Is proprietary trading detrimental to retail investors?

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Abstract

We study the conflict of interests that might arise at universal banks between their proprietary trading and their retail banking. Using a unique data set that covers the stock investments of each German bank and of its respective retail customers on a security-by-security basis we study the return characteristics of those stocks that flow from a bank's proprietary portfolio into its respective customers' portfolio. Our results show that those stocks that are removed from banks' proprietary portfolio into the portfolio of their respective customer are lower performing than the average stock held in both banks and customers portfolios. This suggests that banks abuse their role in advising retail investors in order to dump low performing stocks.

Keywords: Conflict of interest, universal banks, proprietary trading, retail investment, retail banking.

JEL Codes: G30, G32.

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1 Introduction

In recent years a number of misselling scandals suggest that banks might have a substantial conflict of interests in retail banking. The misselling of Lehman 'certificates' by German savings banks, the mortgage endowment and precipice bond misselling in the UK are only the most recent examples that raised public concerns whether banks' financial advice is indeed trustworthy or whether banks do not simply follow their own agenda when giving advice to retail customers.

Indeed, the greater need of households to take own provisions for retirement financing due to the demographic transitions has imposed on households to be actively engaged in managing their personal finances. However, because of their limited financial literacy retail investors are often dependent on financial advice when taking investment decisions (Allen, 2001; Lusardi and Mitchell, 2007). Banks - in particular universal banks - should be well suited to provide this advice. Playing a key role in many financial markets they dispose of and process information that would be relevant for retail investors in taking efficient investment decisions.

At the same time, though, retail finance to some extent resembles a 'credence good': Because of their informational disadvantage customers are often neither ex-ante nor ex-post able to assess the quality of financial products or services, and they often rely on the information and recommendations provided by their advisors.[1] This, of course, creates the possibility of several agency problems between banks and their retail customers such as misselling.[2] If at least ex-post misselling becomes publicly known reputational considerations might incentivize banks to provide truthful advice (Bolton et al., 2007).

Thus to what extent banks' financial advice helps households to contain the consequences of their limited financial literacy or whether banks actually exploit their informational advantage in retail finance is an empirical question. But dearly needed empirical evidence in this area is limited. Studies that have been pursued in that area, like Hackethal, Haliassos, and Jappelli (2009) and Karabulut (2010) who find evidence that indeed the involvement of advisors negatively affects the individual portfolio performance, only capture data from a single advisor.

In this paper, we study a unique data set that comprises the stock investments of all German banks and their private customers on a security-by-security basis. We use that data

[1] Malmendier and Shanthikumar (2007) show evidence that small investors have indeed the tendency to trust the analysts too much and to follow their recommendations exactly, implying that individual investors are not aware of any possible distortions of analyst recommendations.

[2] Misselling is generally understood as the practice of misdirecting customers into buying a product which does not suit their needs (Inderst and Ottaviani, 2009). This of course also includes selling securities with an inferior risk-return-profile to customers.

set to analyze whether banks use their customers as an 'exit channel' and systematically push underperforming stocks from their proprietary portfolios into the portfolios of their private customers. Indeed, in the absence of perfect 'Chinese Walls' within banks, it is conceivable that banks would steer the individual customers through their agents towards stocks which they intend to dump from their proprietary trading books, and thereby, avoid direct (i.e. exchange and brokerage commissions) and indirect (i.e. market impact) transaction costs as well as do not disclose their informational advantage to the market. Even though there are several anecdotes in the financial press that are consistent with this hypothesis, there is yet to the best of our knowledge no systematic evidence testing for such a fraudulent behavior.

Our analysis follows a two-stage process: In the first stage, we assess to what extent banks sell stocks from their proprietary portfolios to their retail customers using correlation analysis as well as a series of different panel regressions. In the second stage, we study how the stocks that flow from bank portfolios into the customer portfolios perform relative to different control groups.

Overall our results provide clear evidence of a conflict of interests in retail banking: Banks seem to abuse their role as advisors to retail investors and exploit their private customers by pushing them into underperforming stocks which banks seek to dump from their proprietary portfolios. Stocks sold off by banks to their customers underperform on a quarterly basis other stocks held in the aggregate household portfolio by 234 basis points. These results are robust to alternative econometric specifications, including alternative measures indicating a significant reduction of a stock in banks' portfolios, and various measures for stock performance.

We also observe that the larger the block size sold off by the respective bank the larger is also the fraction of the block that flows into customers' portfolios at the respective bank.

Our paper contributes to several strands of the literature. Obviously, it is linked to the discussion about conflict of interests within financial institutions. This literature has mostly focused on the incentive problems which arise due to the rampant sharing of information between different divisions of financial institutions.[3] Massa and Rehman (2008) study the possible information spillovers between the lending and asset management divisions of financial conglomerates, and find that mutual funds which belong to bank families exploit their informational advantage (that they acquire through the lending relationship of their affiliated bank) by investing in the stocks of the borrowing firms. Similarly, Acharya and Johnson (2007) and Ivashina and Sun (2010) also provide evidence of insider trading by institutional investors.

[3]For a recent comprehensive survey of this literature see Mehran and Stulz (2007).

They show that lending financial institutions re-use their private information when trading credit derivatives or equities of the borrowing companies.

This literature is closely related to the debate about the benefits of universal banks which culminated in the Gramm-Leach-Bliley Act in the U.S. in 1999 but lead more recently in the aftermath of the financial crisis to suggestions to re-enact the Glass-Steagall Act. Puri (1996) shows that in the pre-Glass-Steagall U.S. investors paid significantly more for IPOs underwritten by banks rather than by investment houses that could not establish credit relations firms.[4] Similarly, Ber et al. (2001) provide evidence for Israeli banks that IPO underpricing is lower if the underwriting bank is also a major lender of the firm. This suggests that universal banks are efficiency enhancing. At the same time, however, Ber et al. (2001) find that bank managed investment funds pay too much for equity offered in IPOs that were underwritten by the respective bank. But none of those papers has so far investigated the link between the general proprietary trading of banks and their retail banking business. We contribute to this literature by directly looking at the stock investments of banks and of their respective retail customers and show that banks tend to take advantage of their uninformed private customers. Thus our results suggest that combining proprietary trading and retail banking in universal banks generates a substantial conflict of interests and might therefore not be efficiency enhancing.

Our work also relates to the budding literature on financial advice and household investment decisions (Bergstresser et al., 2009; Hackethal et al., 2009; Karabulut, 2010). We contribute to this literature by broadening the analysis and taking account of the overall organization to which financial advisors are tied. Our results suggest that agency problems between advisors and their clients are not only limited to the monetary incentives of advisors but also the pressure they face from their financial firms to sell certain products can also drive the possible conflict of interests between customers and advisors.

The remainder of the paper is organized as follows. In Section 2, we introduce the data and provide summary statistics. Section 3 describes the methodology and empirical specifications in the econometric analysis. Section 4 reports the main findings, and Section 5 presents the results of robustness tests. Section 6 concludes the paper.

[4]For a theoretical model pointing out the benefits of universal banks in this context see Puri (1999). Kroszner and Rajan (1997) show that banks' organizational structure helps to contain potential conflicts of interest and mattered for the IPO underpricing.

2 Data and Descriptive Statistics

Our primary data set comprises the quarterly stock holdings of all German commercial banks and the aggregate portfolio of their respective retail customers on a security-by-security basis for the period from December 2005 to September 2009.[5] The data is collected by the Deutsche Bundesbank in order to compile the 'Securities deposits statistics'.

Even though the data set comprises detailed information on different asset classes, such as stocks, bonds and mutual fund shares, we restrict our attention only to single stock investments. Single stocks are more information sensitive than corporate bonds or mutual funds. Thus informational asymmetries are more crucial here giving rise to particularly pronounced conflict of interests between banks and customers.

Out of the 2089 monetary financial institutions reporting to the Bundesbank's 'Securities deposits statistics' in December 2005, 820 financial institutions did not hold any single stock investment during the observation period. In addition, there is a large number of small regional banks that have very limited stock investments in their own portfolios. Therefore, we only consider the banks in the top 10 percentile according to the average quarterly stock portfolio value, which leaves us with a final sample of 102 bank and aggregated customer portfolios. Nevertheless, the total stock holdings of the banks in our sample represents almost 58 percent of all stocks held by monetary financial institutions in Germany during the sample period.

Our sample still captures the major parts of the German banking sector as there are banks from all three main banking groups, i.e. private banks, savings banks and cooperative banks. Table 1 reports the number of banks from the different banking groups and gives a some idea of the representativeness of our sample. The large fraction (slightly more than 60 percent) of the banks in our sample are savings banks whereas the share of cooperative and private banks are 13 and 27 percent, respectively. Similarly, we also contrast in Table 2 the portfolios of banks in our sample with the portfolio of an average German monetary financial institution. As the table indicates, the portfolio shares of both long-term and short-term bonds as well as the mutual funds share held by banks in our sample do not substantially diverge from those held by German banks in total. It is only the equity position in which our sample banks systematically differ from the average German bank. In particular, the weight of listed equities in the portfolios of banks in our sample is almost 6 times larger than stock share in the portfolio of the average

[5] Prior to December 2005, the monetary financial institutions in Germany were only required to report their own portfolio holdings on an annual basis and not on a security-by-security basis. Therefore, our sample period begins from December 2005 as there is no data available from the previous periods.

monetary financial institution in Germany (0.056 vs. 0.01).

Since our identification of an opportunistic behavior of banks relies on the flows of stocks between banks proprietary portfolio and the respective bank's customers portfolio, we have to filter observations in which a bank as well as their customers hold a particular stock for at least two consecutive quarters. Our final sample contains 18,620 different stock positions and a total of 112,303 observations. Out of these 112,303 observations, 57 percent involved a declining of the respective share in the bank portfolio whereas the remaining 43 percent exhibit an increasing share in the bank portfolio.

Table 3 presents further univariate statistics on the stock investments of banks and their customers. The average investment of a bank in a single stock amounts to 4.6 mill. Euro while the mean stock investment of the aggregated customer portfolios of an individual bank is about 5.0 mill. Euro. The average value that banks in our sample hold in stocks in total amounts to 481 mill. Euro while the mean aggregated customer portfolio has about 871 mill. Euro invested in stocks.

Moreover, we collect daily price information on each stock from *Thomson Reuters Datastream* for the period between 1st of January, 2004 to 31th of December, 2009. Based on the daily price data, we compute the daily returns, Jensen's alpha (abnormal returns) and standard deviation for each stock in each period. We also decompose total stock risk into systematic and unsystematic components. Panel B of Table 3 summarizes the descriptive statistics on the abnormal returns, volatility, beta and unsystematic risk of all stocks in our sample.

3 Methodology and Econometric Issues

In the first step of our analysis we want to identify whether the increase in customers' stock holdings at a particular bank can be explained by the reduction of the portfolio holdings of the respective bank itself. In order to do so, we use a difference-in-difference approach: We define a certain threshold for a significant reduction of a certain stock in the bank's portfolio.[6] In the econometric analysis, we use different threshold values. First, we set the threshold value equal to 0 in order to investigate the relationship of stock investments between banks and their customers when banks sell stocks. Further, we set the threshold values to 25 and

[6] An alternative would of course be to split the sample and study separately the portfolio changes of household in those cases were banks did or did not reduce their own portfolio holdings of that particular stock. Nevertheless, as noted by Brambor et al. (2005), this procedure is not associated with any gain in interpreting the coefficients, and it would also induce efficiency losses because of the smaller sample size.

50 percent to examine the effects for substantial changes. We assign the value 1 to a dummy variable Dummy Change$^B_{ijt}$ if a bank j reduces its portfolio share of stock i in period t by more than that threshold. The dummy variable takes the value 0 otherwise. Therefore, we use the following multiplicative interaction model as our baseline regression model to investigate the hypothesis of whether banks push stocks from their proprietary portfolios to their retail customers:

$$\Delta\rho^C_{ijt} = \beta_1 \Delta\rho^B_{ijt} + \beta_2 \text{Dummy Change}^B_{ijt} + \beta_3 \Delta\rho^B_{ijt} \times \text{Dummy Change}^B_{ijt} + \gamma_j + \epsilon_{ijt} \qquad (1)$$

where $\Delta\rho^C_{ijt}$ and $\Delta\rho^B_{ijt}$ denote the first difference in the log share of a given stock i in the aggregated customer and own portfolio of bank j, respectively. I.e.,

$$\Delta\rho^C_{ijt} = \log\left(\frac{S^C_{i,j,t}}{\sum_i S^C_{i,j,t}}\right) - \log\left(\frac{S^C_{i,j,t-1}}{\sum_i S^C_{i,j,t-1}}\right)$$

where $S^C_{i,j,t}$ is the nominal value held of stock i by costumers of bank j in quarter t.

Dummy Change$^B_{ijt} \times \Delta\rho^B_{ijt}$ is the interaction of percentage change in a given stock share and the dummy variable for a change in the bank portfolio. γ_j is a time-invariant bank-specific unobserved heterogeneity, i.e. the fixed effect, that is assumed to be correlated with the regressors.[7] Finally, ϵ_{ijt} is a random disturbance uncorrelated with the dependent variables.

Another complication in the econometric analysis is the possible effects of aggregate shocks on the estimated coefficient on the percentage change of a given stock in the bank portfolio. In order to isolate the possible effects of aggregate (price) shocks, we include time-dummy variables in the estimation model. As noted by Brunnermeier and Nagel (2008), including time dummies de-means the aggregate (price) shocks cross-sectionally, leaving only the idiosyncratic shocks.

Furthermore, in order to ensure that our results are not driven by outliers we drop the top 99th percentile of observations $\Delta\rho^C_{ijt}$ and $\Delta\rho^B_{ijt}$)

[7] In order to assess whether a fixed effect model is the appropriate specification, we first perform Breusch and Pagan (1980) Lagrange multiplier test and and find that the random state effects are significant, and their variance is different than zero. Similarly, the F-test (which examines whether FE is better than pooled OLS or vice versa) implies that FE estimation also does better than the pooled OLS. In order to find out which of these panel estimation techniques (RE or FE) we should employ in the analysis, we finally perform a Hausman and Taylor (1981) specification test: The estimated p-value of Hausman and Taylor (1981) test is zero, implying that we reject the null hypothesis of consistent and unbiased estimates under RE estimation. In other words, Hausman and Taylor (1981) specification test indicates that FE estimation is the appropriate technique as it provides consistent and unbiased estimates. Therefore, we always employ the fixed effects technique in analyzing the relationship between bank and customer portfolios.

Finally, the observations are clustered by banks in order to correct the standard errors that can be affected by the cross-sectional correlation within the sample (Petersen, 2009).

4 Results

Our empirical analysis follows a two-stage process. In the first stage, we attempt to shed light on the issue of whether banks have a tendency to push stocks from their proprietary portfolios into the portfolios of their respective retail customers. To address this concern, we first start with a simple correlation analysis. Then, we conduct panel regressions controlling for bank fixed effects with different specifications. In the second stage we analyze how the stocks pushed by banks to their customers (case group) perform relative to different control groups. To investigate this issue, we employ different hypothesis-testing procedures such as two-sample t-test with unequal variances and two-sample Wilcoxon rank sum score to test the differences of mean and median of abnormal returns between case and control groups, respectively.

4.1 Do banks push stocks from their portfolios to their retail customers?

4.1.1 Correlation Analysis

As a first step towards understanding the dependency between stock investments of banks and their customers, we first examine the univariate relationship. Table 4 reports the Pearson correlation coefficients, which offer preliminary evidence about the test variables.

In Column 1 of Table 4, we first compute for the full sample the average correlation coefficient of the percentage change of a given stock share in the bank and aggregated customer portfolios, and find it to be slightly positive and statistically highly significant (p-value=0.00). This result suggests that investment behavior of banks and their retail customers seems to be positively correlated: When a bank changes its position in a given stock in one direction, the customers of this bank tend to act consistently. Column 1 covers of course both directions of changes in stock investments (increasing and decreasing stock shares) of the banks.

As we are interested in the question of whether banks directly sell stocks from their portfolios to their customers, we next restrict our attention only to stocks which banks dump from their portfolios. When we only consider the subsample of stocks which have a declining share in the bank portfolio, or in other words, when we consider the stock which banks partially or

fully dump from their portfolios, we observe that sign of the average correlation coefficient reverses: The Pearson correlation coefficient is now negative and statistically significant at all conventional levels (p-value=0.00). The reversed sign of the correlation coefficient for this subsample indicates that when banks sell a stock, their customers buy this stock.

Furthermore, Columns 3 and 4 of Table 4 also present similar analysis, however, only for other subsamples of stocks. In particular, we consider the stocks in which banks decline their portfolio shares by 25 and 50 percent, respectively. The correlation analysis shows that the investment direction of banks and their customers is significantly negatively correlated in each of these subsamples. Interestingly, we also observe that the magnitude of the correlation coefficient tends to grow when the observations are restricted only to the substantial reductions in the bank portfolios.

Taken as a whole, the univariate statistics indicate a significant relation between the stock investments of banks and their customers: Correlation between the direction of investment flows of banks and their customers in a particular stock is significantly positive when the banks increase their holdings whereas the sign of the correlation coefficient reverses when the sample is restricted only to stocks which banks dump from their proprietary portfolios. The latter finding can be regarded as a preliminary evidence for the notion that banks directly sell stocks from their portfolios to their customers.

4.1.2 Regression results

We next examine the relation between stock investments of banks and their customers in a regression framework. We estimate the difference-in-difference regression given by (1) which is set up to test the effects of a change in a given stock in the bank portfolio on the share change of the same stock in the aggregated customer portfolios.

Obviously, our key variable in the model is the interaction term which is computed as the product of the percentage change in the stock share i in the bank portfolio j and the dummy variable for reduction. If the banks in fact have a tendency to directly sell stocks from their portfolios to the retail customers, the sum of the estimated coefficients on the interaction term and the stand-alone variable for the stock share change in the bank portfolio ($\Delta\rho^B_{ijt}$), β_1 and β_3, ought to have a negative sign. This would underpin the hypothesis that banks dumb stocks from their portfolios to their private customers.

As our baseline case we set the binary variable Dummy Decrease$^B_{ijt}$ to one if the bank j reduces the share of stock i in its portfolio. In other words, the threshold value is set to zero

in this specification.

Table 5 presents the fixed effects regression results. All three specifications include time dummies and also control for clustering at bank level. Heteroscedasticity-consistent standard errors are reported in parentheses. As shown in Column 1, the coefficient on the $\Delta\rho^B_{ijt}$ is statistically not different than zero whereas the estimated coefficient on the interaction term is negative and statistically significant. This implies that the effect of a drop in a given stock in the bank portfolio leads to an increase in the share of the same stock in the aggregated customer portfolios ($\beta_1 + \beta_3 < 0$). Put differently, while we find no significant relationship between the stock share changes in the bank's portfolio and the portfolio of the respective customers portfolio when the bank increases its position in a given stock (Dummy $\text{Decrease}^B_{ijt} = 0$), if a bank reduces its position in a certain stock costumers of that bank significantly increase their holdings of that particular stock.

Thus our regression analysis confirms the findings of our univariate analysis: Banks tend to sell (a fraction of) stocks which they dump from their proprietary portfolios to their private customers. However, even though the estimated effect is negative in statistical terms, the economical significance of the estimated effect is not far from zero: A coefficient of -0.032 implies that a 10 percent reduction in a given stock share in the bank portfolio leads to a 32 basis points increase in share of the same stock in the aggregated customer portfolios. This is also underscored by the low R^2 (Brunnermeier and Nagel, 2008).

Specifications (ii) and (iii) in Table 5 differ from the baseline regression only with respect to the inclusion of control variables which account for the stock performance in the previous period. As shown in Columns 2 and 3 of Table 5, when a stock displays positive absolute return in the previous period, private investors tend to sell this stock in the next period, and reduce the share of this stock in their portfolios. This finding is in line with the results of Calvet, Campbell, and Sodini (2009) who also find that the probability of an exit decision from the stock market increases when the stocks held by individuals exhibit large absolute positive returns.[8] In the last column of Table 5, the lagged stock volatility is also included in the regression. Although there are several measures to estimate risk, we use the standard deviation of daily returns as measure for stock volatility. The regression results show that lagged volatility of a stock does not show any significant effect on the change in a given stock share in the customer portfolios, even though the estimated coefficient has a positive sign.

[8] Calvet, Campbell, and Sodini (2009) attribute the strong positive effect of winning stock performance on the exit decision to the disposition effect (i.e. tendency to sell winning stocks too early and losing stocks too late (Shefrin and Statman, 1985; Odean, 1998)).

Including this variable in the regression does not improve the performance of the econometric model, though, the magnitude of the estimated coefficient on the interaction term is slightly larger than before.

All in all, the presented results so far imply that there is an econometrically significant negative relation between the direction of flows in stock investments of banks and their private customers. Economically, though, the estimated effect is essentially about zero.

As noted earlier, one might argue that banks may push stocks from their proprietary portfolios to their retail customers in order to prevent the possible direct (i.e. exchange and brokerage commissions) and indirect (i.e. market impact) transaction costs or not to share their private information directly with the market. Substantial changes in stock positions are associated with even higher transaction costs as well as they have more informational content than minor changes. Accordingly, it is natural to expect banks to push stocks even more aggressively to their customers when the reductions in stock shares are stronger. Therefore, we next turn to the relation between stock investments of banks and their customers for the case when banks substantially reduce their stock positions.

To address this concern, we employ different threshold values to identify a substantial change in a stock position in the bank portfolio. In particular, we use 25 and 50 percent percentage change in a stock position as threshold values, respectively.[9]

Table 6 presents the fixed effects regression results for the case where a 'significant reduction' of a given stock in banks' portfolios is defined as a reduction of more than 25 percent. As shown in the Table, the estimated coefficient on the variable $\Delta\rho^B_{ijt}$ is significantly positive whereas it is negative for the interaction term. Nevertheless, the magnitude of the coefficient on the interaction term is much larger than the coefficient on the stand-alone variable for relative change in the bank portfolio (-.113 vs. .003). This implies that the overall effect of a substantial reduction in the bank portfolio on the customer portfolio is negative ($\beta_1 + \beta_3 = -.11$). This means that a 10 percent reduction in the share of a given stock in the bank portfolio leads to a 1 percent increase in the share of this particular stock in the aggregated customer portfolios at the respective bank.

This effect is significantly negative both in terms of economic magnitude and in statistical terms, and confirms the notion that banks push directly a considerable fraction of stocks which they dump from their portfolios to their customers.

[9] In an unreported descriptive statistics, we find that 50 percent reduction in a given stock share in the bank portfolio represents the median value when we only stocks which banks sell are taken into consideration.

Controlling for other variables, we observe that individuals tend to sell the winner stocks and liquidate their profits, which is also consistent with the former results. Interestingly, we find a positive effect of stock volatility on the change of a stock share in the customer portfolio, suggesting that private investors tend to invest more in stocks which were in the previous period more volatile. This result is somewhat puzzling but consistent with the findings of the existing literature (Shefrin and Statman, 2000; Statsman, 2002).

Finally, we turn to the interaction between stock investments of banks and their customers for a more extreme case where banks reduce the share of a given stock by more than 50 percent. In Table 7, we present the regression results. As shown in the Table, the effect of a strong reduction in the bank portfolio on the customer portfolio is slightly larger than before ($\beta_1 + \beta_3 = -.16$). This impact is both economically and statistically highly negative. Particularly, when a bank decreases the share of a given stock by more 50 percent, the customers of this bank increase the share of this stock by more 8.5 percent.

Taken as a whole, our findings provide evidence for the notion that banks sell stocks from their proprietary portfolios to their retail customers. Furthermore, the fraction of stocks which flows into the customer portfolios grows as the reductions in the stock investments of banks become larger, which is consistent with the transaction costs and information hypothesis.

4.2 How do these stocks perform?

In the first stage of the analysis we show that banks sell stocks from their proprietary portfolios to their private customers. However, whether this has any negative implications for the customers is still an open question. Therefore, we next contrast the abnormal returns of stocks which are sold by banks to their retail customers (case group) with the abnormal returns of other stocks held by banks or private customers in order to examine whether banks indeed dumb low performing stocks to their retail customers and whether retail customers receive thereby stocks that are performing worse than their average stock position. Particularly, if these stocks underperform the rest of stocks in customer portfolios or other stocks in any other control groups, in clearly undermines the interests of customers clearly indicating a conflict of interests between banks and private customers.

The abnormal returns are estimated with daily-stock price data using the standard market model as in the following:

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{M,t} - r_{f,t}) + \epsilon_{i,t} \tag{2}$$

where $r_{i,t} - r_{f,t}$ is the daily return of stock i in excess of the risk-free rate, and $r_{M,t} - r_{f,t}$ is the excess daily return of the market portfolio that is proxied by the Euro-denominated MSCI World Index. α_i and β_i denote the estimated abnormal return and market beta for stock i, respectively.

We further construct a set of stock groups for the comparison of stock performance. Particularly, we divide the sample into five parts: The first subsample is the base group whereas the remaining four are the control groups. The first control group (*Control1*) includes all the stocks in the bank portfolio except those in the base group, and the second group comprises stocks in which banks increase their portfolio shares (*Control2*). The third control group (*Control3*) includes all stocks held by private investors other than those sold by banks, and the final group (*Control4*) covers only the securities in which private investors increase their portfolio shares. We use a variety of parametric (i.e. t-test) and non-parametric (i.e. Wilcoxon test (Wilcoxon, 1945)) methods to test the null hypothesis whether the mean and median values of abnormal returns in the base and control groups are equal.

Table 8 presents the mean and median values of abnormal returns for all five subsamples. In Panel A, the base group includes all the stocks which display diminishing portfolio share in the bank portfolios ($\Delta\rho^B_{ijt} < 0$). As shown in the Table, the t-test and Wilcoxon test both indicate that the mean and median differences of abnormal returns between the base and control groups are significant. For instance, we observe that stocks sold by banks to retail investors on average underperform significantly all other stocks in the bank portfolio (*Control1*). Similarly, stocks in which the banks increase their holdings display significantly higher abnormal returns than the stocks in the base group (*Control2*). Of course, one could argue that this is simply reflecting the better stock selection and market timing abilities of institutional investors compared to individual investors (Bollen and Busse, 2001). From that perspective those performance differences do not indicate that banks' behavior is detrimental to retail investors. It only shows that retail investors do not fully benefit from the stock selection and market timing ability of their respective banks.

Thus in order to identify whether the conflict of interests at banks is indeed detrimental to retail investors, we next compare the performance of stocks sold by banks with the performance of stocks held in the aggregated customer portfolios. Interestingly, the stocks sold off by banks to households also underperform on average all other stocks held by private investors (*Control3*) and also those stocks in which private investors increase their portfolio shares (*Control4*). Particularly, stocks sold by banks to their customers underperform the stocks in the group

Control3 quarterly by almost 234 basis points in absolute terms, which is almost equal to a loss of 117,000 Euro quarterly for the customers.[10]

In Panel B and Panel C of Table 8, we use further specifications for defining the stocks in the base group. In particular, we restrict our attention only to stocks in which the banks decline their portfolio shares substantially by 25 and 50 percent, respectively ($\Delta\rho^B_{ijt} < -.25$ and $\Delta\rho^B_{ijt} < -.50$). The t-test and Wilcoxon test also imply that we should reject the null hypothesis that mean and median abnormal returns in the base and control groups are equal. In both specifications, stocks which flow from proprietary portfolios of banks to the customer portfolios underperform the stocks in all four control groups. In other words, banks reduce the share of underperformer stocks in their portfolios and sell a remarkable fraction of them to their retail customers, which consequently undermine the interests of the private investors.

Taken as a whole, our findings provide evidence for the notion of conflict of interests in retail banking. In particular, it appears that banks breach their fiduciary duty and exploit their private customers by pushing them 'loser' stocks which they intend to dump from their own portfolios.

5 Robustness Checks

We next consider a series of robustness tests. First, we repeat our analysis using different threshold values in identifying the substantial reductions in the bank portfolios. Particularly, a reduction is perceived as substantial when the relative decline in the bank portfolio is larger than 75 and 90 percent, respectively. The regression results are reported in Table 9. The results show that the main variable of interest, the interaction term changes in magnitude but retains the significance and negative sign in every estimation. For instance, our results imply that when a bank lowers the share of a given stock by more than 75 percent, customers of this bank increase the share of this particular stock by almost 28 percent, implying that banks sell almost one-third of stocks which they strongly dump from their proprietary portfolios to their customers. We find a similar pattern when we use the 90 percent relative change as threshold value as reported in columns 3 and 4. Overall, our results seem to be robust to alternative threshold values for changes in stock ownership.

Another potential issue is that the direction of stock flows is not from banks to retail customers, but it is rather from customers to banks. In other words, one can relate the negative

[10]This number is computed by multiplying the average underperformance of stocks pushed by banks with the average Euro value invested in a given stock.

relationship between bank and private customer portfolios to the fact that banks act as counterparts, i.e. market makers, for their private customers. If such a relationship exists, the dependency between the changes in bank and customer portfolios should also be negative even when the banks increase their holdings in a given stock, or put differently, when the customers of the bank sell this particular stock to the bank. To test this hypothesis, we regress the changes in a given stock in customer portfolios on the changes in the same stock share in the bank portfolios when the banks substantially increase their stock share. The results are reported in Table 10. As shown in the Table, even though the estimated coefficient on the interaction term is statistically negative, the overall effect is almost equal to zero, implying that there is economically no significant relationship between bank and customer portfolios when banks substantially increase their positions. These results imply that our results are robust and the relationship between bank and customer portfolios is only negative when the banks sell stocks from their portfolios.

Further, one can argue that individual investors may buy or sell stocks following the actual trends in the stock market. In other words, the decision of individuals to invest in a particular stock may be influenced by what other investors do - the so-called herd behavior (Banerjee, 1992). Accordingly, there is an extensive theoretical and empirical literature that links the herding behavior to the various economic activities such as investment recommendations (Scharfstein and Stein, 1990; Graham, 1999). Therefore, ignoring the possible direct effects of herd behavior on the change in a particular stock share could render the so far presented results suspect. To check the robustness of our results to herding behavior, we add to our regressions a dummy variable which captures the investment trend among individual investors in a particular stock. In particular, this variable takes the value 1 if the direction of investment flow of the bank customers in a given stock is similar to the average market trend, and 0 otherwise. As shown in Table 11, controlling for the direct effects of herding behavior on the change in a given stock in the aggregated customer portfolios leaves our results unaffected, supporting the view that they are not driven by herding behavior.

Next, we employ a different specification in the construction of our main variables ($\Delta\rho^B_{ijt}$ and $\Delta\rho^C_{ijt}$). As noted earlier, we have used the first-log difference of a given stock share in the bank and customer portfolios as major variables in the primary analysis. However, in this specification, the stock share changes from zero to a positive value are treated as missing values as they are not mathematically defined. Therefore, we set the stocks share changes which move

from zero to a positive value equal to one, and repeat the analysis using these specification.[11] As shown in Table 12, regression results show that the estimated coefficients on the regressors term retain their significance and their signs in all specification, implying that our results are not affected by any specification failure. Nevertheless, it is noteworthy that the magnitude of the coefficient on interaction term becomes larger than in the primary analysis.

Finally, in the comparison of median values of abnormal returns, we also employ an alternative hypothesis-test procedure. In particular, we perform a a non-parametric median test on the equality of medians. We find that our results from the Wilcoxon test are also robust to different hypothesis procedure, implying that the medians of abnormal returns of stocks in the base group and in the control groups significantly differ. In other words, stocks sold by banks to their private customers underperform the stocks in other control groups, which also underpins the hypothesis of conflict of interests in retail banking.

6 Conclusion

In this paper we study directly the stock investments of banks and their retail customers on a security-by-security basis and address the question of whether banks push stocks from their proprietary portfolios to their retail customers. Even though the existing theoretical literature implies that possible incentive problems can arise in retail banking because of information asymmetries or due to conflicting interests, there has been yet no systematic empirical evidence. Against this background, we provide strong support for the conclusion that there is conflict of interests between banks and their retail customers. In particular, we show that banks push stocks which they dump from their portfolios to their retail customers. Far more interesting appears to be the finding that these stocks tend to be the underperformers. For instance, stocks sold off by banks to their customers underperform on a quarterly basis other stocks held in the aggregate household portfolio by 234 basis points, which is almost equal to a loss of 117,000 Euro quarterly for the customers. In short, in the absence of perfect 'Chinese Walls', combining proprietary trading and retail banking in universal banks generates a substantial conflict of interests.

[11] e.g. when the stock share moves from 0 to 0.1, we assume the growth in the stock share to be 100 percent.

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Table 1: Banks in the sample

	Obs	Stocks (eur) - all	Stocks (eur) - final	Share
Big private banks	5	2.70e+11	2.70e+11	100%
Regional banks	19	1.28e+11	6.34e+10	49.5%
Foreign banks	2	1.40e+10	2.86e+08	2%
State banks	9	4.66e+10	4.65e+10	99.78%
Savings banks	53	2.05e+10	1.32e+10	64.3%
CBs of cooperative banks	2	3.05e+10	3.05e+10	100%
Cooperative banks	11	8.64e+09	2.47e+09	28.6%
Real-estate CIs	1	1.59e+09	8.31e+07	5.2%

Note: This table presents the banks in the final sample classified by their group belongings. There is a total of 102 banks in the final sample.

Table 2: Portfolio composition

	Full sample			**Final sample**		
	Obs	Mean	Std. dev.	Obs	Mean	Std. dev.
Short term bond share	27,761	0.0203	0.059	1,466	0.028	0.062
Long term bond share	27,761	0.788	0.236	1,466	0.718	0.203
Listed equities share	27,761	0.01	0.055	1,466	0.056	0.139
Non listed equities share	27,761	0.0134	0.085	1,466	0.003	0.010
Other equities share	27,761	0.0007	0.008	1,466	0.011	0.022
Mutual fund share	27,761	0.168	0.222	1,466	0.194	0.181

Note: This table presents the descriptive statistics on the portfolio compositions of banks in our sample and the financial institutions in the full sample. The data represent a panel dataset and cover the period from December 2005 to September 2009.

Table 3: Descriptive statistics on stocks and stock positions in the sample

	Obs	Mean	Median	Std. Dev	1%	99%
Panel A:						
Bank	112,321	4,592,631	84,087	6.35e+07	0	80,000,000
Aggregated customers	112,321	5,039,914	107,740	3.70e+07	0	83,000,000
Panel B:						
Jensen's Alpha	107,293	-0.0002	0	0.0036	-0.0127	0.0088
Return Volatility	106,655	0.027	0.0223	0.0181	0	0.092
Market Beta	107,293	0.8423	0.8396	0.7472	-0.938	2.865
Unsystematic Risk	107,293	0.0258	0.0185	0.0356	0	0.162

Note: Panel A of this table reports the descriptive statistics on investments in stock positions of bank and their aggregated customers. Panel B presents descriptive statistics on the performance measures of stocks in our final sample. Daily return information on each stock in the sample for the period from 1st. January, 2005 to 31st. December, 2009 is collected from from Thomson Reuters Datastream. Jensen's Alpha, Beta and idiosyncratic risk of a stock is computed using a one-factor market model. Return volatility is captured by the standard deviation of daily returns.

Table 4: Pearson Correlation Coefficients

	(1)		(2)		(3)		(4)	
	$\Delta\rho^C$	$\Delta\rho^B$	$\Delta\rho^C$	$\Delta\rho^B$	$\Delta\rho^C$	$\Delta\rho^B$	$\Delta\rho^C$	$\Delta\rho^B$
$\Delta\rho^C$	1.0000		1.0000		1.0000		1.0000	
$\Delta\rho^B$	0.04***	1.0000	-0.049***	1.0000	-0.089***	1.0000	-0.082***	1.0000
Obs	112,321	112,321	64,072	64,072	42,221	42,221	30,835	30,835

Note: This table reports the Pearson correlation coefficients of the change in a given stock in the bank portfolio and change in the same stock in the aggregated customer portfolios for different samples. The first columns covers all the changes in the full sample. The second column restricts the sample to stocks which banks dump from their portfolios. The third and fourth columns includes only the observations of stocks which banks substantially reduce in their portfolio by 25 and 50 percent, respectively. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.

Table 5: Do banks push stocks from their portfolios to their retail customers? - Threshold: 0

	(i)	(ii)	(iii)
	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$
$\Delta\rho^B_{ijt}$	-.0004	-.0002	-.00011
	(.0007)	(.0008)	(.0008)
Dummy Decrease$_{ijt}$	-.110***	-.110***	-.107***
	(.0128)	(.0141)	(.0134)
Dummy Decrease$_{ijt}\times\Delta\rho^B_{ijt}$	-.0318**	-.0303**	-.034**
	(.0122)	(.0129)	(.0122)
Dummy Gain$_{ijt-1}$	-	-.0419***	-.043***
		(.0041)	(.0043)
$Vola_{ijt-1}$	-	-	.969
			(.414)
Time effects	Yes	Yes	Yes
Clustering	Bank	Bank	Bank
R^2	2%	2.2%	2%
Number of obs	112,321	93,690	89,391
Number of groups	18,631	15,169	14,229
Average obs per group	6.0	6.2	6.3
F-statistics	72.37	129.38	146.17

Note: This table presents the fixed effects regression. Dummy Decrease$_{ijt}$ takes the value 1 if the relative decline in a given stock share in the bank portfolio is larger than zero, and 0 otherwise. Dummy Gain$_{ijt-1}$ is a binary variable that equals to 1 if the stock 'i' had a positive absolute return at time 't-1'. Heteroskedasticity-robust standard errors are reported in parentheses. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.

Table 6: Do banks push stocks from their portfolios to their retail customers? - Threshold: -25

	(i)	(ii)	(iii)
	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$
$\Delta\rho^B_{ijt}$	.00233**	.003***	.0028***
	(.0009)	(.0011)	(.0009)
Substantial Decrease$_{ijt}$	-.143***	-.146***	-.142***
	(.0193)	(.0203)	(.019)
Substantial Decrease$_{ijt}\times\Delta\rho^B_{ijt}$	-.110***	-.112***	-.113***
	(.0144)	(.0146)	(.0152)
Dummy Gain$_{ijt-1}$	-	-.043***	-.044***
		(.0041)	(.0044)
$Vola_{ijt-1}$	-	-	1.02***
			(.403)
Time effects	Yes	Yes	Yes
Clustering	Bank	Bank	Bank
R^2	1.45%	1.6%	1.5%
Number of obs	112,321	93,690	89,391
Number of groups	18,631	15,169	14,229
Average obs per group	6.0	6.2	6.3
F-statistics	100.47	114.79	130.38

Note: This table presents the fixed effects regression. Dummy Substantial Decrease$_{ijt}$ takes the value 1 if the relative decline in a given stock share in the bank portfolio is larger than 25 percent, and 0 otherwise. Dummy Gain$_{ijt-1}$ is a binary variable that equals to 1 if the stock 'i' had a positive absolute return at time 't-1'. Heteroskedasticity-robust standard errors are reported in parentheses. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.

Table 7: Do banks push stocks from their portfolios to their retail customers? - Threshold: -50

	(i)	(ii)	(iii)
	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$
$\Delta\rho^B_{ijt}$	.0042***	.0051***	.0047***
	(.0012)	(.0014)	(.0012)
Substantial Decrease$_{ijt}$	-.175***	-.179***	-.177***
	(.029)	(.0292)	(.0267)
Substantial Decrease$_{ijt}\times\Delta\rho^C_{ijt}$	-.166***	-.171***	-.173***
	(.0261)	(.026)	(.025)
Dummy Gain$_{ijt-1}$	-	-.044***	-.0455***
		(.004)	(.0044)
$Vola_{ijt-1}$	-	-	1.02
			(.407)
Time effects	Yes	Yes	Yes
Clustering	Bank	Bank	Bank
R^2	1%	1.15%	1%
Number of obs	112,321	93,690	89,391
Number of groups	18,631	15,169	14,229
Average obs per group	6.0	6.2	6.3
F-statistics	103.69	106.17	120.37

Note: This table presents the fixed effects regression. Dummy Substantial Decrease$_{ijt}$ takes the value 1 if the relative decline in a given stock share in the bank portfolio is larger than 50, and 0 otherwise. Dummy Gain$_{ijt-1}$ is a binary variable that equals to 1 if the stock 'i' had a positive absolute return at time 't-1'. Heteroskedasticity-robust standard errors are reported in parentheses. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.

Table 8: Abnormal return comparison - Hypothesis testing

	Obs	Mean	Median	t-test	Wilcoxon test
Panel A: Threshold = 0					
Case group vs.	61,121	-.00086	-.0003		
Control1	159,273	-.00014	.0000	-47.398***	54.463***
Control2	46,172	.00054	.00042	-65.495***	65.375***
Control3	2,932,768	-.0006	-.0001	-17.044***	19.232***
Control4	1,554,071	.0012	.0009	-130***	-135.3***
Panel B: Threshold = -25%					
Case group vs.	40,361	-.00095	-.00026		
Control1	180,409	-.0002	.0000	-43.306***	44.334***
Control2	66,932	.00016	.0001	-48.892***	38.73***
Control3	2,953,528	-.0006	-.0001	-17.08***	13.164***
Control4	1,563,170	.00119	.0009	-99.66***	-104.471***
Panel C: Threshold = -50%					
Case group vs.	29,464	-.00069	-.00006		
Control1	191,481	-.00029	.0000	-26.128***	20.880***
Control2	77,799	-.00009	.000	-22.26***	11.133***
Control3	2,964,395	-.0006	-.00012	-3.704***	-3.69***
Control4	1,567,798	.0012	.0009	-76.194***	-79.453***

Note: This table shows the differences in abnormal returns. We divide the sample into five parts where the base group includes stocks that are pushed by banks to their retail customers. Control1 covers all stocks held by banks other than those sold to customers, Control2 includes stocks in which banks increase their portfolio shares, the third control group (Control3) comprises all stocks held by private investors other than those sold by banks, and the final group (Control4) covers only the securities in which private investors increase their portfolio shares. In Panel A, the case group comprises all stocks which banks reduce in their portfolios whereas case groups in Panel B and Panel C include the stocks which banks substantially reduce in their portfolios by 25 and 50 percent, respectively. We test the significance of mean difference using two-sample paired t-test and the significance of the median using Wilcoxon rank-sum test. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.

Table 9: Alternative threshold values

	(i)	(ii)	(iii)	(iv)
	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$
$\Delta\rho^B_{ijt}$	.005***	.005***	.006***	.006***
	(.001)	(.0013)	(.001)	(.0014)
Substantial Decrease$_{ijt}$	-.363***	-.362***	-.767*	-.763*
	(.0896)	(.0896)	(.411)	(.413)
Substantial Decrease$_{ijt}\times\Delta\rho^B_{ijt}$	-.368***	-.366***	-.777*	-.774*
	(.088)	(.088)	(.412)	(.414)
Dummy others$_{ijt}$	-	.021**	-	.021**
	-	(.009)	-	(.009)
Time effects	Yes	Yes	Yes	Yes
Clustering	Bank	Bank	Bank	Bank
R^2	1%	1%	1%	1%
Number of obs	112,321	112,321	112,321	112,321
Number of groups	18,631	18,631	18,631	18,631
Average obs per group	6.0	6.0	6.0	6.0
F-statistics	58.13	64.28	49.5	55.21

Note: This table presents the fixed effects regression. Substantial Decrease$_{ijt}$ takes the value 1 if the relative decline in a given stock share in the bank portfolio is larger than the threshold value, and 0 otherwise. In Columns (1) and (2) the threshold value is set equal to 75 percent and in columns (3) and (4) the threshold value equals to 90 percent. Heteroskedasticity-robust standard errors are reported in parentheses. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.

Table 10: Substantial Increase in the Bank Portfolio

	(i)	(ii)	(iii)
	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$
$\Delta\rho^B_{ijt}$	.0213*	.0423***	.0524***
	(.0124)	(.0119)	(.0128)
Substantial Increase$_{ijt}$	.0939***	.0930***	.0953***
	(.0141)	(.0178)	(.0199)
Substantial Increase$_{ijt}\times\Delta\rho^B_{ijt}$	-.0233*	-.0456***	-.0560***
	(.0124)	(.0124)	(.0133)
Time effects	Yes	Yes	Yes
Clustering	Bank	Bank	Bank
R^2	1.7%	1.61%	1.55%
Number of obs	112,321	112,321	112,321
Number of groups	18,631	18,631	18,631
Average obs per group	6.0	6.0	6.0
F-statistics	72.12	87.43	87.59

Note: This table presents the fixed effects regression. Substantial Increase$_{ijt}$ takes the value 1 if the relative decline in a given stock share in the bank portfolio is larger than the threshold value, and 0 otherwise. The threshold value equals to 25, 50 and 75 percent in specification (i), (ii) and (iii), respectively. Heteroskedasticity-robust standard errors are reported in parentheses. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.

Table 11: Do banks push stocks to their customers? Controlling for herding behavior

	(i)	(ii)	(iii)
	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$
$\Delta\rho^B_{ijt}$	0.001	0.003***	0.004***
	(.0008)	(.0009)	(.0012)
Substantial Decrease$_{ijt}$	-.107***	-.141***	-.177***
	(.0136)	(.0186)	(.027)
Substantial Decrease$_{ijt}\times\Delta\rho^B_{ijt}$	-.0334***	-.112***	-.172***
	(.0121)	(.0152)	(.0252)
Dummy Gain$_{ijt-1}$	-.043***	-.044***	-.045***
	(.004)	(.004)	(.004)
Vola$_{ijt-1}$	.953**	1.01**	1.02**
	(.413)	(.402)	(.406)
Dummy others$_{ijt}$	.02*	.0195*	.0193*
	(.011)	(.011)	(.010)
Time effects	Yes	Yes	Yes
Clustering	Bank	Bank	Bank
R^2	2%	1.6%	1.1%
Number of obs	89,391	89,391	89,391
Number of groups	14,229	14,229	14,229
Average obs per group	6.3	6.3	6.3
F-statistics	174.54	133.25	120.22

Note: This table presents the fixed effects regression. Substantial Increase$_{ijt}$ takes the value 1 if the relative decline in a given stock share in the bank portfolio is larger than the threshold value, and 0 otherwise. The threshold value equals to 25, 50 and 75 percent in specification (i), (ii) and (iii), respectively. Heteroskedasticity-robust standard errors are reported in parentheses. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.

Table 12: Substantial Decrease in the Bank Portfolio - alternative specification

	(i)	(ii)	(iii)
	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$	$\Delta\rho^C_{ijt}$
$\Delta\rho^B_{ijt}$	-.00011	.0028***	.0047***
	(.0008)	(.0009)	(.0012)
Dummy Decrease$_{ijt}$	-.107***	-.142***	-.177***
	(.0134)	(.019)	(.0267)
Dummy Decrease$\times\Delta\rho^B_{ijt}$	-.034**	-.113***	-.173***
	(.0122)	(.0152)	(.025)
Dummy Gain$_{ijt-1}$	-.043***	-.044***	-.0455***
	(.0043)	(.0044)	(.0044)
Vola$_{ijt-1}$	.969	1.02***	1.02***
	(.414)	(.403)	(.407)
Time effects	Yes	Yes	Yes
Clustering	Bank	Bank	Bank
R^2	2%	1.5%	1%
Number of obs	89,391	89,391	89,391
Number of groups	14,229	14,229	14,229
Average obs per group	6.3	6.3	6.3
F-statistics	146.17	130.38	120.37

Note: This table presents the fixed effects regression. Dummy Decrease$_{ijt}$ takes the value 1 if the relative decline in a given stock share in the bank portfolio is larger than the threshold value, and 0 otherwise. The threshold value equals to 0, 25 and 50 percent in specification (i), (ii) and (iii), respectively. Heteroskedasticity-robust standard errors are reported in parentheses. Three stars denote significance at 1 percent or less; two stars denote significance at 5 percent or less; one star denotes significance at 10 percent or less.