency. Given the large size of banks involved in CRT transactions, this may have stability implications for the banking system as a whole. In this respect, it is crucial for regulators not only to effectively monitor banks' exposure to liquidity risk but also to ensure a minimum level of activity in CRT markets, in situations of malfunctioning of monetary and capital markets.

As far as credit derivatives are concerned, very little empirical research has been carried out so far, mainly due to the lack of quantitative data and the short history of the market. Nonetheless, some preliminary considerations can be drawn from our analysis. According to our findings, the usage of credit derivatives is more common among very large, internationally exposed and less "traditional" banks, and is primarily led by credit risk and effective capital management purposes. In this respect, a better understanding of the impact of risk sensitive regulatory capital requirements on the incentive for efficient CRT via credit derivatives is strongly required.

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Table 1: Credit Risk Transfer: Summary Statistics

	2002	2003	2004	2005	2006	2007	2008 (first half)
Non users	63.84%	64.29%	67.50%	66.24%	64.68%	63.89%	61.76%
Users							
Loan sales	19.20%	21.19%	23.18%	23.93%	25.87%	27.38%	28.79%
Securitization	21.70%	20.48%	15.00%	14.32%	12.53%	11.71%	12.97%
Credit Derivatives	5.74%	5.71%	6.14%	6.41%	7.80%	7.54%	9.01%
<i>Net protection buyers</i>	34.78%	37.50%	37.04%	43.33%	34.21%	39.47%	39.02%
<i>Net protection sellers</i>	34.78%	12.50%	14.81%	23.33%	34.21%	34.21%	39.02%
<i>Dealers</i>	30.43%	50.00%	48.15%	33.33%	31.58%	26.32%	21.95%
Users of all three	2.00%	2.62%	3.18%	2.35%	2.87%	2.78%	3.52%
Total number of banks	401	420	440	468	487	504	455

Table 2: Credit Risk Transfer Usage by Bank Size (at year-end 2007)

	All banks	1 – 5 bln	5 – 20 bln	20 – 100 bln	> 100 bln
Non users	63.89%	74.73%	48.84%	14.71%	0.00%
Users					
Loan sales	27.38%	22.01%	32.56%	47.06%	81.25%
Securitization	11.71%	2.72%	20.93%	52.94%	81.25%
Credit Derivatives	7.54%	1.36%	6.98%	35.29%	93.75%
<i>Net protection buyers</i>	39.47%	40.00%	33.33%	41.67%	40.00%
<i>Net protection sellers</i>	34.21%	60.00%	66.67%	41.67%	6.67%
<i>Dealers</i>	26.32%	0.00%	0.00%	16.67%	53.33%
Users of all three	2.78%	0.00%	0.00%	8.82%	68.75%
% Number banks	100.00%	73.02%	17.06%	6.75%	3.17%
% Total assets	100.00%	7.47%	8.36%	16.65%	67.52%

Table 3: Bank Characteristics of CRT Users and Non Users

	Small		Medium		Large	
	Non Users	Users	Non Users	Users	Non Users	Users
Capitalization (%)						
Tier1 risk-adjusted	12.07	11.32	13.67	11.12	11.21	9.94
Tier1	9.00	8.79	8.01	8.61	7.87	7.87
Capital ratio	13.39	12.75	13.23	13.10	12.54	12.72
Loan composition (%)						
Secured real estate	68.40	69.88	57.50	56.60	56.58	46.45
C&I total	17.79	17.32	21.47	18.52	24.97	20.04
Retail	9.43	7.86	12.58	17.44	7.66	21.43
Small businesses	18.32	18.75	12.63	11.49	6.80	6.85
Medium term	13.12	13.38	9.70	9.65	6.38	8.53
Long term	9.92	9.69	10.40	9.27	7.17	7.64
Asset Quality (%)						
Net charge-off ratio	0.25	0.36	0.29	0.49	0.15	0.60
RWA ratio	76.09	78.08	68.79	77.27	73.29	81.21
Liquidity / Funding						
Liquid asset ratio (%)	15.25	14.60	15.79	15.30	14.67	12.14
Interbank ratio (%)	3.08	2.81	3.47	4.34	4.22	4.97
Overall deposit ratio (%)	73.66	73.17	66.77	64.24	63.70	53.25
Core deposit ratio (%)	60.21	60.54	56.01	50.21	56.51	44.95
Loan / Deposits	1.49	0.97	1.82	2.02	1.11	1.63
Loan / Core deposits	3.15	2.33	3.31	5.88	1.35	4.78
Other borrowing ratio (%)	13.89	14.32	19.31	20.35	17.73	20.07
Cost of funding (%)	2.27	2.42	2.12	2.42	1.98	2.71
Profitability (%)						
Loan profitability	6.61	6.63	5.98	6.58	5.10	5.80
Net interest income	3.62	3.53	3.17	3.44	2.70	3.19
Non interest income	1.31	1.91	1.82	2.57	1.45	3.17
ROA	1.22	1.29	1.25	1.29	1.15	1.46
ROE	12.40	13.14	13.36	12.54	12.75	14.62
Size / reputation						
Log(TA)	14.39	14.48	15.91	16.08	17.48	17.98
Net standby letter credit (%)	1.37	1.43	1.67	1.66	4.33	3.84
Intermediation (%)						
Trading asset ratio	0.09	0.10	0.97	0.60	4.54	3.03
Loan ratio	67.98	68.22	59.53	63.60	63.74	62.27
N. Observations						
	1495	418	247	246	28	286

Figures in bold denote mean values significantly different at 95% confidence level.

Table 4: Credit Risk Transfer Tools and Bank Characteristics

	Loan sales / sec. vs. CD		Loan Sales vs Loan Securitization			
	(Large banks)		(Small / Medium)		(Large)	
	Loan sales / Securitization	CD net buyers	LS only	Sec. only	LS only	Sec. only
Capitalization (%)						
Tier1 risk-adjusted	9.98	12.66	10.67	12.64	9.67	10.36
Tier1	8.17	8.88	8.02	9.98	9.00	8.77
Capital ratio	10.51	12.18	12.16	14.40	12.19	13.10
Loan composition (%)						
Secured real estate	47.59	36.10	71.79	51.70	70.62	30.21
C&I total	14.17	30.17	16.28	16.96	14.78	13.02
Retail	30.98	7.65	7.47	24.99	9.63	45.63
Small businesses	8.16	4.52	18.72	10.63	8.97	5.79
Medium term	8.78	4.45	13.48	8.87	17.91	4.93
Long term	7.68	3.05	9.83	8.26	14.16	5.27
Asset Quality (%)						
Net charge-off ratio	0.92	0.17	0.20	1.09	0.17	1.40
RWA ratio	81.22	76.89	76.19	78.37	71.03	87.02
Liquidity / Funding						
Liquid asset ratio (%)	9.77	22.11	14.06	15.59	10.74	10.71
Interbank ratio (%)	5.77	6.36	2.88	4.72	3.99	5.80
Overall deposit ratio (%)	52.00	48.01	73.25	64.07	57.70	53.11
Core deposit ratio (%)	41.47	43.22	60.59	50.76	50.97	38.13
Loan / Deposits	1.77	0.98	0.95	2.62	1.29	1.42
Loan / Core deposits	4.56	1.34	2.03	5.04	1.50	6.35
Other borrowing ratio (%)	26.03	15.45	15.01	19.49	22.02	20.49
Cost of funding (%)	2.48	3.39	2.36	2.53	2.35	2.63
Profitability (%)						
Loan profitability	6.69	4.84	6.55	7.20	5.84	6.42
Net interest income	3.79	2.14	3.47	3.86	2.93	4.12
Non interest income	4.01	2.81	1.30	4.69	1.61	6.12
ROA	1.76	1.18	1.15	1.75	1.26	2.12
ROE	16.41	13.38	12.52	14.71	12.62	18.62
Size / reputation						
Log(TA)	17.48	17.95	14.81	15.48	17.51	17.69
Net standby letter credit (%)	3.53	5.3	1.34	1.03	2.23	2.81
Intermediation (%)						
Trading asset ratio	1.55	5.77	0.16	0.33	0.34	1.30
Loan ratio	68.30	45.62	68.67	61.97	64.98	66.80
N. Observations	148	51	416	158	50	62

Figures in bold denote mean values significantly different at 95% confidence level.

Table 5: Credit Risk Transfer Drivers: Multinomial Logit

	Loan Sales / / Securitization (a) Large Banks		Securitization (b)			
			Small-Medium Banks		Large Banks	
LogTA(-1)	-1.6127	(0.3779)*	0.9466	(0.0985)*	0.5488	(0.2484)*
% Loans Real estate / Retail (-1)	11.0386	(1.9972)*	-	-	-	-
% Loans Real estate (-1)	-	-	-0.2166	(0.4385)	-11.8025	(1.9000)*
Net charge-off (-1)	773.2694	(231.4501)*	16.6475	(25.7554)	-30.0341	(31.1368)
Liquid Assets (-1)	1.5122	(2.2253)	-0.7459	(0.6911)	-9.2570	(1.8627)*
Loan / Deposit ratio (-1)	0.4938	(0.7060)	0.0005	(0.0006)	-1.2161	(0.7227)
Interbank ratio (-1)	8.2976	(4.0621)*	-0.3445	(0.7663)	-6.4053	(5.5719)
Cost of funding (-1)	-78.3378	(69.5895)	54.1720	(16.2465)*	-65.1720	(44.1064)
Non-interest income (-1)	-20.9358	(33.0796)	10.8491	(3.7237)*	20.759	(3.8697)*
Tier1 RA (-1)	-25.7784	(9.1787)*	3.4347	(1.8656)**	2.6890	(9.0285)
Constant	23.5674	(6.6674)*	-17.3155	(3.7128)*	0.4655	(5.0572)
N. Observations	242		278		110	
Pseudo R^2	42.09%		10.30%		32.72%	

* and ** denote significance at 10% and 5% confidence level, respectively.

Robust standard errors in brackets.

(a) Variables' effect on the probability of belonging to group (a) relative to net protection buyers.

(b) Variables' effect on the probability of belonging to group (b) relative to loan sellers.

Table 6: Credit Risk Transfer Drivers: Dynamic Panel Test

	Δ Loan Sales / / Securitization				Δ Credit Derivatives	
	Small-Medium Banks		Large Banks		Large Banks	
Δ LogTA(-1)	0.1015	(0.0292)*	-0.0013	(0.0695)	0.0733	(0.0506)
Δ % Real estate and Retail (-1)	0.0260	(0.0674)	-0.1685	(0.1795)	-	-
Δ % C&I (-1)	-	-	-	-	0.0905	(0.0785)
Δ Net charge-off (-1)	0.2680	(0.6339)	-3.3127	(3.9338)	-5.7146	(4.6670)
Δ Liquid Assets (-1)	0.0148	(0.0428)	-0.2003	(0.1979)	-0.0548	(0.0666)
Δ Loan / Deposit ratio (-1)	0.0002	(0.0001)*	0.00003	(0.00001)*	-0.0009	(0.0043)
Δ Interbank ratio (-1)	-0.1603	(0.0684)*	0.1740	(0.1659)	0.2995	(0.0964)*
Δ Cost of funding (-1)	2.3342	(1.2130)*	6.1220	(3.0533)*	-0.3461	(1.3755)
Δ Non-interest income (-1)	0.4392	(0.4124)	-5.4135	(1.6165)*	0.3075	(0.6370)
Δ Tier1 RA (-1)	-0.1342	(0.1710)	-0.2648	(0.4841)	-0.3241	(0.1471)*
Δ Dependent var. (-1)	0.0019	(0.0388)	0.0022	(0.0529)	-0.3970	(0.1352)*
Constant	-0.0127	(0.0064)*	0.0110	(0.0158)	0.0251	(0.0101)*
N. Observations	772		358		78	

* and ** denote significance at 90% and 95% confidence level, respectively.

Robust standard errors in brackets.