

Deposit Withdrawals from Distressed Commercial Banks

Martin Brown^{*}, Benjamin Guin^{**} and Stefan Morkoetter^{***}

October 2014

Abstract: We study retail deposit withdrawals from European commercial banks which incurred investment losses in the wake of the U.S. subprime crisis. We document a strong propensity of households to withdraw deposits from distressed banks, especially when a bank receives a public bailout. However, the withdrawal risk for a distressed bank is mitigated by strong bank-client relationships and household-level switching costs: Households which rely on a single deposit account, which do not live close to a non-distressed bank, or which maintain a credit relationship with a distressed bank are significantly less likely to withdraw deposits. Our findings provide empirical support to the Basel III liquidity regulations which emphasize the role of well-established client relationships for the stability of bank funding.

Keywords: Liquidity Risk, Market Discipline, Switching Costs

JEL Codes: D14, G21, G28

^{*}Brown: University of St.Gallen, martin.brown@unisg.ch. ^{**}Guin: University of St.Gallen, benjamin.guin@unisg.ch. ^{***}Morkoetter: University of St.Gallen, stefan.morkoetter@unisg.ch.

This paper was previously circulated under the title “Switching Costs, Deposit Insurance and Deposit Withdrawals from Distressed banks”. We thank Christoph Basten, Tobias Berg, Emilia Garcia-Appendini, Vasso Ioannidou, Rajkamal Iyer, Charles Kahn, Catherine Koch, Steven Ongena, Lev Ratnovski, Jean-Charles Rochet, Enrico Sette, Greg Udell and Jan Wrampelmeyer, as well as seminar participants at Aalto University, the Bank for International Settlements, the Swiss Financial Market Authority, the Swiss National Bank, the University of Zurich, the Ph.D. seminar at Columbia University, the 7th Swiss Winter Conference on Financial Intermediation, the International Risk Management Conference 2014 in Warsaw, the IBEFA Summer Meeting 2014, the EFMA Annual Conference 2014, the 6th IFABS Conference 2014 and the 2014 EEA Meetings for helpful comments. We are grateful to the Swiss National Science Foundation for financial support. Moreover, we gratefully acknowledge financial support from the European Investment Bank Institute through its EIBURS initiative. The findings, interpretations and conclusions presented in this article are entirely those of the authors and should not be attributed in any manner to the European Investment Bank or its Institute. Any errors are the authors’ responsibility.

1. Introduction

The recent financial crisis has demonstrated forcefully that the withdrawal of wholesale and retail funds may jeopardize the liquidity and solvency of large commercial banks leading to costly policy interventions (e.g. Northern Rock in the U.K.). The crucial role of liquidity risk in the recent crisis has led policy makers to harmonize minimum liquidity requirements for banks within the regulatory framework of Basel III. A key feature of the new regulations is that required liquidity depends not only on the type and maturity of bank funding, but also on the type of depositors that a bank caters to: Banks with tighter depositor relationships may hold less liquidity as the corresponding deposits are presumed to be a more stable source of funding (BIS, 2013).

The prominent role of bank-client relationships in the Basel III liquidity regulations is in line with the theory of industrial organization which emphasizes the importance of switching costs in consumer markets (Klemperer, 1987). Applications to the market for bank deposits (e.g. Sharpe, 1997) suggest that once a household has established a relationship with a bank the client faces substantial costs of switching providers (e.g. account closure and opening fees, or the time and effort required to switch loans and standing orders to a new bank). It is thus reasonable to assume that switching costs may also limit retail deposit withdrawals when a bank enters distress. To our knowledge, however, this conjecture has not yet been substantiated by empirical evidence.

In this paper we examine how switching costs arising from bank relationships and limited access to alternative providers affect the propensity of retail clients to withdraw deposits from distressed commercial banks. We study deposit reallocations across banks in Switzerland during 2008-2009, exploiting a “natural experiment”: The two largest Swiss commercial banks (Credit Suisse and UBS) suffered substantial losses during the recent financial crisis, leading to recapitalizations of both banks and a government bailout of one bank (UBS). Importantly, the losses of the two large banks were driven by asset write downs on financial investments and trading losses

in the wake of the U.S. subprime crisis, and were unrelated to their domestic retail banking operations. Indeed, their domestic competitors (state-owned commercial banks and regional savings banks) suffered no losses at all, earning stable net interest incomes throughout the crisis. The distress situation at the two large Swiss banks in 2008-2009 can thus be viewed as an exogenous shock to their domestic retail clients which we study in this paper.

We use survey data which covers all bank relationships of 1,475 households in German-speaking Switzerland, and provides information on the reallocation of deposits across banks in 2008-2009. The survey is representative of the underlying population with respect to the household characteristics which are most important for our study: Household wealth, household location, and pre-crisis deposit relations with banks. As the majority of households in our sample maintain multiple bank accounts, we are able to compare the withdrawal behavior from distressed banks to that from non-distressed banks for the same households. By doing so we can control for unobserved heterogeneity in the clientele of distressed versus non-distressed banks.

We first document a strong propensity to withdraw deposits from the distressed banks: Households are 16 percentage points more likely to withdraw deposits and 7 percentage points more likely to close the account at a distressed bank compared to a non-distressed bank. We find that deposit withdrawals are five times higher in the case of a government bailout (UBS) compared to the case where the distressed bank did not need to be bailed out (Credit Suisse). The propensity to withdraw from UBS is not only driven by concerns about bank risk, but also by disagreement with the banks corporate strategy. This partly explains why retail depositors withdraw funds from a bank which is widely perceived to be “too big to fail”.

Second, we show that the propensity to withdraw deposits from the bailed-out bank (UBS) is substantially lower for households which face switching costs: Households with no other bank account, households which are geographically distant from a non-distressed bank and households which have a credit relationship with UBS. Finally, we show that the role of switching costs in

detering deposit withdrawals holds independent of household coverage by or knowledge about deposit insurance. Moreover, impact of switching costs in detering deposit withdrawals arises independent of the financial sophistication of households.

Our findings contribute to the empirical literature on the disciplining of distressed banks by depositors. Several studies use bank-level balance sheet data or interest rate data to study the impact of bank distress on the flow and pricing of insured vs. non-insured deposits.¹ However, these studies provide only a coarse understanding of market discipline by retail depositors as (i) they can rarely distinguish household deposits from those of non-financial firms, (ii) cannot relate withdrawal behavior to socioeconomic characteristics of households, and (iii) cannot relate withdrawal behavior to the number and scope of bank relations that a household has. Davenport and McDill (2006) and Iyer et al. (2013) use client-level administrative data to provide a more detailed account of retail deposit withdrawals from distressed banks.² Davenport and McDill (2006) document that the impact of (the lack of) deposit insurance on deposit withdrawals is largely driven by business accounts as opposed to retail deposit accounts. Iyer et al. (2013) show that - besides deposit insurance - the information of the client about the bank may impact on withdrawals from a distressed bank. We add to the insights of these two papers in two crucial dimensions: First, we study an event in which the distressed banks are systemically important large commercial banks. Thus, we can examine to what extent financial distress triggers deposit withdrawals from banks which are commonly viewed to be “too big to fail”. By contrast, the bank studied by Davenport and McDill (2006) is a small U.S. commercial bank, while the bank studied by Iyer et al. (2013) is a small Indian cooperative bank. Second, our data provides us

¹ Calomiris & Kahn (1991) and Diamond & Rajan (2001) provide theories of market discipline emphasizing ex-ante withdrawal and ex-post withdrawals by depositors, respectively. Studies which examine bank balance-sheet data provide evidence that distressed banks suffered stronger deposit outflows during the Great Depression (Saunders and Wilson, 1996, Calomiris and Mason, 1997), the U.S. Savings and Loan crisis (Goldberg and Hudgins, 2002), the financial crises in Latin America in the 1980s and 1990s (Peria and Schmukler, 2001; Schumacher, 2000) and Eastern Europe (Karas et al., 2013; Hasan et al., 2013). Studies of bank-level interest rates provide evidence for market discipline by relating bank risk to changes in deposit interest rates for uninsured deposits (Demirguc-Kunt and Huizinga, 2004; Ellis and Flannery, 1992; Hannan and Hanweck, 1988).

² Iyer and Puri (2012) provide household-level evidence on withdrawal behavior in a banking panic. Iyer and Pedro (2011) study interbank contagion in the same context of Indian cooperative banks.

with information on all bank relationships for a representative sample of households. We can thus study to what extent the number and scope of all bank relations of a household affect the withdrawals from an account with a distressed bank. The number and scope of bank relations should be of particular importance to understand household withdrawal behavior in the context of large commercial banks, given that many households are likely to hold multiple bank accounts.

Our findings also contribute to the industrial organization literature which highlights the importance of switching costs in retail banking markets. Sharpe (1997) argues that switching costs for existing bank clients reduces the effective competition between banks for retail deposits. Exploiting differences in migration levels across regional banking markets (e.g. a proxy for customers with low switching costs), he documents that a high proportion of movers increases the deposit rates paid by banks. These findings have been confirmed by Carbo-Valverde et al. (2011) and Hannan and Adams (2011).³ Kiser (2002) provides survey evidence documenting that retail bank customers in the U.S. rarely change their main bank relationship. Her findings suggest that both preferences for differentiated products (e.g. customer service) as well as explicit switching costs (geographic location) are responsible for the stickiness of household-bank relations. We contribute to this literature by documenting the importance of switching costs in mitigating the withdrawal risk of retail deposits from distressed banks.

The remainder of the paper is organized as follows. Section 2 describes the institutional background to the paper. Section 3 presents the data and methodology. Section 4 contains the empirical results. Section 5 concludes.

³ Kim et al. (2003) estimate the size of switching costs for borrowers in Norway.

2. Institutional Background

In this section we argue that the 2008-2009 global financial crisis gave rise to a “natural experiment” in the Swiss retail banking market which allows us to study how depositors react to exogenous shocks to the solvency of large commercial banks: First, the two largest Swiss commercial banks suffered substantial distress during this period, while the competing commercial and savings banks did not. Second, the distress of the two large banks was caused by developments which were unrelated to their domestic retail market.

In Switzerland, the retail banking market is served by three main groups of banks: The two large universal banks Credit Suisse and UBS compete with 24 regionally operating state-owned commercial banks (Cantonal Banks) and nearly 400 regional savings banks.⁴ At the end of 2007 Credit Suisse and UBS together held 30 percent of domestic customer deposits, while the cantonal banks accounted for 32 percent and the regional savings banks for 30 percent of the deposit market. In addition to these three major bank groups, a limited number of other banks, such as the state-owned postal bank⁵, smaller nationwide commercial banks and specialized consumer lenders operate in the Swiss retail market.

Figure 1 here

In 2007-2008 the two large Swiss banks, UBS and Credit Suisse, incurred massive losses primarily due to trading losses and asset write-downs on their international investments (see Figure 1). In this period the two banks had to write down their financial investments and tradable assets by over CHF 30 billion (CHF 1 = USD 0.87 in October 2008), while they also incurred trading losses of CHF 10 billion. The losses incurred by the two large banks were unrelated to market conditions in the domestic retail market: Figure 1 (Panel B) shows that the net-interest

⁴ There are currently 321 mutually owned Raiffeisen banks and 66 other regional savings banks.

⁵ For the following analysis, cantonal banks and the postal bank were aggregated into one category (state-owned banks).

income ratio of the large banks declined only slightly during the crisis, while that of the domestically focused cantonal banks and savings banks remained stable. In contrast to Germany where many state-owned banks (Landesbanken) had also heavily invested in U.S. asset backed securities (see Puri et al., 2011), this was not the case for the state-owned commercial banks or savings banks in Switzerland. Indeed, as these banks had limited financial investments and tradable assets, they incurred negligible asset-write downs or trading losses (see Figure 1, Panel C & D).

The losses incurred by the two large Swiss banks in 2007-2008 wiped out more than 60 percent of their pre-crisis equity (see Figure 1, Panel A). In response both banks were forced to raise additional shareholder capital. Credit Suisse secured a capital infusion of CHF 10 billion in October 2008 from a group of private investors (Credit Suisse, 2008). UBS had to absorb substantially higher losses and required multiple capital infusions: UBS raised CHF 13 billion of equity capital (mainly from sovereign wealth funds) at the end of 2007 and another CHF 16.3 billion through a rights offering to its shareholders in mid-2008 (UBS, 2007; UBS, 2008a). Despite these capital infusions UBS required a government bailout in October 2008. The Swiss National Bank agreed to take over CHF 68 billion of illiquid assets from the balance sheet of UBS. At the same time, UBS received CHF 6 billion of additional capital in the form of mandatory convertible notes fully placed with the Swiss Confederation (UBS, 2008b). This direct government intervention was the only bail-out in the Swiss banking industry during the recent financial crisis.

Figure 2 here

Despite the recapitalizations of the two large banks, and the bail-out of UBS, both banks were subject to discipline by investors and depositors. Between mid-2007 and the end of 2008 the spreads for Credit Suisse and UBS bonds rose by more than 250 and 350 basis points respec-

tively, while the yields on other Swiss banks hardly increased at all.⁶ More important for this study, the two large banks experienced a significant decline in customer deposits of more than 20% between end-2007 and mid-2009. As shown by Figure 2 the decline in customer deposits did not happen overnight with the bail out of UBS in October 2008. By contrast, the withdrawal of customer deposits occurred steadily between 2008 and 2009 as the two banks reported falling and then negative earnings. Figure 2 also shows that the deposit withdrawals from the two large banks can hardly be attributed to widespread liquidity shocks among domestic households or a general loss in confidence in Swiss banks. While customer deposits declined strongly at the two large banks, deposits at the domestically focused cantonal banks and savings banks increased throughout the crisis.

3. Data and methodology

3.1. Data

Our analysis is based on a survey of 1,475 households in the German-speaking area of Switzerland.⁷ The survey sample was constructed to be representative of the underlying population with respect to gender, age and geographical location.⁸ The survey is also representative of the Swiss population in terms of income, wealth and education (see Appendix 1, Panel A). The survey was implemented with telephone interviews (in German) which lasted on average 15 minutes. The interviewees were not remunerated for their participation. However, at the beginning of each interview the respondent was informed about the academic purpose of the survey in

⁶ See e.g. the 2010 Financial Stability Report of the Swiss National Bank.

⁷ This survey was conducted by GfK, a leading international market research institute, on behalf of the University of St. Gallen in 2011. The sample size corresponds to 0.05% of the targeted population in Switzerland, which is an adequate coverage compared to large surveys in the U.S. or the EU (e.g. the Health and Retirement Study in the U.S. covers about 0.03% and the Survey of Health, Aging and Retirement in Europe about 0.04% of the targeted population).

⁸ Respondents were limited to those with an age of 20-74 years of age, with sufficient German skills to be able to understand the questions, and to the respondents which were not self-employed.

order to encourage participation and reduce the number of non-responses to what may be viewed as sensitive questions on financial status and financial behavior.⁹

The survey questionnaire was designed to elicit information on all bank relationships maintained by each household prior to the crisis and their reallocation of funds between banks during the financial crisis.¹⁰ Information was also gathered on socioeconomic characteristics (e.g. age, education, gender, household income and wealth), financial literacy, knowledge about deposit insurance, behavioral traits (risk aversion and time preferences) and the geographical location of the households. We match the location of each household with hand-collected information on the geographical location of all bank branches in Switzerland.¹¹

Pre-crisis bank relations and the reallocation of deposits during the crisis

The 1'475 households in our sample report a total of 2'414 pre-crisis deposit relations, i.e. bank relationships which feature either a savings or a current account. The majority of households (59%) in our sample have multiple bank relationships. Figure 3 illustrates the network of pre-crisis deposit relationships of households in our sample. Within our sample 495 households (34%) had deposits with one of the large banks (Credit Suisse or UBS) before the financial crisis. Among these households, 216 also had a deposit account with a state-owned bank, 138 with a regional savings bank and 66 with another (non-distressed) bank.

Deposit market shares across banks calculated on the basis of the number of bank relationships derived from the survey are consistent with market shares based on official deposit volume data of the Swiss National Bank (see Appendix 1, Panel B). This again points to the representativeness of our survey in terms of household characteristics relevant to our analysis.

⁹ In total 9'361 households were contacted, of which 6'696 refused to participate and 1'151 interviews were terminated early (primarily due to a lack of German language knowledge). According to GfK the response rate for the survey is comparable to other academic-orientated surveys and higher than that for regular market research surveys in the field of financial services.

¹⁰ The questionnaire is available upon request.

¹¹ We use data for the network of bank branches in Switzerland as per December 2012. Distance calculations are based on zip code information for both households and bank branches, and computed through the Google maps API.

Figure 3 here

For each household we elicit information on the reallocation of assets across banks during the financial crisis. Specifically, each respondent was asked whether he /she “(...) *reallocated bank assets during the financial crisis, i.e. at the end of 2008 or in 2009. With reallocation we understand the transfer of (savings) deposits or securities from one bank to another.*” All households which replied that they did reallocate funds were subsequently asked which bank they withdrew funds from. For each bank relationship that funds were withdrawn from respondents were asked which share of their assets they withdrew from this bank (less than 25 percent, 25-50 percent, 50-75 percent, more than 75 percent), what type of assets they withdrew (deposits, securities portfolios, voluntary retirement savings) and which bank they transferred the assets to. Finally, all respondents which reallocated funds were asked to report their motives for doing so. In total, 113 of the 1’475 households in our survey report that they reallocated deposits across banks during the crisis.

The main dependent variable in our analysis is the binary variable *Withdrew deposits* which takes on the value of one if the household shifted deposits away from a bank during 2008/2009 (zero otherwise). In order to test the sensitivity of our results we employ two further indicators of withdrawals. The variable *Withdrew deposits (>50%)* takes on the value of one if at least 50% of the deposits held at a bank were reallocated to another bank (zero otherwise). Furthermore, the variable *Account closed* takes on the value of one if the household not only withdrew all of its deposits from the bank but also closed the corresponding account. Appendix 2 provides definitions of all variables employed in our analysis. Appendix 3 provides summary statistics and shows that 5% of the pre-crisis deposit relations in our sample experience a withdrawal during the crisis, 3% experience a withdrawal of more than 50%, and 2% of deposit accounts are closed.

The main explanatory variable in our analysis is the variable *Distress* which takes on the value one for a pre-crisis deposit relationship with one of the two large banks (UBS or Credit Suisse) and zero for a pre-crisis deposit relationship with any other bank. Appendix 3 shows that nearly one-quarter of all pre-crisis deposit relationships (23%) were held with one of the two large banks.

Switching costs

We employ three measures of switching costs to examine whether such costs deter households from withdrawing deposits from distressed banks. Our first indicator is the variable *Single account* which takes on the value of one if a respondent had only one deposit account prior to the crisis. Having only one deposit account implies high switching costs for two reasons: First, the household would have to incur the transaction costs (fees, opportunity costs of time) of opening a new account in order to reallocate deposits. Second, the household is likely to be using the existing account for a broad range of payment and savings transactions. If the household wants to switch all these services to the new bank relationship this would imply further transaction costs.

The variable *Credit linkage* provides us with a further indicator of the scope of the services used within a bank relationship. It indicates whether the household had a consumer loan or mortgage loan with the bank at the beginning of the financial crisis. Lenders often require retail clients to maintain their main transaction account with the bank. This variable thus captures potential transaction costs (fees, opportunity costs of time) related to switching other financial services related when a household transfers its main deposit account to another bank.

The variable *No local banks* captures the geographical distance between the household and non-distressed banks and thus the transaction costs (travel and time costs) involved in opening up and maintaining a distant bank account. It takes on the value one if there is no branch of a non-distressed bank in the same location (same ZIP code) as the household. Appendix 3 shows

that in our sample 52% of households have a single deposit account prior to the crisis, 23% of households are not located close to a branch of a non-distressed bank, and 22% of the bank relations have a credit linkage.

3.2. Methodology

We estimate linear parametric models using ordinary least squares in which the dependent variable $Withdraw_{j,i}$ indicates whether household i withdrew deposits from its pre-crisis relationship with bank j . As illustrated by equations [1a-1b] the estimate of β for the variable $Distress_{j,i}$ captures the propensity of households to withdraw deposits from distressed banks as opposed to non-distressed banks. In equation [1a] the vector of household-level socioeconomic characteristics X_i accounts for observable heterogeneity between households. This vector includes indicators of household income, household wealth, age, gender, education, nationality, risk aversion, time preferences and geographical proximity to branches of the two distressed banks. Appendix 2 and 3 provide definitions and summary statistics of these household-level control variables. A direct comparison between clients of distressed and non-distressed banks reveals that, on average, the clients of distressed banks have higher income, higher wealth and are better educated (see Appendix 4). This disparity between the two groups can be explained by the fact that the distressed banks are large commercial banks which have a stronger focus on wealth management services as compared to state-owned banks or regional banks.

$$[1a] \quad Withdraw_{j,i} = \alpha + \gamma \cdot X_i + \beta \cdot Distress_{j,i} + \varepsilon_{j,i}$$

$$[1b] \quad Withdraw_{j,i} = \alpha_i + \beta \cdot Distress_{j,i} + \varepsilon_{j,i}$$

Although we control for a wide array of household characteristics X_i in model [1a], it is questionable whether we observe and correctly measure all relevant variables that jointly affect withdrawals of deposits and the decision to have a relationship with a distressed (i.e. large) bank. In order to control for a potential bias due to unobserved heterogeneity of distressed bank clients versus non-distressed bank clients we replicate our analysis on a sample of households that had pre-crisis deposit relationships with distressed bank and non-distressed banks. As illustrated in equation [1b], this allows us to control for unobserved heterogeneity at the household level with household fixed effects α_i . The estimated effect of $Distress_{j,i}$ in model [1b] is cleanly identified as it is not biased by unobserved heterogeneity across clients of distressed and non-distressed banks. However, this identified effect is not representative for the average effect across all households. In particular, if we conjecture that switching costs affect the propensity of households to withdraw deposits then the estimated effect in this subsample of multiple account holders should be higher than in the full sample including households with only one deposit account. We therefore report estimates for model [1a] based on the full sample of deposit accounts as well as for model [1b] on the subsample of households with accounts at both distressed and non-distressed banks. In all models we calculate heteroskedasticity-robust standard errors by clustering at the regional level.¹²

In the second step of our analysis we examine the relation between household-level switching costs and the propensity to withdraw from distressed banks. Here we add our indicators of switching costs $Single\ account_i$, $No\ local\ banks_i$ or $Credit\ linkage_{i,j}$ to our baseline model as well as their respective interaction terms with $Distress_{j,i}$. As illustrated by equation [2] the parameter estimates of δ for the interaction term $Distress_{j,i} \cdot Switching_{i,j}$ captures whether switching costs reduce the propensity of households to withdraw from a distressed bank account – more than it reduces the probability to withdraw from the account of a non-distressed bank.

¹² Switzerland is partitioned into 106 MS regions which largely represent local labor markets.

$$[2] \quad Withdraw_{j,i} = \alpha + \gamma \cdot X_i + \beta \cdot Distress_{j,i} + \theta \cdot Switching_{j,i} + \delta \cdot Distress_{j,i} \cdot Switching_{j,i} + \varepsilon_{j,i}$$

where $Switching_{i,j}$ is either *Single account_i*, *No local banks_i* or *Credit linkage_{i,j}*.

In the final step of our analysis we conduct subsample splits to examine whether the effects of $Distress_{j,i}$ and $Distress_{j,i} \cdot Switching_{i,j}$ estimated in equation [2] differ across households. First we split our sample by household coverage by and knowledge about deposit insurance. Second, we split our sample by the degree of financial sophistication of a household.

Recent household-level evidence using data on cooperative banks in India (Iyer & Puri, 2012, Iyer et al., 2013) suggests that deposit insurance reduces the propensity of households to withdraw deposits in a bank panic as well as in times of fundamental bank distress. All banks that have at least one branch in Switzerland are required by law to participate in the depositor protection scheme.¹³ In October 2008 the coverage threshold of the guarantee scheme was increased from CHF 30'000 to CHF 100'000 per depositor and bank. Our survey data does not provide information on the volume of deposits held by household's with each of their banks. However, we do have information on the total financial wealth of each household. We therefore take the variable *Low wealth* - indicating that total financial wealth (and thus also the volume of deposits at any bank) is below CHF 100'000 CHF - as a proxy for deposit insurance coverage and split the sample based on this indicator.¹⁴

The survey further elicited the knowledge of respondents about deposit insurance protection: Households were asked if they knew whether a deposit insurance scheme exists in Switzerland or not. If they responded correctly, they were then asked whether they knew the current the

¹³ See www.einlagensicherung.ch/en for details of foreign banks' requirements to participate in the Swiss depositor protection scheme.

¹⁴ In unreported robustness checks, we divide overall household wealth by the number of deposit relationships a household had and also use the dummy variable *Low income* (household income below CHF 7'000 per month) as an alternative measure of deposit insurance coverage. Both indicators yield qualitatively similar results to *Low wealth*.

maximum coverage at each bank and whether the threshold had been changed in recent years. In our analysis we split our sample based on the binary variable *Insurance knowledge* which takes on the value of one if the household responded correctly to all three questions on the deposit insurance scheme. Appendix 3 shows that 72% of the households in our survey are covered by the deposit insurance according to our definition, but only 25% of all households are knowledgeable about the scheme.¹⁵

Recent evidence suggests that financial literacy and numerical ability is related to patterns of household financial behavior, i.e. retirement savings (Van Rooij et al., 2012), financial market participation (Van Rooij et al., 2011), consumer borrowing (Lusardi & Tufano, 2009, Agarwal & Mazumder, 2013) and mortgage default (Gerardi et al., 2013). We employ two measures of financial sophistication available from the survey and split our sample based on both indicators: The dummy variable *Financial literacy* measures whether households answer correctly to three standard financial literacy questions on compound interest, inflation and risk diversification to what extent financial literacy.¹⁶ The dummy variable *Financial crisis interest* captures whether the household actively informed itself about ongoing developments during the financial crisis. Appendix 3 suggests that 50% of the households in our sample have a high level of financial literacy and 62% display strong interest in the financial crisis.

4. Results

4.1 Bank distress and deposit withdrawals

In this section we document that (i) households in our sample are much more likely to withdraw from distressed banks than from non-distressed banks, (ii) the propensity to withdraw is much higher for clients of the bailed out bank (UBS) than for the distressed bank which was

¹⁵ This finding is consistent with recent survey evidence suggesting that households are not well informed about the coverage by and procedures of deposit insurance schemes across Europe (Bartiloro, 2011; Sträter *et al.*, 2008).

¹⁶ See Lusardi and Mitchell (2011) for a cross-country comparison of financial literacy using these three questions. See Brown and Graf (2013) for evidence on financial literacy in Switzerland based on the survey data used in this study.

not bailed out (Credit Suisse), and (iii) that withdrawals from UBS were driven as much by disagreement with the banks corporate policy as by concerns about the solvency of the bank.

Table 1 presents a univariate analysis comparing the propensity of households to withdraw from accounts with the distressed banks as opposed to accounts with non-distressed banks. The table shows that for distressed banks the propensity to withdraw is fourteen-times higher (17.6%) than for non-distressed banks (1.3%). Considering only the most substantial deposit withdrawals (*Withdrew deposits (>50%)*) the propensity to withdraw from distressed banks is 11.4% compared to 0.8% at non-distressed banks. Moreover, 7.3% of deposit accounts at distressed banks are closed (*Account closed*) compared to only 0.4% at non-distressed banks.

A comparison of our Table 1 results with the aggregate deposit data presented in Figure 2 suggests that the withdrawal rates observed in our sample of households are representative for depositor behavior throughout the country. As documented in Figure 2, the volume of customer deposits held by the two large distress banks (CS and UBS) declined by 20 percentage points during 2008 and 2009. This figure compares well to the incidence of withdrawals documented in Table 1.

The multivariate analysis presented in Table 2, Panel A confirms the economic magnitude of our univariate estimates. Controlling for observable differences between clients of distressed and non-distressed banks we find that the propensity to withdraw is 16.4 percentage points higher for accounts with distressed banks (column 1). Also, the propensity to withdraw a significant share of deposits is 11.3 percentage points higher (column 2) and the propensity to close an account is 7.7 percentage points higher (column 3) for accounts with distressed banks. In columns (4-6) we replicate our estimates for the subsample of households which hold deposit accounts at distressed and at non-distressed banks. The results suggest that the differences in withdrawal rates between accounts with distressed banks and non-distressed banks are not driven by unobserved heterogeneities in the clientele of the two large banks compared to other banks: Our esti-

mates suggest that the same household is 24 percentage points more likely to withdraw from a distressed bank account (column 4), 15 percentage points more likely to withdraw a substantial share of these deposits (column 5), and 11 percentage points more likely to close the account with a distressed bank (column 6). Comparing the magnitude of our estimates for Distress in columns (4-6) to those in (1-3) provides a first indication that switching costs – which are arguably lower for households with multiple bank accounts – may strongly affect the propensity to withdraw from a distressed bank. We return to this in detail in section 4.2 below.

Table 1 here

Table 2 here

Table 2, Panels B and C examine to what extent the incidence of deposit withdrawals differs between the two large distressed banks UBS and Credit Suisse. While both banks experienced substantial investment losses in 2008 and 2009 the distress at UBS was arguably more severe than at Credit Suisse. UBS not only required a much larger recapitalization than Credit Suisse but also eventually had to be bailed out by the Swiss authorities (see section 2). We therefore expect a higher incidence of withdrawals from UBS accounts than from Credit Suisse accounts.

In Table 2, Panel B we compare withdrawals from UBS (the bailed-out bank) to withdrawals from non-distressed banks.¹⁷ Controlling for heterogeneity across households with household-level covariates our estimates in columns (1-3) suggest that households are 22 percentage points more likely to withdraw deposits, 15 percentage points more likely to withdraw a substantial share of deposits and 11 percentage points more likely to close their account with UBS than with a non-distressed bank. The column (4-6) results confirm these significant estimates for the sample of households with an account at UBS and at least one non-distressed bank.

¹⁷ In this analysis we exclude all bank relationships with Credit Suisse.

In Table 2, Panel C we replicate this exercise, now comparing withdrawals from Credit Suisse (the distressed bank which was not bailed out) to withdrawals from non-distressed banks.¹⁸ Here, our estimates show a much weaker effect of bank distress on deposit withdrawals. The column (1) results show that households are only 4 percentage points more likely to withdraw deposits from Credit Suisse compared to a non-distressed bank. Moreover, the propensity to withdraw a substantial share of deposits (column 2) or close the deposit account (column 3) is not significantly higher at Credit Suisse compared to a non-distressed bank. The low propensity to withdraw from Credit Suisse accounts is confirmed in columns (4-6) for the sample of households with deposit accounts at both Credit Suisse and a non-distressed bank.

Overall, our findings in Tables 1 and 2 document that a substantial share of retail clients withdraw deposits from the large distressed commercial banks. This is especially the case for UBS which experienced the most severe distress and required a government bailout. These findings are surprising given that both of the large Swiss banks are considered to be “too big to fail”.¹⁹ Our results contrast those of Oliveira et al. (2014) who document that (in Brazil) systemically important banks experienced a strong inflow of deposits during the recent crisis. Instead we show that the “too big to fail” status may not insulate a bank from retail deposit withdrawals if the bank itself is in distress.

Why do households withdraw funds from a large, systemically important bank like UBS, which receives a government bailout? One reason is that a government bailout may actually trigger concerns among depositors in the first place. Shin (2009) documents that in the case of Northern Rock, the provision of liquidity support by the Bank of England was the trigger for subsequent retail deposit withdrawals.²⁰ An alternative explanation is that retail clients are angered or disappointed by a bank which has to be bailed out with public funds. The consumer

¹⁸ In this analysis we exclude all bank relationships with UBS.

¹⁹ Both UBS and Credit Suisse are listed among the 29 Global Systemically Important Banks by the Financial Stability Board: http://www.financialstabilityboard.org/publications/r_131111.pdf.

²⁰ See Brown et al. (2013) for experimental evidence on the role of salience in bank runs.

research literature provides evidence that company crises damage organizational reputations and affect how clients interact with a company (see e.g. Jorgensen, 1996, or Pearson and Clair, 1998). Since 2007 banks and their senior executives have repeatedly been subject to public anger. For example, public outcry over the involvement of Barclays Bank in the recent LIBOR scandal contributed to the dismissal of their CEO in 2012.²¹ It is thus reasonable to assume that the withdrawals of deposits from UBS in our context were at least partly driven by disagreement with the bank's corporate policy, rather than by fear about losing savings.²²

Table 3 here

In the survey, all households which withdrew funds from a bank during the crisis were asked about their motivations for doing so. Respondents were asked to what extent they agreed (on a scale of 0 to 4) to the propositions that they withdrew their funds because they (i) were offered better conditions or better services at other banks, (ii) feared that their funds were at risk at the current bank, or (iii) because they did not agree with the corporate policy of the bank. Table 3 reports the share of households who list competitors' conditions, bank risk or corporate policy as their strongest motive to withdraw funds.²³ We hereby compare 78 households who withdraw from UBS to 7 households which withdraw from Credit Suisse and 18 households who withdraw from non-distressed banks.

The Table 3 results suggest that disagreement with corporate policy is an important motivation for households to withdraw deposits from UBS. This is especially the case for clients who closed their account with the UBS. By contrast, among households which withdraw a substantial share of their deposits but do not close their account with UBS, bank risk is a more important

²¹ See Financial Times (2013).

²² See Teichert and Wagenführer (2012) for survey evidence of changes in attitudes of retail clients towards German banks and how this impacts their intentions to switch banks in the aftermath of the financial crisis.

²³ Households which responded that two or three motives are equally important are labelled as households with "mixed" withdrawal motives. 108 out of 113 households responded on the questions.

motive than corporate policy. Thus, it seems that the most severe punishment for a bank, i.e. the closure of the account, is mainly motivated by anger or disappointment, while less severe punishment is mainly driven by market discipline. This interpretation is supported by the fact that none of the (few) Credit Suisse clients which withdraw their deposits cite corporate policy as their main reason for doing so. Reassuringly, we find that among households which withdraw from non-distressed banks the conditions offered by competitors are a more important motivation than either bank risk or corporate policy.

4.2. Switching costs and withdrawal risk

In this section we document that bank-client relationships and related switching costs mitigate the risk of deposit withdrawals for large distressed commercial banks. Throughout this section we focus our attention on pre-crisis deposit accounts with UBS and compare these to pre-crisis deposit accounts with non-distressed banks.²⁴

Table 4 presents a univariate comparison of the 86 households in our sample which withdraw deposits from UBS during the crisis to the 282 households in the sample which have pre-crisis deposits with UBS but do not withdraw them. The table provides first indicative evidence that bank-client relationships and switching costs - as measured by single vs. multiple bank accounts, the geographical proximity to non-distressed banks or a credit relationship with UBS - affect the propensity to withdraw deposits. Households which withdraw from UBS are 26 percentage points less likely to be single account holders, are 9 percentage points less likely to live in areas where no branch of a non-distressed bank is located and are 11 percentage points less likely to maintain a credit relationship with UBS.

Table 4 shows that households which withdraw from UBS do not differ significantly from those who do not withdraw in terms of income and education. However, households which withdraw

²⁴ We exclude bank relations with Credit Suisse from our analysis as the previous section documented that the share and absolute number of deposit withdrawals from Credit Suisse is negligible compared to those from UBS.

display higher wealth levels, a better knowledge of deposit insurance, higher levels of financial literacy and a stronger interest in financial matters. While these differences are not statistically significant they do suggest that when examining the role of switching costs it is important to account for the potential impact of deposit insurance and financial sophistication. We will return to this in section 4.3 below.

Table 4 here

In Table 5 we provide a multivariate difference-in-difference analysis of the impact of switching costs on the propensity to withdraw from UBS as opposed to non-distressed banks. The dependent variable is *Withdrew deposits*.²⁵ In column (1) of Table 5 we compare the withdrawal propensity of households with single bank accounts to those with multiple bank accounts. The estimated interaction term *Distress * Single account* is negative, statistically significant and economically large (22 percentage points). Comparing this result to the estimated main effect of *Distress* (28 percentage points) suggests that the lack of an alternative deposit account reduces the propensity to withdraw from a distressed bank by nearly 80%.

In columns (2-3) of Table 5 we compare the withdrawal propensity of households which are geographically distant from non-distressed banks to that of households which are close to other banks. The estimate displayed for the interaction term *Distress * No local banks* in column (2) shows that geographical distance to a non-distressed bank reduces the propensity to withdraw from UBS (as opposed to a non-distressed bank) by nearly 10 percentage points. Again comparing this result to the estimated main effect of *Distress* (24 percentage points) suggests that switching costs due to transaction costs almost half the propensity to withdraw from a distressed bank. The importance of geographical distance should be especially strong for those households

²⁵ Unreported robustness tests confirm the results when we consider substantial deposit withdrawals (*Withdrew deposits (>50%)*) or account closures (*Account closed*).

which are single account holders and thus would have to open a new account in order to reallocate their funds. The results presented in column (3) for the subsample of single account holders show that this is the case: The estimated positive coefficient for *Distress* (7.8 percentage points) and negative coefficient for *Distress * No local banks* (8.6 percentage points) suggests that geographic distance to a non-distressed bank eliminates withdrawal risk altogether for this sample of households.

The column (4) results of Table 5 document that depositors which have a broad relationship with a bank are substantially less likely to withdraw deposits when the bank is in distress. Comparing the magnitude of the negative estimate for *Distress* Credit Linkage* (14.2 percentage points) to the positive estimate for *Distress* (25.3 percentage points) in column (4) suggests that having a loan with a distressed bank reduces withdrawal risk by more than half.²⁶

Table 5 here

4.3. Deposit insurance and financial sophistication

Table 4 shows that UBS clients which withdraw deposits are characterized not only by lower switching costs than UBS clients which do not withdraw. They are also wealthier, more knowledgeable about deposit insurance, and are more likely to be financial literate and interested in financial matters. It is therefore possible that the estimated coefficients for $Distress_{j,i} \cdot Switching_{i,j}$ in Table 5 are partly driven by correlated effects of deposit insurance and financial sophistication on the propensity to withdraw from distressed banks. To rule that this is the case we replicate the analysis presented in Table 5 controlling for the interaction terms of

²⁶ Unreported robustness tests confirm these results when controlling for unobserved heterogeneities in the clientele of the two large banks compared to other banks by performing a subsample analysis with households, which had deposit accounts at UBS and at a non-distressed bank.

Distress with indicators of deposit insurance (*Low wealth, Insurance knowledge*) and financial sophistication (*Financial Literacy, Financial crisis interest*). The results presented in Appendix 5 show that the impact of switching costs on the propensity to withdraw from UBS as identified in Table 5 is robust to the inclusion of these further interaction terms.

In Tables 6 and 7 we present subsample analyses which examine whether the impact of switching costs on withdrawal behavior varies across households. In Table 6 we conduct separate estimates for households with low wealth vs. high wealth (Panel A) and high vs. low insurance knowledge (Panel B). In Table 7 we conduct separate estimates for households with high vs. low financial literacy (Panel A) and high vs. low financial crisis interest (Panel B). For each subsample of households in the two tables we replicate models (1, 2 and 4) from Table 5 and also present a baseline specification without interaction terms of *Distress*Switching*.

The Table 6 results suggest that switching costs mitigate the withdrawal risk from distressed banks independent of whether households are covered by or know about deposit insurance. The Panel A results show that there is little difference in the propensity to withdraw deposits from UBS when we compare households with low financial wealth and households with high financial wealth (see the estimated coefficients of *Distress* in columns (1) and (5)). Moreover, while the magnitude and precision of the estimates vary, we find that the estimated coefficients for *Distress*Single account* (columns 2, 6), *Distress*No local banks* (columns 3, 7) and *Distress*Credit linkage* (columns 4, 8) are large and negative in both subsamples. The Panel B results display similar findings when we split households by their knowledge about deposit insurance.

Table 6 here

Table 7 here

The Table 7 results show that switching costs mitigate the withdrawal risk from distressed banks independent of whether households display high or low levels of financial sophistication. Panel A results show that households with high financial literacy are only slightly more likely to withdraw deposits from UBS when compared to households with low financial literacy (see the estimated coefficients of *Distress* in columns (1) and (5)). Moreover, while the magnitude and precision of the estimates again vary we find that the estimated coefficients for *Distress*Single account* (columns 2, 6), *Distress*No local banks* (columns 3, 7) and *Distress*Credit linkage* (columns 4, 8) are large and negative in both subsamples. The Panel B results display similar findings when we split households by their interest in the financial crisis.

5. Conclusion

We study retail deposit withdrawals from distressed commercial banks, exploiting a “natural experiment” in which two large Swiss banks suffered substantial losses which were unrelated to their retail operations. Our analysis is based on survey data providing information on all bank relations of 1’475 households and documenting their reallocation of deposits across banks relations during 2008-2009.

We document that retail clients do discipline large distressed commercial banks, and especially so if the bank receives a government bailout. These findings qualify recent evidence suggesting that “too big to fail” banks serve as safe-havens for depositors in times of financial distress. By contrast, our evidence suggests that when systemically important banks are hit directly by a crisis they experience substantial deposit outflows despite their too big to fail status.

We also document that strong bank-client relationships and related switching costs play a crucial role in mitigating withdrawal risk for distressed banks. This finding provides an empirical underpinning for the discrimination of “stable” versus “unstable” deposits in the recent Basel III

liquidity regulations and underlines the relevance of bank-client relationships for the management of liquidity risk.

References

Agarwal, S. and B. Mazumder (2013). Cognitive Abilities and Household Financial Decision Making. *American Economic Journal: Applied Economics* 5, 193-207.

Bartiloro, L. (2011). Is Your Money Safe? What Italians Know about Deposit Insurance. Banca D'Italia Occasional Paper 104.

BIS (2013). Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools. Available online at <http://www.bis.org/publ/bcbs238.pdf>; retrieved on July 2nd, 2013.

Brown, M. and R. Graf (2013). Financial Literacy and Retirement Planning in Switzerland. *Numeracy* 6.

Brown, M., S. Trautmann, and R. Vlahu (2013). Contagious Bank Runs: Experimental Evidence. De Nederlandsche Bank Working Paper 363.

Calomiris, C. W. and C. M. Kahn (1991). The Role of Demandable Debt in Structuring Optimal Banking Arrangements. *American Economic Review* 81, 497-513.

Calomiris, C. W. and J. R. Mason (1997). Contagion and Bank Failures during the Great Depression: The June 1932 Chicago Banking Panic. *American Economic Review* 87, 863-883.

Carbo-Valverde, S., T.H. Hannan, and F. Rodriguez-Fernandez (2011). Exploiting old customers and attracting new ones: The case of bank deposit pricing. *European Economic Review* 55, 903-915.

Credit Suisse (2008). Credit Suisse builds on strong capital position. Press Release. Available online at https://www.credit-suisse.com/news/en/media_release.jsp?ns=40924, retrieved on September 22th, 2013.

Credit Suisse (2009). Annual Report 2009. Available online at https://www.credit-suisse.com/investors/doc/ar09/csg_ar_2009_en.pdf; retrieved on July 15th, 2013.

Davenport, A.M., and K.M. McDill (2006). The Depositor Behind the Discipline: A Micro-Level Case-Study of Hamilton Bank. *Journal of Financial Services Research* 30, 93-109.

Demirguc-Kunt, A. and H. Huizinga (2004). Market discipline and deposit insurance. *Journal of Monetary Economics* 51, 375-399.

Diamond, D.W. and R. Rajan (2001). Liquidity Risk, Liquidity Creation and Financial Fragility: A Theory of Banking. *Journal of Political Economy* 109, 287-327.

Ellis, D. M. and M. J. Flannery (1992). Does the debt market assess large banks, risk?: Time series evidence from money center CDs. *Journal of Monetary Economics* 30, 481-502.

Financial Times (2013). Diamond misjudged public anger over bankers. Available online at <http://www.ft.com/cms/s/0/2f869726-b33b-11e2-b5a5-00144feabdc0.html>, retrieved on October 1st, 2013.

Gerardi K., L. Goette, and S. Meier (2013). Numerical ability predicts mortgage default. *Proceedings of the National Academy of Sciences (PNAS)*, 110, 11267-11271.

Goldberg, L.G. and S. C. Hudgins (2002). Depositor Discipline and Changing Strategies for Regulating Thrift Institutions. *Journal of Financial Economics* 63, 263-274.

Hannan, T. H. and G. A. Hanweck (1988). Bank insolvency risk and the market for large certificates of deposit. *Journal of Money, Credit and Banking* 20, 203-211.

Hannan, T. H. and R. M. Adams (2011). Consumer Switching Costs and Firm Pricing: Evidence from Bank Pricing of Deposit Accounts. *Journal of Industrial Economics* 59 (2), 296-320.

Hasan, I., K. Jackowicz, O. Kowalewski, and L. Kozlowski (2013). Market Discipline during Crisis: Evidence from Bank Depositors in Transition Countries. *Journal of Banking and Finance* 37, 5436-5451.

Iyer, R. and J. Peydro (2011). Interbank Contagion at Work: Evidence from a Natural Experiment. *Review of Financial Studies* 24 (4), 1337-1377.

Iyer, R. and M. Puri (2012). Understanding bank runs: The importance of depositor bank relationships and networks. *American Economic Review* 102, 1414-1445.

Iyer, R., M. Puri, and N. Ryan (2013). Do Depositors Monitor Banks? NBER Working Paper 19050.

Jorgensen, B. (1996). Components of Consumer Reaction to Company-Related Mishaps: a Structural Equation Model Approach. *Advances in Consumer Research Volume* 23, 346-351.

Karas, A., W. Pyle, and K. Schoors (2013). Deposit Insurance, Banking Crises, and Market Discipline: Evidence from a Natural Experiment on Deposit Flows and Rates. *Journal of Money, Credit and Banking* 45, 179-200.

Kim, M., D. Kliger, and B. Vale (2003). Estimating Switching Costs and Oligopolistic Behavior. *Journal of Financial Intermediation* 12, 25-56.

Kiser, E. K. (2002). Predicting household switching behavior and switching costs at depository institutions. *Review of Industrial Organization* 20, 349-365.

Klemperer, P. (1987). Entry deterrence in markets with consumer switching costs. *Economic Journal* 97, 99-117.

Lusardi, A. and O.S. Mitchell (2011). Financial literacy around the world: an overview. *Journal of Pension Economics and Finance* 10, 497-508.

Lusardi, A. and P. Tufano (2009). Debt Literacy, Financial Experiences and Overindebtedness. NBER Working Paper 14808.

Oliveira R. de F., R.F. Shiozer and L.A.B. de C. Barros (2014). Depositors' Perception of 'Too Big Too Fail'. *Review of Finance*, forthcoming.

Pearson, C. M. and J. A. Clair (1998). Reframing Crisis Management. *Academy of Management Review* 23, 59-76.

Peria, M. S. M. and S. L. Schmukler (2001). Do Depositors Punish Banks for Bad Behavior? Market Discipline, Deposit Insurance, and Banking Crises. *Journal of Finance* 56, 1029-1051.

Puri, M., J. Rocholl, and S. Steffen (2011). Global Retail Lending in the Aftermath of the US Financial Crisis: Distinguishing between Demand and Supply Effects. *Journal of Financial Economics* 100, 556-578.

Saunders, A. and B. Wilson (1996). Contagious bank runs: Evidence from the 1929-1933 period. *Journal of Financial Intermediation* 5 (22), 409-423.

Schumacher, L. (2000). Bank runs and currency run in a system without a safety net: Argentina and the 'tequila' shock. *Journal of Monetary Economics* 46, 257-277.

Sharpe, S. (1997). The Effect of Consumer Switching Costs on Prices: A Theory and its Application to the Bank Deposit Market. *Review of Industrial Organization* 12, 79-94.

Shin, H. S. (2009). Reflections on Northern Rock: The Bank Run That Heralded the Global Financial Crisis. *Journal of Economic Perspectives* 23, 101-119.

SNB (2012). Banks in Switzerland 2012. Available online at www.snb.ch/en/i/about/stat/statpub/bchpub/stats/banken/banken_bInAusland_d24, retrieved on September 15th 2014.

Sträter, N., M. Cornelissen, and A. Pfingsten (2008). Deposit Insurance: An Empirical Study of Private Investors' Knowledge and Perception. Working Paper, University of Muenster.

Teichert, T. and D. Wagenführer (2012). Effects of Disruptive Events on Consumer Loyalty: Bank Switching after the 2008's Crisis. *Journal of Business and Policy Research* 7, 195-205.

UBS (2007). UBS strengthens capital base and adjusts valuations. Available online at http://www.ubs.com/global/en/about_ubs/investor_relations/releases/adhocre/news_display_page_adhocre.html/en/2007/12/10/ubs_strengthens_capital_base_and_adjusts.html; retrieved on January 2nd, 2013.

UBS (2008a). UBS AG successfully completes its rights offering. Available online at http://www.ubs.com/global/en/about_ubs/investor_relations/releases/adhocre/news_display_page_adhocre.html/en/2008/06/13/ubs_ag_successfully_completes_its_rights_offering.html; retrieved on January 2nd, 2013.

UBS (2008b). UBS further materially de-risks balance sheet through transaction with Swiss National Bank. Available online at http://www.ubs.com/global/en/about_ubs/about_us/news/news.html/en/2008/10/16/2008_10_16a.html; retrieved on January 2nd, 2013.

UBS (2009). Annual Report 2009. Available online at http://www.ubs.com/global/de/about_ubs/investor_relations/quarterly_reporting/2009.html; retrieved on October 29th, 2013.

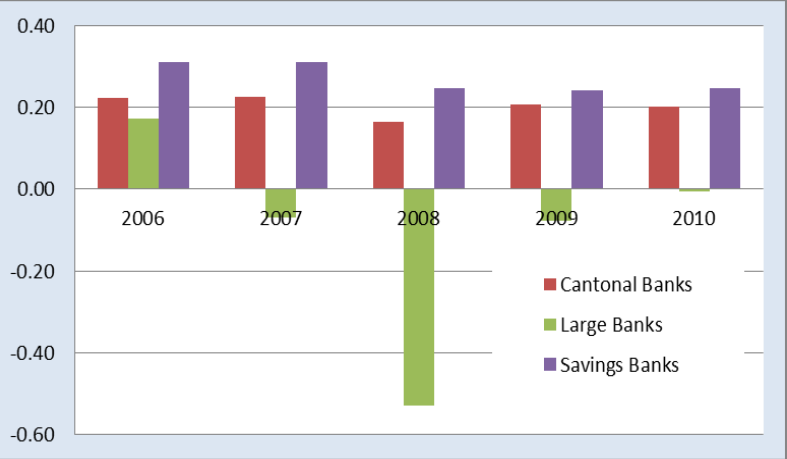
Van Rooij, M., A. Lusardi and R.J.M. Alessie (2012). Financial Literacy, Retirement Planning and Household Wealth. *Economic Journal* 122, 449-478.

Van Rooij, M., A. Lusardi and R.J.M. Alessie (2011). Financial Literacy and Stock Market Participation. *Journal of Financial Economics* 101, 449-472.

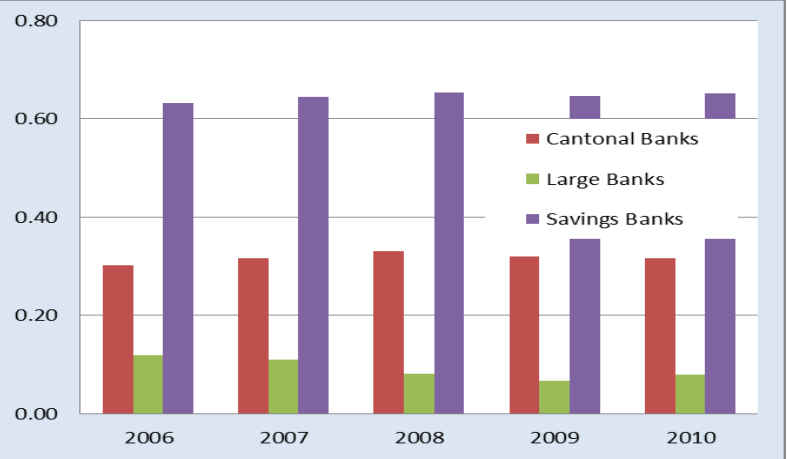
Figure 1. The performance of Swiss banks, 2006-2010

This figure compares the net income before tax (Panel A), net interest income (Panel B), trading gains and losses (Panel C) and asset revaluations (Panel D) by bank group. All measures are standardized by bank equity in 2006. Source: Swiss National Bank.

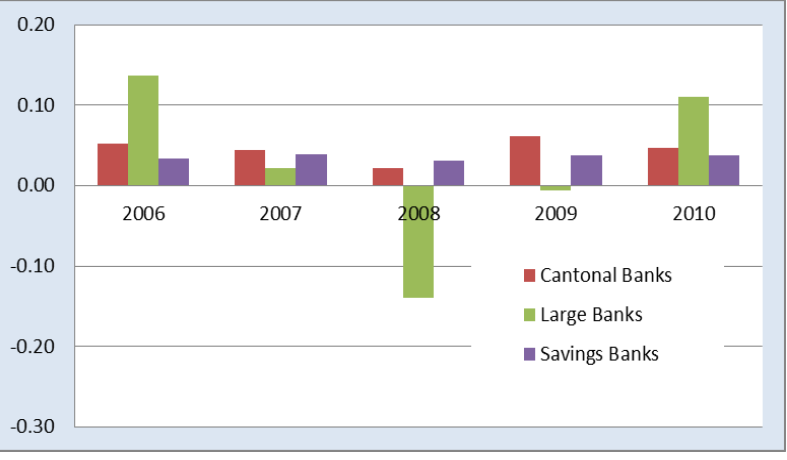
Panel A. Net income before tax as a share of equity in 2006



Panel B. Net interest income as a share of equity in 2006



Panel C. Trading gains and losses as a share of equity in 2006



Panel D. Asset revaluations as a share of equity in 2006

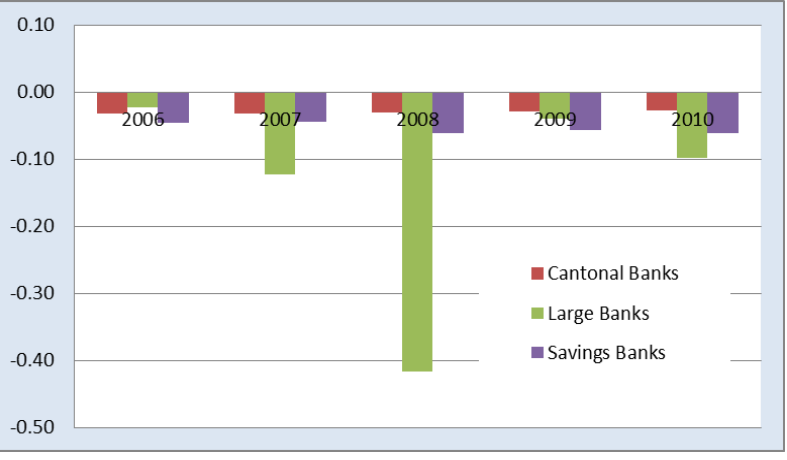


Figure 2. Volume of domestic customer deposits by bank group 2007-2009

This figure compares the volume of domestic customer deposits between 2007 and 2009 relative to the volume in December 2006 (=100) by bank group. Source: Swiss National Bank.

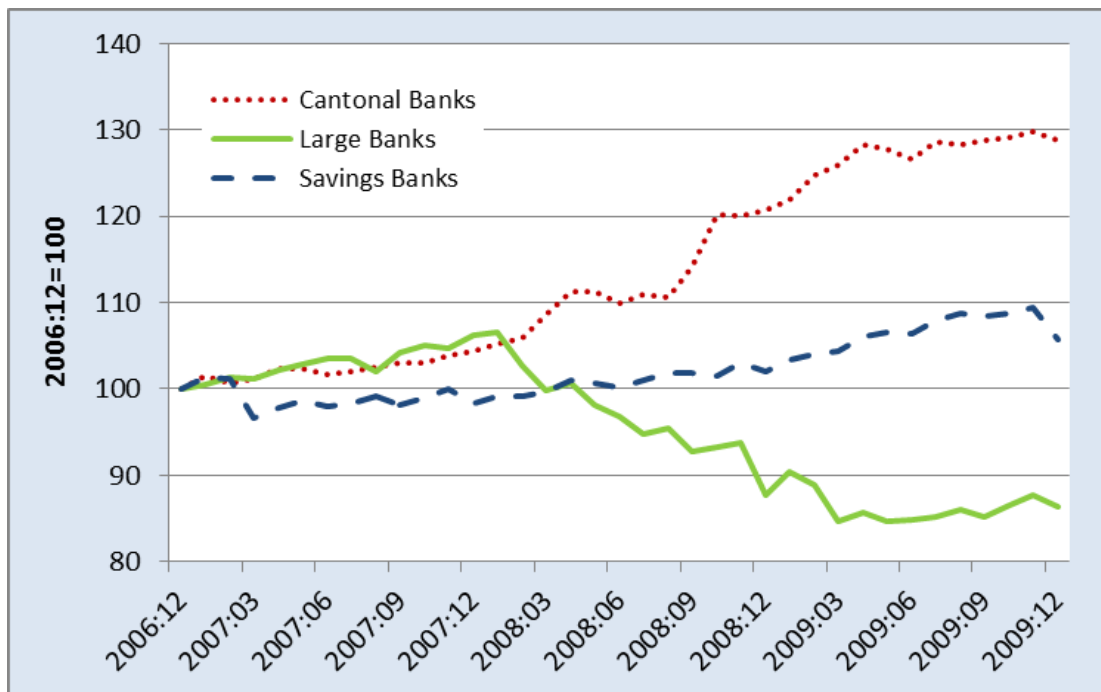


Figure 3. Households and banks

This figure shows the number of households that have a pre-crisis deposit relationship at a Large bank (UBS & Credit Suisse), State owned bank (Cantonal banks & Postfinance), Savings bank (Raiffeisen banks and savings banks) and other banks indicated by the red and blue circles. The shaded lines connecting two circles indicate the number of households that had a pre-crisis deposit account with both bank types.

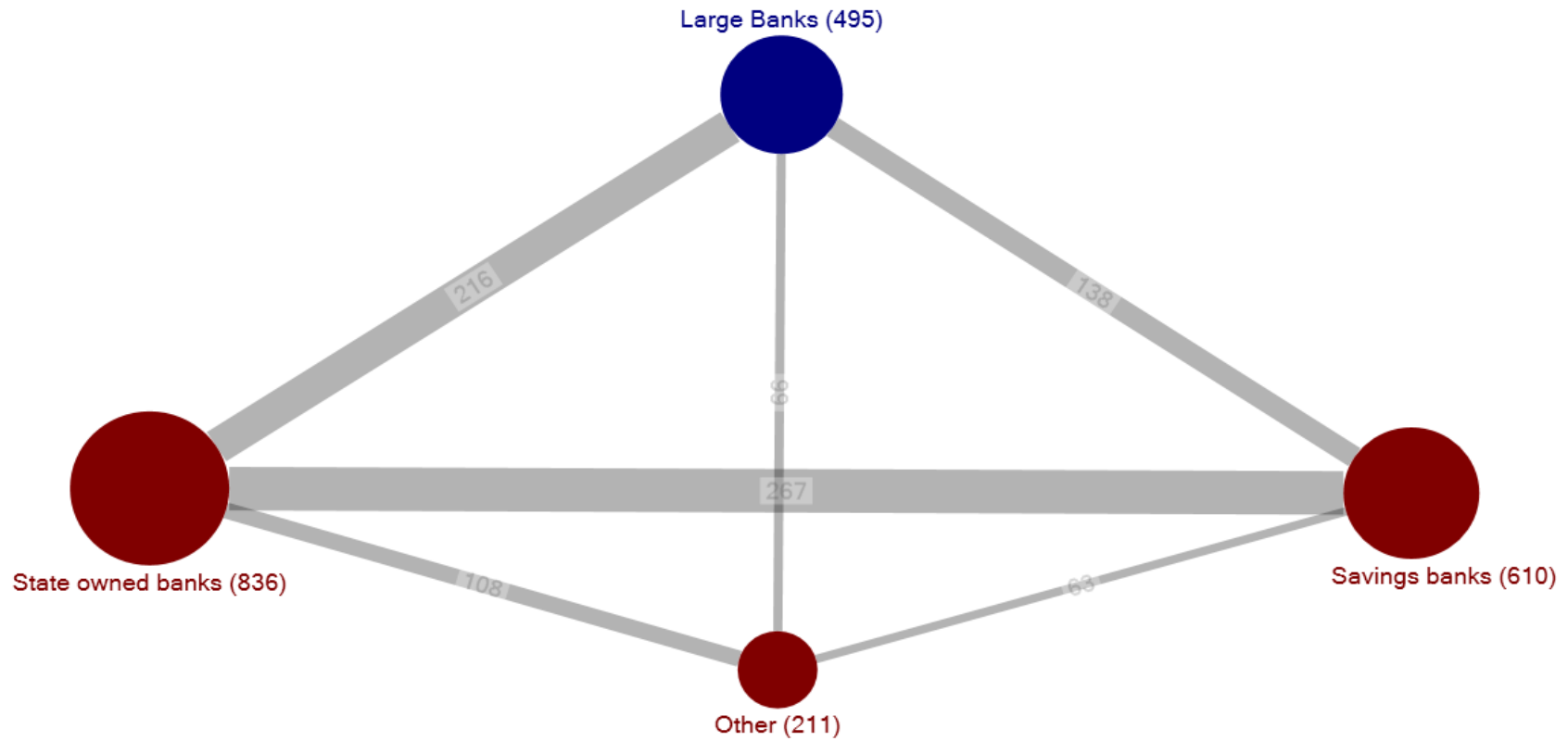


Table 1. Bank distress and deposit withdrawals (univariate)

This table shows univariate tests that compare mean withdrawals from deposit accounts at distressed banks to mean withdrawals from deposit accounts at non-distressed banks. The dependent variables are *Withdrew deposits*, *Withdrew deposits (>50%)* and *Account closed*. Ordinary standard errors and the number of deposit relationships (N) are reported in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively. Definitions and sources of the variables are provided in appendix 2.

Dependent variable	Distress	Non-Distress	Difference
Withdrew deposits	0.176 (0.016) (N=546)	0.013 (0.003) (N=1868)	0.163*** (0.010) (N=2414)
Withdrew deposits (>50%)	0.114 (0.014) (N=546)	0.008 (0.002) (N=1868)	0.106*** (0.008) (N=2414)
Account closed	0.073 (0.011) (N=546)	0.004 (0.002) (N=1868)	0.069*** (0.007) (N=2414)

Table 2. Bank distress and depositor withdrawals (multivariate)

This table shows the estimates of a linear probability model where the dependent variables are *Withdrawn deposits* (columns 1, 4), *Withdrawn deposits (>50%)* (columns 2, 5), *Account closed* (columns 3, 6). Panels A, B, C show the effect of having a deposit relationship with a distressed bank (UBS or Credit Suisse), with UBS, or with Credit Suisse as opposed to a non-distressed bank, respectively. In each panel, columns 1-3 report the results for the full sample of all deposit relationships with distressed or non-distressed banks, while columns 4-6 report the results for the subsample of deposit relationships held by households with deposit relationships with a distressed bank and with at least one non-distressed bank. In columns 1-3 household control variables are the *Wealth* and *Income* dummy variables, *Age*, *Male*, *University*, *Swiss nationality*, *Risk aversion*, *Time preference*, *Distance UBS km* and *Distance CS km*. Definitions of the variables are provided in appendix 2. Standard errors are clustered on the MS Region level and are reported in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively.

Panel A. Distressed banks (UBS or Credit Suisse) vs. non-distressed banks

Sample Dependent variable	1	2	3	4	5	6
	All deposit accounts			Deposit accounts of households with deposit accounts at a distressed bank and non-distressed banks		
	Withdrawn deposits	Withdrawn deposits (>50%)	Account closed	Withdrawn deposits	Withdrawn deposits (>50%)	Account closed
Distress	0.164*** [0.020]	0.113*** [0.014]	0.077*** [0.013]	0.247*** [0.024]	0.152*** [0.015]	0.112*** [0.016]
Household Controls	YES	YES	YES	NO	NO	NO
Household Fixed Effects	NO	NO	NO	YES	YES	YES
Observations	2,093	2,093	2,093	822	822	822
Households	1,231	1,231	1,231	315	315	315
R-squared	0.110	0.073	0.054	0.218	0.132	0.095
Clustered standard errors	MS-Region	MS-Region	MS-Region	MS-Region	MS-Region	MS-Region
Method	OLS	OLS	OLS	OLS	OLS	OLS

Panel B. UBS vs. non-distressed banks

Sample Dependent variable	1	2	3	4	5	6
	Deposit accounts at UBS or at non-distressed banks			Deposit accounts of households with deposit accounts at UBS and at non-distressed banks		
	Withdrawn deposits	Withdrawn deposits (>50%)	Account closed	Withdrawn deposits	Withdrawn deposits (>50%)	Account closed
Distress	0.218*** [0.022]	0.153*** [0.017]	0.106*** [0.017]	0.311*** [0.026]	0.198*** [0.019]	0.154*** [0.021]
Household Controls	YES	YES	YES	NO	NO	NO
Household Fixed Effects	NO	NO	NO	YES	YES	YES
Observations	1,947	1,947	1,947	605	605	605
Households	1,188	1,188	1,188	242	242	242
R-squared	0.151	0.105	0.076	0.299	0.191	0.145
Clustered standard errors	MS-Region	MS-Region	MS-Region	MS-Region	MS-Region	MS-Region
Method	OLS	OLS	OLS	OLS	OLS	OLS

Panel C. Credit Suisse vs. non-distressed banks

Sample Dependent variable	1	2	3	4	5	6
	Deposit accounts at Credit Suisse or at non-distressed banks			Deposit accounts of households with deposit accounts at Credit Suisse and at non-distressed banks		
	Withdrawn deposits	Withdrawn deposits (>50%)	Account closed	Withdrawn deposits	Withdrawn deposits (>50%)	Account closed
Distress	0.039* [0.022]	0.017 [0.016]	0.010 [0.009]	0.089*** [0.025]	0.039* [0.020]	0.012 [0.012]
Household Controls	YES	YES	YES	NO	NO	NO
Household Fixed Effects	NO	NO	NO	YES	YES	YES
Observations	1,772	1,772	1,772	270	270	270
Households	1,142	1,142	1,142	106	106	106
R-squared	0.023	0.016	0.011	0.058	0.021	0.003
Clustered standard errors	MS-Region	MS-Region	MS-Region	MS-Region	MS-Region	MS-Region
Method	OLS	OLS	OLS	OLS	OLS	OLS

Table 3. Reasons for deposit withdrawals

This table reports the reasons for deposit withdrawals as reported by 103 households. The dependent variables are *Corporate policy* (column 1), *Bank risk* (column 2), *Prices* (column 3) and *Mixed* (column 4). *Corporate policy* takes on the value of one if the respondent stated that the reason *Corporate policy* was more important than *Bank risk* and *Prices* (zero otherwise). *Bank risk* takes on the value of one if the respondent stated that the reason *Bank risk* was more important than *Corporate policy* and *Prices* (zero otherwise). *Prices* takes on the value of one if the respondent stated that the reason *Prices* was more important than *Bank risk* and *Corporate policy* (zero otherwise). *Mixed* takes on the value of one if the respondent valued at least two out of three reasons (*Corporate policy*, *Bank risk*, *Prices*) as being equally important. Row 1 reports the results for the subsample of households that withdrew deposits only from UBS. Row 2 shows the results for the subsample of households that withdrew deposits and closed accounts at UBS. Row 3 shows the results for the subsample of households that withdrew more than 50% of their deposits from UBS. Row 4 shows the results for the subsample of households that withdrew less than 50% of their deposits from UBS. Row 5 shows the results for the subsample of households that withdrew deposits from non-distressed banks. The last row shows the results for the subsample of households that withdrew deposits only from Credit Suisse. In total 114 households in our sample report that they reallocated deposits during the crises. Five households did not respond at all to the questions why they withdrew deposits. Six households which withdrew from UBS or Credit Suisse and at least one other bank are not displayed in the table.

Reason for withdrawal	Corporate policy	Bank risk	Prices	Mixed	Observations (N=108)
Withdrew only from UBS (distressed, bailed out)	0.23	0.22	0.14	0.41	N=78
closed	0.35	0.12	0.18	0.35	N=34
not closed & more than 50% of deposits withdrawn	0.00	0.30	0.13	0.57	N=23
not closed & less than 50% of deposits withdrawn	0.29	0.29	0.10	0.33	N=21
Withdrew only from non-distressed banks	0.06	0.11	0.44	0.39	N=18
Withdrew only from Credit Suisse (= distressed, not bailed out)	0.00	0.29	0.14	0.57	N=7

Table 4. Characteristics of clients with pre-crisis deposits at UBS

The table compares household characteristics of pre-crisis clients of UBS (= the bailed out bank) depending on deposit withdrawals. The last column tests the differences in means (t-test). The number of households (N) are reported in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively (calculated using ordinary standard errors). Definitions and sources of the variables are provided in appendix 2.

	Withdrew	Did not withdraw	Difference
Single account	0.093 (N=86)	0.355 (N=282)	-0.262*** (N=368)
No local banks	0.163 (N=86)	0.255 (N=282)	-0.093* (N=368)
Credit linkage	0.314 (N=86)	0.429 (N=282)	-0.115* (N=368)
Low wealth	0.571 (N=77)	0.646 (N=257)	-0.074 (N=334)
Low income	0.342 (N=79)	0.328 (N=259)	0.014 (N=338)
Insurance knowledge	0.372 (N=86)	0.287 (N=282)	0.085 (N=368)
Financial literacy	0.593 (N=86)	0.521 (N=282)	0.072 (N=368)
Financial crisis interest	0.779 (N=86)	0.670 (N=282)	0.109* (N=368)
University	0.419 (N=86)	0.404 (N=282)	0.014 (N=368)

Table 5. Switching costs and deposit withdrawals

This table displays the estimates of a linear probability model where the dependent variable is *Withdrew deposits*. Columns 1, 2 & 4 show the results for the full sample of all deposit relationships with UBS (= the bailed out bank) or non-distressed banks. Column 3 shows the results for the subsample of deposit relationships of households with only one deposit relationship with UBS or a non-distressed bank. In all columns, deposit relationships with Credit Suisse (= the distressed but not bailed out bank) are excluded. Household control variables are the *Wealth* and *Income* dummy variables, *Age*, *Male*, *University*, *Swiss nationality*, *Risk aversion*, *Time preference*, *Distance UBS km* and *Distance CS km*. Definitions of the variables are provided in appendix 2. Standard errors are clustered on the MS Region level and are reported in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively.

	1	2	3	4
Sample	Deposit accounts at UBS or at non-distressed banks	Deposit accounts at UBS or at non-distressed banks	Single deposit account with UBS or non-distressed banks	Deposit accounts at UBS or at non-distressed banks
Dependent variable	Withdrew deposits	Withdrew deposits	Withdrew deposits	Withdrew deposits
Distress	0.280*** [0.025]	0.243*** [0.027]	0.078** [0.031]	0.253*** [0.024]
Distress*Single account	-0.221*** [0.033]			
Distress*No local banks		-0.098** [0.048]	-0.086** [0.038]	
Distress*Credit linkage				-0.142*** [0.036]
Single account	-0.015** [0.006]			
No local banks		-0.007 [0.006]	-0.001 [0.005]	
Credit linkage				-0.007 [0.007]
Household Fixed Effects	NO	NO	NO	NO
Household Controls	YES	YES	YES	YES
Observations	1,947	1,947	576	1,947
Households	1,188	1,188	576	1,188
R-squared	0.190	0.158	0.136	0.165
Clustered standard errors	MS-Region	MS-Region	MS-Region	MS-Region
Method	OLS	OLS	OLS	OLS

Appendix 1. Survey Representativeness

Panel A compares socioeconomic characteristics of the surveyed households to official data provided by the Federal Statistical Office in Switzerland (*Income, Age, Male, Swiss nationality*), Swiss Federal Tax Administration (*Wealth*) and OECD (*University*). Panel B compares the share of bank relationships in the survey to the share of total domestic deposits (savings and sight & time deposits) by bank group (Large Banks, Cantonal Banks, Savings Banks, Other Banks) as reported by the Swiss National Bank (as per end 2010).

Panel A. Socioeconomic characteristics

	Survey	Official data
Income*	106'405	115'248
Wealth**		
Wealth below CHF 100'000	71.7%	66.0%
Wealth above CHF 100'000 & below CHF 1'000'000	26.8%	29.2%
Wealth above CHF 1'000'000	1.5%	4.8%
Education***		
University	32.0%	35.2%
Age		
20-39 years	42.3%	33.6%
40-64 years	45.4%	44.7%
65+ years	12.4%	21.7%
Male	47.4%	49.6%
Swiss nationality	90.4%	76.7%

* Arithmetic average. Survey mean calculated as follows: income dummies weighted by share of households (assuming an average of CHF 2'250 of *First income dummy* and CHF 24'000 of *Sixth income dummy* and the middle of the income intervals for the other income dummies) for all households. Official data taken from the Swiss Federal Statistical Office. ** Official data taken from Swiss Federal Tax Administration (Gesamtschweizerische Vermögensstatistik der natürlichen Personen 2010). *** Official data taken from OECD (Factbook 2011-2012).

Panel B. Bank relationships

	Survey: Share of bank relationships (May 2011)	Official data: Share of total domestic deposits* (end 2010)
Large Banks (UBS or Credit Suisse)	23.6%	36.8%
Cantonal Banks	23.5%	30.7%
Savings Banks	24.3%	19.0%
Other Banks	28.6%	13.5%

* Source: Swiss National Bank (Banks in Switzerland 2010).

Appendix 2. Variable definitions and sources

This table presents definitions and sources of the variables used in the empirical analysis. The first column indicates the variable name. The second column indicates the definition of the variable. The third column shows the data source.

Variable name	Definition	Source
<i>Bank relationship variables (dependent variables)</i>		
Withdrew deposits	Dummy = 1 if the household has withdrawn deposits from transaction or savings accounts, = 0 otherwise	Survey
Withdrew deposits (>50%)	Dummy = 1 if the household has withdrawn at least 50% of its deposits from transaction or savings accounts, = 0 otherwise	Survey
Account closed	Dummy = 1 if the household has withdrawn deposits and has closed its bank account, = 0 otherwise	Survey
<i>Bank relationship variables (explanatory variables)</i>		
Distress	Dummy = 1 if the pre-crisis deposit relationship was with a bank in distress, = 0 otherwise	Survey
Credit linkage	Dummy = 1 if the pre-crisis deposit relationship included a credit linkage with the bank (consumer or mortgage loan), = 0 otherwise	Survey
<i>Household-level variables (explanatory variables)</i>		
Single account	Dummy = 1 if the household had deposit relationships with only one bank, = 0 otherwise	Survey
No local banks	Dummy = 1 if there was no other bank branch in the same ZIP code (except distressed banks), = 0 otherwise	Survey
Low wealth	Dummy = 1 if the household wealth is below CHF 100'000, = 0 otherwise	Survey
Wealth	Household wealth; five wealth dummy variables (below CHF 50'000, at least CHF 50'000 and below CHF 100'000, at least CHF 100'000 and below CHF 250'000, least CHF 250'000 and below CHF 1 mio., at least CHF 1 mio.)	Survey
Low income	Dummy = 1 if the monthly household income is below CHF 7'000, = 0 otherwise	Survey
Income	Monthly household income; six income dummy variables (below CHF 4'500, at least CHF 4'500 and below CHF 7'000, at least CHF 7'000 and below CHF 9'000, at least CHF 9'000 and below CHF 12'000, at least CHF 12'000 and below CHF 15'000, at least CHF 15'000)	Survey
Insurance knowledge	Dummy = 1 if the respondent correctly responds to three questions about the existence & coverage of deposit insurance, = 0 otherwise	Survey
Financial literacy	Dummy = 1 if the respondent correctly responds to the three questions on financial literacy, = 0 otherwise	Survey
Financial crisis interest	Dummy = 1 if the household actively informed itself about the financial crisis, = 0 otherwise	Survey
Age	Age of the respondent in years (natural logarithm)	Survey
Male	Dummy = 1 if the respondent is male, = 0 otherwise	Survey
University	Dummy = 1 if the respondent has a university degree, = 0 otherwise	Survey
Swiss nationality	Dummy = 1 if the respondent is Swiss, = 0 otherwise	Survey
Risk aversion	Dummy = 1 if the respondent has high risk aversion (above two on a scale from 1 (low) to 6 (high)), = 0 otherwise	Survey
Time preference	Dummy = 1 if the respondent has high time preference (above two on a scale from 1 (low) to 4 (high)), = 0 otherwise	Survey
Distance UBS km	Travel distance by car between the household and the closest UBS bank branch in km	Googlemaps
Distance CS km	Travel distance by car between the household and the closest Credit Suisse bank branch in km	Googlemaps

Appendix 3. Summary statistics

This table reports the summary statistics of variables which include the number of observations, the mean values and standard deviations, as well as the minimum and maximum values. Panel A reports the summary statistics of characteristics of bank relationships that existed at the beginning of the financial crisis (end 2008). Panel B reports the summary statistics of household characteristics of households that had bank relationships that existed at the beginning of the financial crisis (end 2008). Definition and sources of the variables are provided in appendix 2.

Panel A. Bank relationship variables

	Mean	Std. Dev.	Minimum	Maximum	Observations
Withdrew deposits	0.05	0.22	0	1	2'414
Withdrew deposits (>50%)	0.03	0.18	0	1	2'414
Account closed	0.02	0.14	0	1	2'414
Distress	0.23	0.42	0	1	2'414
Credit linkage	0.22	0.41	0	1	2'414

Panel B. Household-level variables

	Mean	Std. Dev.	Minimum	Maximum	Observations
Single account	0.52	0.50	0	1	1'432
No local banks	0.23	0.42	0	1	1'432
Low wealth	0.72	0.45	0	1	1'288
First wealth dummy	0.47	0.50	0	1	1'288
Second wealth dummy	0.25	0.43	0	1	1'288
Third wealth dummy	0.18	0.38	0	1	1'288
Fourth wealth dummy	0.09	0.29	0	1	1'288
Fifth wealth dummy	0.01	0.12	0	1	1'288
Low income	0.39	0.49	0	1	1'315
First income dummy	0.09	0.28	0	1	1'315
Second income dummy	0.30	0.46	0	1	1'315
Third income dummy	0.25	0.43	0	1	1'315
Fourth income dummy	0.19	0.39	0	1	1'315
Fifth income dummy	0.09	0.29	0	1	1'315
Sixth income dummy	0.07	0.25	0	1	1'315
Insurance knowledge	0.25	0.44	0	1	1'432
Financial literacy	0.50	0.50	0	1	1'432
Financial crisis interest	0.62	0.49	0	1	1'432
Age	3.78	0.30	3	4	1'432
Male	0.47	0.50	0	1	1'432
University	0.32	0.47	0	1	1'432
Swiss nationality	0.90	0.29	0	1	1'432
Risk aversion	0.32	0.47	0	1	1'405
Time preference	0.28	0.45	0	1	1'419
Distance UBS km	5.08	5.95	0	85	1'432
Distance CS km	7.38	7.35	0	58	1'432

Appendix 4. Depositor characteristics: depositors of distressed vs. non-distressed banks

This table compares household characteristics of those households with deposit relationships with distressed banks (= UBS and/or Credit Suisse) to those households without deposit relationship with distressed banks but with at least one non-distressed bank. In this table, *Credit linkage* is defined by having at least one deposit relationship including a credit linkage. The last column tests the differences in means (t-test). The number of households (N) are reported in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively (calculated using ordinary standard errors). Definitions and sources of the variables are provided in appendix 2.

	Pre-crisis depositor at distressed bank ?		Difference
	Yes	No	
Single account	0.327 (N=495)	0.616 (N=937)	-0.289*** (N=1432)
No local banks	0.244 (N=495)	0.229 (N=937)	0.015 (N=1432)
Credit linkage	0.408 (N=495)	0.360 (N=937)	0.048* (N=1432)
Low wealth	0.620 (N=440)	0.768 (N=848)	-0.147*** (N=1288)
Low income	0.325 (N=455)	0.429 (N=860)	-0.104*** (N=1315)
Insurance knowledge	0.333 (N=495)	0.213 (N=937)	0.120*** (N=1432)
Financial literacy	0.547 (N=495)	0.478 (N=937)	0.069** (N=1432)
Financial crisis interest	0.687 (N=495)	0.583 (N=937)	0.104*** (N=1432)
University	0.402 (N=495)	0.274 (N=937)	0.128*** (N=1432)

Appendix 5. Switching costs and deposit withdrawals (Robustness)

This table displays the estimates of a linear probability model where the dependent variable is *Withdrew deposits*. Columns 1, 2 & 4 show the results for the full sample of all deposit relationships with UBS (= the bailed out bank) or non-distressed banks. Column 3 shows the results for the subsample of deposit relationships of households with only one deposit relationship with UBS (= the bailed out bank) or a non-distressed bank. In all columns, deposit relationships with Credit Suisse (= the distressed but not bailed out bank) are excluded. Household control variables are the *Wealth* and *Income* dummy variables, *Age*, *Male*, *University*, *Swiss nationality*, *Risk aversion*, *Time preference*, *Distance UBS km* and *Distance CS km*. All regressions include the additional interaction terms *Distress*Insurance knowledge*, *Distress*Low wealth*, *Distress*University*, *Distress*Financial crisis interest*, *Distress*Financial literacy*, *Distress*Low income* as well as the main terms of the variables *Insurance knowledge*, *Financial crisis interest* and *Financial literacy*. Definitions of the variables are provided in appendix 2. Standard errors are clustered on the MS Region level and are reported in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10-level respectively.

Sample	1	2	3	4
Dependent variable	Deposit accounts at UBS or at non-distressed banks Withdrew deposits	Deposit accounts at UBS or at non-distressed banks Withdrew deposits	Single deposit account with UBS or non-distressed banks Withdrew deposits	Deposit accounts at UBS or at non-distressed banks Withdrew deposits
Distress	0.237*** [0.067]	0.224*** [0.068]	0.151** [0.063]	0.231*** [0.066]
Distress*Single account	-0.222*** [0.035]			
Distress*No local banks		-0.096** [0.047]	-0.096** [0.044]	
Distress*Credit linkage				-0.160*** [0.039]
Single account	-0.014*** [0.005]			
No local banks		-0.008 [0.006]	-0.003 [0.005]	
Credit linkage				-0.004 [0.007]
Additional interaction terms	YES	YES	YES	YES
Household Fixed Effects	NO	NO	NO	NO
Household Controls	YES	YES	YES	YES
Observations	1,947	1,947	576	1,947
Households	1,188	1,188	576	1,188
R-squared	0.198	0.167	0.260	0.176
Clustered standard errors	MS-Region	MS-Region	MS-Region	MS-Region
Method	OLS	OLS	OLS	OLS