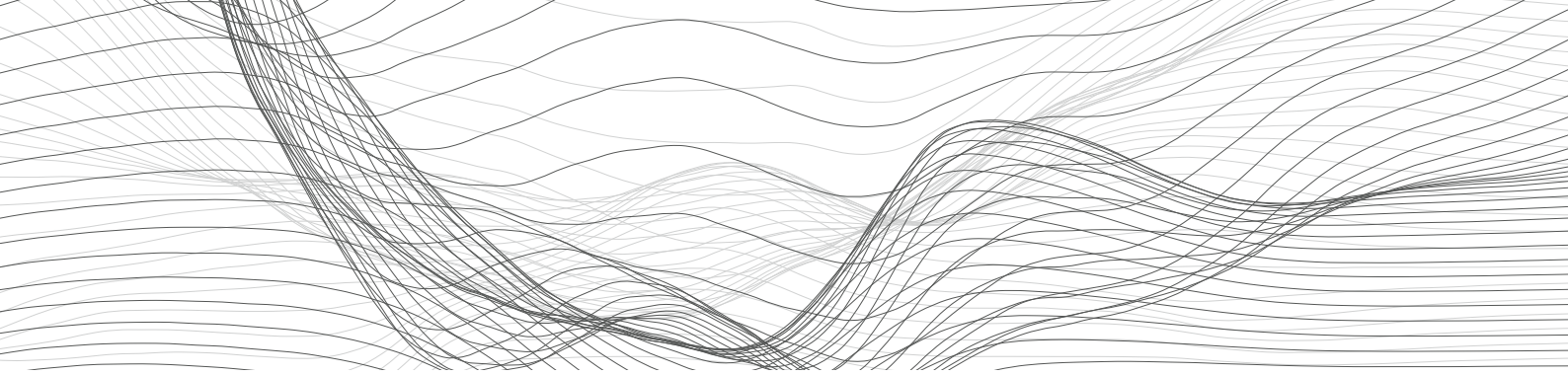

A decade of low interest rates: impact on Swiss bank profitability

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A decade of low interest rates: Impact on Swiss bank profitability

Jayson Danton & Terhi Jokipii[*]

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We analyse the impact of interest rates on Swiss banks' profitability. Our assessment is based on annual data on individual bank balance sheets and income statements in a standard panel regression setting for a sample of domestically focused commercial banks. We find that net interest rate margins (NIM) and return on assets (ROA) exhibit different sensitivities to market interest rate levels and highlight the non-linear effect of compressed liability margins on NIM. In addition, we show that initial bank characteristics affect the link between falling interest rates and profitability. However, bank characteristics that amplify/alleviate NIM pressure from falling interest rates differ from those that affect ROA pressure. Furthermore, banks have taken measures to safeguard profitability: (i) with respect to risk-taking, all banks increased their exposure to rising interest rates by increasing their asset durations. Moreover, banks that started with lower mortgage ratios increased these ratios considerably, particularly during the second half of the sample period (2015-2019); and (ii) Some banks actively worked to curb deposit growth when other sources of funding became relatively cheaper. Overall, these adjustments have helped alleviate the downward pressure of falling interest rates on bank profitability.

JEL Codes: E43, E52, G21

Keywords: Bank profitability, Net interest margin, Low interest rates, Liability margin

1. Introduction

In Switzerland, interest rates have been low since the global financial crisis in 2008/2009. In the first half of 2009, the Swiss National Bank (SNB) lowered its policy rate to near zero levels. By the end of 2014, the SNB announced another decrease in its policy rate into negative territory. This was the first time that the SNB's policy rate became negative. Interest rates remained negative until the middle of 2022. This prolonged period of low and negative interest rates is exceptional by historical standards and has affected bank profitability.

There is a consensus that a low interest rate environment constitutes a risk to bank profitability (Claessens, Coleman, & Donnelly, 2018; Molyneux, Reghezza, & Xie, 2019; Agrimon, Danton, de Haan, Rodriguez-Martin, & Rogriguez-Moreno, 2023; Segev, Ribon,

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Kahn, & de Haan, 2024). This is particularly true for small and medium sized banks whose revenue depends heavily on net interest margins (NIM) earned through maturity transformation. For overall profitability, which is measured as the return on assets (ROA), the direct impact of low interest rates is weaker.[1] This is because ROA comprises more than just interest income. The other sources of income and expenses may only be indirectly linked to interest rate levels (Bikker & Vervliet, 2018). In addition, banks can respond endogenously to NIM pressure by either diversifying towards non-interest income, increasing risk appetite, and/or reducing operating costs. These adjustments can help, in part, balance out the dampening effect of low interest rates on NIM. This paper analyses the impact of low interest rates on Swiss banks' profitability (as measured by NIM and ROA). To do so, we use annual individual bank data on balance sheets and income statements in a standard panel regression setting for a sample of domestically focused commercial banks (henceforth DFBs).[2] Our analysis proceeds in three steps. First, we establish the link between interest rates and bank profitability. Second, we examine whether certain bank characteristics in 2009 meant that a bank was structurally positioned to face profitability pressure in a low interest rate environment. Third, we analyse how banks have adjusted to safeguard profitability against falling interest rates and determine whether these adjustments have had the desired effect on bank profitability.

Our paper provides three main insights for understanding the effect of low interest rates on bank profitability in Switzerland. First, NIM and ROA exhibit different sensitivities to market interest rate levels: NIMs appear to react strongly to changes in interest rates, whereas ROAs do not. NIMs are directly affected by interest rate levels as well as the slope of the yield curve (Borio, Gambacorta, & Hofmann, The influence of monetary policy on bank profitability, 2017). In contrast, ROAs are affected by additional sources of income as well as expenses that react differently to low interest rate environments. For example, low interest rates tend to boost stock markets, which in turn drives increased income from commission and fee-based businesses (Brei, Borio, & Gambacorta, 2019; Bottero, Minoiu, Polo, Presbitero, & Sette, 2019; Arce, García-Posada, Mayordomo, & Ongena, 2018).

Second, initial bank characteristics are shown to affect the link between falling interest rates and profitability. On average, banks holding more customer deposits or financial assets on their balance sheets at the start of the low interest rate period experienced greater NIM pressure from falling interest rates. Conversely, banks holding more mortgages or corporate credit on the balance sheet on average experienced less NIM pressure. In addition, our results confirm that bank characteristics that amplify or alleviate ROA pressure from falling interest

[1] Related articles are Genay & Podjasek (2014), Alessandri & Nelson (2015), Busch & Memmel (2015) and Lopez, Rose, & Spiegel (2019).

[2] The Swiss banking sector consists of approximately 240 banks, with a combination of two globally active Swiss banks, banks specialised in wealth management and a large share of domestically focused commercial banks, primarily comprising cantonal, regional and Raiffeisen banks. At the consolidated level, the globally active banks have been less affected by the low interest rate environment in Switzerland due to (i) their traditionally low reliance on net interest income, and (ii) their diversification of net interest income by business, instrument and currency. Banks specialised in wealth management are less directly relevant from a financial stability perspective.

rates differ somewhat from those that affect NIM pressure. In particular, we find that longer initial repricing maturities reduced ROA pressure from falling interest rates.

Finally, our findings show that banks have taken measures to safeguard profitability, with positive overall effects on alleviating interest rate pressure. With respect to risk-taking, all banks have considerably increased the duration of their assets, thereby increasing their exposure to rising interest rates over the low interest rate period. This finding is in line with previous literature showing that very low policy rates drive search-for-yield behaviour, especially for banks that are heavily dependent on retail deposits (Bottero, Minoiu, Polo, Presbitero, & Sette, 2019; Heider, Saidi, & Schepens, 2019). This finding is also consistent with the risk-taking channel of monetary policy (Adrian & Shin, 2011; Borio & Zhu, 2012). Moreover, banks with lower initial mortgage ratios substantially increased their mortgage ratios, particularly during the second half of the sample period (2015-2019). Our findings also show that banks with initially high customer deposit ratios actively worked to curb deposit growth when other sources of funding became relatively cheaper. Overall, these adjustments helped alleviate the downward pressure of falling interest rates on bank profitability.

2. Domestically focused bank profitability in Switzerland since 2009

The low interest rate environment since 2009 has coincided with large decreases in two standard measures of bank profitability (Chart 1). The net interest rate margin (NIM), which measures the profitability of banks' interest rate business, decreased by approximately 40 basis points (or almost 30%) between 2009 and 2019. The return on assets (ROA), which measures banks' overall profitability, decreased by approximately 15 basis points over the same time period.[3]

Banks' NIM pressure stems from the effect of interest rate levels on both banks' assets and liabilities. Chart 2 provides a slightly longer perspective to highlight three main features. First, we find strong correlations between the short-term rate and interest income and expense contributions to the NIM from 2000 to 2019.[4] For example, interest income contributes positively to the NIM when interest rates increase and negatively when interest rates decrease or remain at low levels. Second, on the asset side, mortgage loans constitute approximately 80% of the DFB's interest-bearing assets.[5] Overall, the decline in interest income is driven by the average interest rate on outstanding mortgage loans, which declined from 2.8% to 1.37% between 2009 and 2019.[6] The average interest rate for new mortgages was 0.98% at the end of 2019. Third, on the liability side, while banks benefitted from decreasing interest expenses

[3] The net interest margin is calculated as net interest income divided by the sum of mortgages due from customers and financial assets. The return on assets is calculated as after-tax profits divided by total assets.

[4] Interest bearing assets have a mechanical contribution effect to the NIM. As long as interest bearing assets continue to grow, the contribution to NIM will be negative.

[5] Corporate credit and financial assets each accounted for approximately 10% of the DFBs' aggregate interest-bearing assets in 2009.

[6] On average, approximately 30% of the mortgage stock is renewed each year. The average interest rate on outstanding mortgages was 4.3% at the end of 2000.

between 2009 and 2019, liability margins were compressed before short-term interest rates became negative in 2014/2015.[7] The liability margin compression was driven by banks maintaining the non-negative interest rates on a large fraction of their funding, while market interest rates converged to zero and eventually turned negative. As a result, the positive contribution from interest expense savings became increasingly limited as the low interest rate environment continued.

Chart 1: Bank profitability

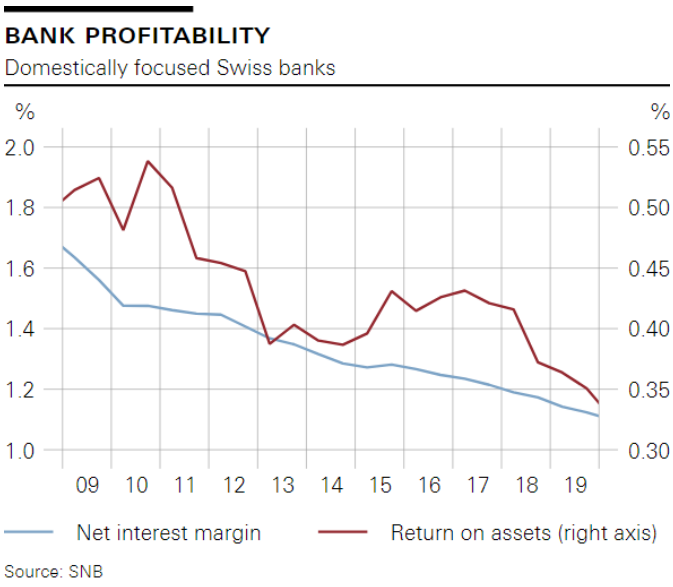


Chart notes: The chart is calculated by aggregating the numerator and denominators separately before taking the ratio. The net interest margin (NIM) is aggregate net interest income divided by aggregate interest-bearing assets. Return on assets (ROA) is aggregate profits divided by aggregate total assets.

While banks' NIMs are directly affected by interest rate levels, their link with banks' ROA is ambiguous. ROA comprises not only net interest income but also other sources of income and expenses that may only be indirectly linked to interest rate levels (Chart 3). For example, net commission and fee income depend mainly on commissions earned through assets under management. Over the sample period, net commission and fee income contributions to ROA remained stable. Another example is the large decrease in operating expenses over the sample period, which had a positive effect on ROA. A less visible example is that banks' balance sheets expanded substantially over the sample period. This expansion was in part driven by large increases in sight deposit volumes held at the SNB. The large increase was due to expansionary SNB monetary policy, which affected the banking system as a whole and was therefore largely out of the control of individual banks.[8]

[7] The liability margin is defined at the difference between the appropriate capital market interest rate and the interest rate on the bank liability.

[8] In addition, commercial banks' central bank reserve balances have also grown considerably during this period. As of 2019, central bank reserve holdings were approximately 39 times the size of central bank reserve holdings in 2009.

Chart 2: Contribution to changes in net interest margin

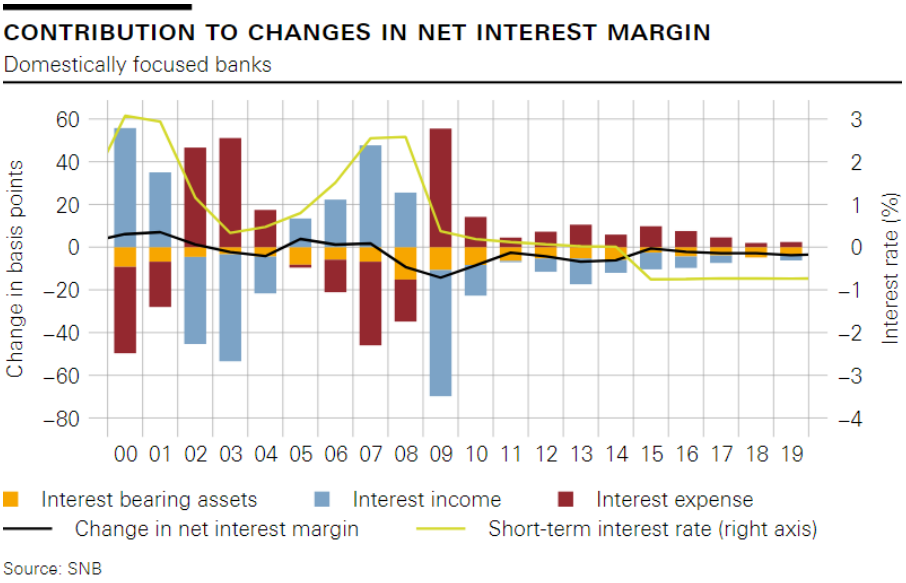


Chart notes: The chart is calculated by aggregating the numerator and denominators separately. With the aggregates, we then use the following total differential formula to decompose the contributions to changes in NIM over time. Given that NII is a linear combination of interest income and interest expenses, we can further decompose the first term of the RHS.

$$\Delta NIM = \frac{\Delta NII \cdot IBA - NII \cdot \Delta IBA}{IBA^2}$$

The total differential is then evaluated at the appropriate values. Interest-bearing assets (IBAs) are the sum of mortgages due from customers and financial assets. The short-term rate is the 3-month LIBOR.

Chart 3: Return-on-assets decomposition

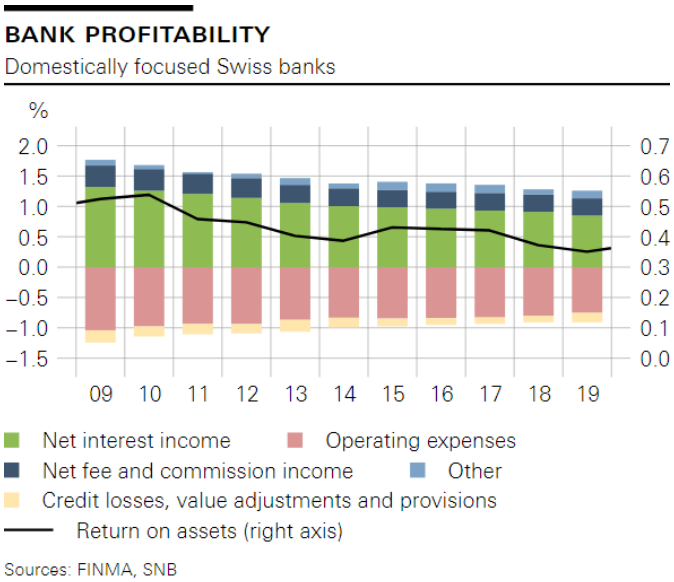


Chart notes: The chart is calculated by aggregating the numerator and denominators separately before taking the ratio. In this chart, we decompose profits into their main categories before dividing those aggregates by aggregate total assets. ROA is aggregate profits divided by aggregate total assets.

3. Bank sample and data

We focus on a sample of 93 domestically focused banks (DFBs). These banks have traditionally concentrated on domestic deposits and lending business. Revenue from the interest business accounts for approximately 70% of these banks' total revenue. Together, they constitute approximately 70% of the total domestic credit market share.

Our analysis uses individual bank balance sheet and income statement information from 2009 to 2019.[9] Individual bank data stem from the comprehensive year-end statistics reported to the Swiss National Bank (SNB), which provides detailed information based on the bank accounting guidelines of the Federal Council and FINMA. Macroeconomic indicators are taken from the SNB data portal. The data are at an annual frequency.

Table 1 Summary statistics

Variables	Description	Unit	N	Mean	Std Dev	Min	Max
Bank-level							
Net interest margin (NIM)	net interest income / interest bearing assets	%	1019	1.37	0.26	0.12	2.33
Return on assets (ROA)	profit / total assets	%	1019	0.35	0.33	-5.20	3.25
Customer deposit ratio	relative share of customer deposits to total assets	%	1019	67.72	8.19	43.7	93.14
Corporate credit ratio	relative share of corporate credit to total assets	%	1019	7.38	4.25	0.29	24.81
Mortgage credit ratio	relative share of mortgage credit to total assets	%	1019	74.64	12.47	0.00	91.00
Financial asset ratio	relative share of financial credit to total assets	%	1019	4.34	5.11	0.00	52.54
Average asset duration	based on banking book residual maturities and repricing bucket midpoints	years	999	2.69	0.59	0.53	4.07
Cost-to-income	operating expenses / operating income	%	1019	57.97	10.34	27.1	97.78
Non-interest income share	non-interest income share of total income	%	1019	24.39	15.88	-2.05	98.04
Interest rate risk (IRR)	change in net present value of economic value (dEVE) / tier 1 capital	%	1019	19.56	12.30	-29.6	94.30
Bank size	log total assets	log	1019	14.42	1.76	11.2	19.33
Credit loss	change in value adjustments for default risks and losses from interest operations / total assets	%	1019	0.20	0.25	-0.11	5.82
Macro-level							
Liability margin	(relevant capital market interest rate) - (average interest rate current and savings accounts)	%	10	-0.36	0.35	-0.83	0.16
1-year swap rate	CHF LIBOR swap curve	%	10	-0.25	0.43	-0.79	0.43
10-year swap rate	CHF LIBOR swap curve	%	10	0.88	0.87	-0.14	2.46
Real GDP growth	real GDP YoY growth rate	%	10	1.85	0.60	1.10	2.83

Summary statistics for the full set of variables considered in our analysis are presented in Table 1. For each variable, the table shows the total number of observations, the mean, the standard deviation, and the minimum and maximum observed values over the sample. The profitability variables NIM and ROA exhibit considerable variation. The standard deviation of the NIMs (0.25%) is slightly lower than that of ROA (0.33%). However, considering the mean values (1.35% for NIMs and 0.34% for ROA), there appears to be more variability in

[9] We focus on the 2009 to 2019 period to abstract from decreases which were likely to have been driven by worsening economic and financial conditions as a result of the global financial crisis (between 2008 and 2009), and the impact of the COVID pandemic and related relief measures (2020).

ROA. This likely reflects the overall effect of various factors and endogenous decisions that vary considerably between banks. Considerable variation is also visible for the bank-specific variables. For the relative share of mortgage credit, for example, the standard deviation is approximately 12%, with values ranging from 0% to 91%. The range for the share of non-interest income is from -2% to 98%. Overall, our dataset contains sufficient variation to identify dominant patterns.

The selection of macroeconomic variables aims to capture features common to all banks. We use two swap curve interest rates (1-year and 10-year maturities) and a year-to-year real GDP growth rate. This selection of variables, while not exhaustive, provides sufficient information to identify macro-related signals.

Finally, we include an average measure of liability margins in the banking sector. A bank's liability margin measures the profitability of its deposit taking, which is a core business for the banks in our sample. In general, the liability margin can be defined as the difference between the relevant capital market interest rate and the average interest rate deposits. In our setting, we take the difference between the 1-year swap rate and the average retail deposit interest rate to obtain a proxy for the average liability margin in the banking sector.

4. Econometric methodology

To isolate the effect of interest rate levels on bank profitability, our econometric methodology uses a standard panel regression specification. This approach enables us to focus on the level effects of interest rates on bank profitability while controlling for time-invariant bank characteristics, time-varying bank characteristics, and macroeconomic conditions.

Our simplified baseline regression specification is in line with the literature.[10] The outcome variable is either the NIM or ROA. The short-term (i_t^{1Y}) and long-term (i_t^{10Y}) interest rate levels capture the effect of the general level of interest as well as the slope of the yield curve.[11] These interest rates are chosen given their relevance for the Swiss DFBs, who typically extend medium- to long-term fixed interest rate loans and take deposits with shorter-term repricing maturities. Hence, the short-term rate provides a proxy for assessing the impact of interest rate changes working through the funding side, whereas the long-term rate proxies the impact of interest rate changes on the asset side. The remaining macroeconomic variable is the real GDP variable ($rgdp_t$), which accounts for general economic activity, adjusted for

[10] See for example Borio, Gambacorta, & Hofmann, (2017), Altavilla, Boucinha, & Peydró (2018), Claessens, Coleman, & Donnelly, (2018).

[11] This choice of variables allows for more flexibility in interest rate movements. A specification with the short-term interest rate and the spread (e.g. 10 y – 1 y) loads the short-term interest rate coefficient. This is a result of the more restrictive *ceteris paribus* interpretation of movements in the short-term interest rate, if the spread is included. In other words, the specification with the spread forces the *ceteris paribus* analysis to assume parallel shifts in the interest rate curve. In our setting, we want to allow more flexibility. As a robustness check, we also estimate our equations by exchanging the long-term rate with a spread between the long- and short-term interest rates (10 y – 1 y). As expected, the results are stable. The main change occurs with the short-term interest rate coefficient, but it does not affect the direction of the results discussed in our main analysis. See the robustness Tables R2-R3c in the appendix.

inflation. Finally, the bank-specific constants (α_i) capture features unique to each bank that do not vary over time.

Our baseline specification is defined as

$$y_{it} = \alpha_i + \beta_1 i_t^{1Y} + \delta_2 i_t^{1Y} \times CM_t + \delta_1 CM_t + \beta_2 i_t^{10Y} + \beta_3 rgdp_t + \epsilon_{it}. \quad (1)$$

We contribute to the literature by including the compressed margin in this regression setting. The compressed margin (CM_t) term is equal to one if liability margins are non-positive and zero otherwise. The contribution is twofold. First, it is an analytical proxy (measured by the liability margin) for the profitability of bank deposit taking, particularly in a low interest rate environment. Second, we no longer need to define a *low* level for the interest rate, as the liability margin can be compressed before market interest rates converge to or go below zero. Nevertheless, findings based on this specification should be interpreted with the necessary caution. The limited sample of banks restricts the freedom for different econometric strategies and diminishes the statistical power of the strategies used in this paper.

5. Analysing the impact of the interest rate level on profitability

We present our analysis and findings in three steps. First, we establish a stylised link between interest rate levels and bank profitability. Second, we analyse how initial bank characteristics affect the link between interest rates and bank profitability. Third, we analyse how banks adjusted to safeguard profitability against falling interest rates, and we assess the impact of the adjustments.

5.1. Establishing a link between interest rate levels and bank profitability

In line with the empirical literature, we establish a significant and positive relationship between interest rate levels and the NIM.[12] Table 2 presents the results from estimating our baseline specification given by Equation (1). On average, a *ceteris paribus* 100 basis point parallel decline in the swap curve translates into a 20-basis point decline in the NIM (see Column 1). Our findings show that the NIM is affected by both short-term and long-term interest rates. A ceteris paribus 100 basis point decrease in the long-term interest rate results in a 9-basis point decrease in NIM, whereas the same decrease in the short-term interest rate is associated with a 12-basis point decrease in NIM.

[12] See Claessens, Coleman, & Donnelly (2018), Altavilla, Boucinha, & Peydró (2018), Windsor, Jokipii, & Bussier (2023).

Table 2: Effect of interest rate levels on bank profitability

	NIM	NIM	ROA	ROA
Swap rate 1-year	0.117***	-0.567***	-0.001	-0.208
	(0.016)	(0.090)	(0.027)	(0.290)
Swap rate 1-year X compressed margins		0.705***		0.230
		(0.098)		(0.301)
Compressed margins		-0.295***		-0.134
		(0.032)		(0.085)
Swap rate 10-year	0.090***	0.068***	0.027***	-0.001
	(0.006)	(0.006)	(0.010)	(0.015)
Real GDP growth rate	-0.056***	-0.084***	-0.004	-0.015
	(0.005)	(0.007)	(0.016)	(0.024)
Constant	1.428***	1.791***	0.332***	0.507***
	(0.011)	(0.044)	(0.043)	(0.121)
Observations	1,019	1,019	1,019	1,019
R-squared	0.635	0.655	0.010	0.014
Bank fixed effects	YES	YES	YES	YES
Number of banks	93	93	93	93

*Notes: The dummy variable "compressed margins" is equal to one if the liability margin <= 0 and zero otherwise. Cluster robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

The results indicate that accounting for compressed liability margins captures a non-linear relationship between NIM and interest rate levels. While liability margins are not compressed, a ceteris paribus decrease in short-term interest rates translates into an increase in NIM. In such a setting, a ceteris paribus 100 basis point parallel decline in the swap curve translates into a 50-basis point increase in NIMs (see Column 2). This is in line with expectations, given the nature of these banks' interest business, interest rates on assets are locked in for longer than interest rates on liabilities.[13] As a result, these banks benefit from falling rates through the effect on funding costs. However, as interest rates continue to fall, liability margins become compressed. With compressed liability margins, further, ceteris paribus, decreases in the short-term interest rate will no longer have a positive effect on NIM but rather result in a decrease in NIM. This is because banks apply the zero lower bound on the majority of their retail deposit due to the uncertainty related to the level of the effective zero lower bound on retail deposits (Claessens, Coleman, & Donnelly, 2018; Bech & Malkhozov, 2016; Heider, Saidi, & Schepens, 2019). In such a setting, a ceteris paribus 100 basis point parallel decline in the swap curve translates into a 20-basis point decline in NIMs (see Column 2).

The interest rate level impact on ROA is limited and considerably smaller in magnitude, which is in line with the findings in the literature (Claessens, Coleman, & Donnelly, 2018; Lopez, Rose, & Spiegel, 2019). We find a positive correlation between the long-term interest rate and ROA. On average, a ceteris paribus 100 basis point parallel decrease in the swap curve translates into a 3-basis point decline in ROA (see Column 3). We find no significant effect of the short-term interest rate on ROA. In addition, when controlling for compressed

[13] The Swiss DFB's interest business typically involves extending medium to long-term fixed interest rate loans and taking deposits with potentially short-term repricing maturities.

liability margins, we find no significant effect for either the short- or long-term interest rates on ROA (see Column 4).

However, the ROA regressions suffer from a key caveat. In response to pressure from ultra-low interest rates, banks have taken measures to safeguard ROA (see Section 5.3), which have likely affected the interest rate impact on ROA. Our specification does not control for such behavioural changes.[14]

5.2. Effect of initial bank characteristics on the link between interest rate levels and profitability

Building on previous results, we now analyse how initial bank characteristics affect the link between interest rate levels and profitability.

The extended baseline specification enables us to identify whether banks' NIMs or ROAs were more *structurally* exposed to decreases in interest rates. Our baseline regression specification is extended as follows:

$$y_{it} = \alpha_i + \beta_1 i_t^{1Y} + \delta_2 i_t^{1Y} \times CM_t + \delta_1 CM_t + \gamma_1 i_t^{1Y} \times \bar{X}_{i,2009} + \gamma_2 i_t^{1Y} \times \bar{X}_{i,2009} \times CM_t + \beta_2 i_t^{10Y} + \beta_3 rgdp_t + \epsilon_{it}, \quad (2)$$

where $\bar{X}_{i,2009}$ measures bank-specific variables that are centred on the cross-sectional sample mean in 2009. The bank-specific variables account for banks' structural position at the start of the low-rate environment. They include a bank's asset duration and share of mortgage credit. Together, these positions provide an approximation of a banks' risk appetite. In addition, banks' customer deposit ratio is included to proxy funding costs. Finally, the corporate credit and financial asset ratios are included given their significance for net interest income.

Each bank is categorised along these variable dimensions on the basis of its starting position relative to the sample median. A positive value for any $\bar{X}_{i,2009}$ variable indicates that bank i had a higher value of the given variable than the average bank did in 2009 and vice versa. These centred variables interact with the short-term interest rate and triple interact with the short-term interest rate and the compressed margin binary variable.

5.2.1. Initial bank characteristics and NIM pressure

Our results show that some banks' NIMs were structurally exposed to decreases in interest rates through certain initial characteristics. Table 3a presents the results from estimating Equation (2) in Panels A and B and provides an indication of the economic relevance of our point estimates in Panel C.[15]

[14] We conducted a series of robustness checks by including additional macroeconomic variables as well as lagged individual bank characteristics. The coefficients of interest remained largely unchanged. To avoid confusion due to the lack of comparability we do not report those tables in the paper. Tables are available upon request.

[15] Panel C compares starting characteristic values from the 75th percentile bank with the 25th percentile bank in order to provide an indication of the economic relevance of the results.

Our findings confirm the non-linear effect of interest rates on NIM when liability margins become fully compressed (see Panel A), as found in the previous section (Table 2). As long as the zero lower bound on customer deposits is not binding, a ceteris paribus decrease in the short-term interest rate leads to an increase in NIM. The result corresponds to $\hat{\beta}_1$. However, the opposite is true when the zero lower bound becomes binding (i.e., liability margins are compressed) and customer deposits become relatively more expensive than wholesale funding becomes. This result is obtained by adding $\hat{\beta}_1$ and $\hat{\delta}_2$.

Table 3a: Impact of interest rates on NIM, depending on individual bank start-point characteristics

Panel A	**Interest rate level effect:**	
	Short-term rate *1-year swap*	Long-term rate *10-year swap*
Without compressed liability margins	**-0.565*** **	**0.064*** **
With compressed liability margins	**0.137*** **	**0.064*** **

Panel B	**Starting-point bank characteristic effect:**				
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio
Without compressed liability margins	**0.165*** **	**0.002**	**0.005**	**-0.005**	**0.015** **
With compressed liability margins	**0.018**	**-0.003***	**0.006*** **	**-0.008***	**0.007** **

Panel C	**Overall effect on NIM evaluated at difference between p75 and p25 values:**				
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio
Without compressed liability margins	***0.021*** **	***0.024***	***0.042***	***-0.030***	***0.079*** **
With compressed liability margins	***0.002***	***-0.028****	***0.049*** **	***-0.051****	***0.037*** **

*Notes: This table summarises the results from regression equation (2), where the outcome variable is the net interest margin. The dummy variable "compressed liability margins" is equal to one if the liability margin <= 0 and zero otherwise. Panel (A) reports the coefficients of the short- and long-term interest rates directly. Panel (B) reports the transformed coefficients of the bank characteristic indicated in each column. The first row is without compressed margins and the second row accounts for compressed margins. Positive sign indicates that a decrease in the level of interest rates will have a negative effect on NIM. Panel (C) takes the coefficients from panel (B) and compares the 75th percentile bank with the 25th percentile bank for each of the characteristics. For example, the mortgage ratio result suggests that for a 100 basis point decrease in short-term interest rates, the bank with a relatively higher mortgage ratio will experience less NIM pressure as it's NIM would decrease by 2.8 basis points less. Cluster robust standard errors by bank. *** p<0.01, ** p<0.05, * p<0.1*

Higher initial mortgage ratios are associated with *less* NIM pressure. The negative and significant coefficient of the mortgage ratio variable (Panel B) with compressed liability margins indicates that a decrease in the short-term interest rate has a positive effect on NIM.[16] This result stems from the collection of $\hat{\beta}_1$, $\hat{\delta}_2$, $\hat{\gamma}_1$, and $\hat{\gamma}_2$ for the mortgage ratio variable. By comparing the coefficient observed in Panel B for the hypothetical banks in the 25th and 75th percentiles of the mortgage ratio variable, we can quantify the ceteris paribus impact on NIM. Column 2 of Panel C shows that for a given ceteris paribus 100 basis point decrease in the short-term interest rate, a bank with a relatively higher initial mortgage ratio would experience less NIM pressure and would see its NIM decrease by approximately 3 basis points *less* than that of another bank with a relatively lower initial mortgage ratio. These results are in line with expectations, as a bank with a relatively large market share in the

[16] The result in Panel B for the mortgage ratio variable in the setting without compressed liability margins collects $\hat{\beta}_1$ as well as $\hat{\gamma}_1$ for the variable mortgage ratio.

domestic mortgage market can utilise its market power to safeguard profits in the face of decreasing interest rates, either by increasing volumes further or adjusting product rates.

The results for initial asset durations are somewhat counterintuitive. When liability margins are not compressed, we find that relatively longer asset durations are associated with *more* NIM pressure when rates decrease. This result is counterintuitive because we would expect banks with relatively longer initial asset durations to have more stable interest income and thereby be relatively less affected by falling interest rate levels. When liability margins are compressed, we find no significant effect.

Higher initial customer deposit ratios are associated with *more* NIM pressure (Column 3, Panel B). With compressed liability margins, a bank with a relatively higher initial customer deposit ratio would see its NIM decrease by approximately 5 basis points *more* than another bank with a relatively lower initial customer deposit ratio (see Column 3 of Panel C). This result highlights the effect of a binding zero lower bound on customer deposits. As a result, for a bank that is funded mainly by customer deposits, interest rate decreases will affect NIMs when liability margins are compressed (Hack & Nicholls, 2021).

Initial corporate credit and financial asset ratios have opposing effects on NIM pressure. On the one hand, banks with higher initial corporate credit ratios experienced *less* NIM pressure (Column 4 of Panel B). A likely explanation is that banks have market power over their corporate credit conditions. On the other hand, banks with higher initial financial asset ratios experienced *more* NIM pressure (Column 5 of Panel B). Unlike mortgage and corporate credit, banks can choose only the credit rating of their financial asset portfolio and therefore take the associated financial asset prices as given. Given the materiality of these two positions on the average bank's balance sheet, we put more weight on the results related to risk-taking and customer deposit ratios.

To summarise, our results indicate that certain initial bank characteristics act as NIM pressure amplifiers when interest rates fall, whereas others act as NIM pressure alleviators. Banks that initially held more mortgage or corporate credit faced less NIM pressure from falling interest rates, whereas banks that held relatively more customer deposits or financial assets faced more NIM pressure from falling interest rates.

5.2.2. Initial bank characteristics and ROA pressure

Our results show that some banks' ROAs were structurally exposed to decreases in interest rates through certain initial characteristics. Table 3b presents the results from estimating Equation (2) in Panels A and B and provides an indication of the economic relevance of our point estimates in Panel C.[17]

Initial bank characteristics that are associated with NIM pressure do not necessarily lead to ROA pressure (see Tables 3a & b). On the one hand, higher initial financial asset ratios are

[17] Panel C compares starting characteristic values from the 75th percentile bank with the 25th percentile bank in order to provide an indication of the economic relevance of the results.

associated with *more* ROA pressure. This result is in line with the impact on the NIM pressure. On the other hand, higher initial asset durations and corporate credit ratios are associated with opposite effects on ROA pressure compared with NIM pressure. The remaining variables are statistically insignificant.

Table 3b: Impact of interest rates on ROA, depending on individual bank start-point characteristics

Panel A	**Interest rate level effect:**				
	Short-term rate *1-year swap*	Long-term rate *10-year swap*			
Without compressed liability margins	**-0.453****	**0.010**			
With compressed liability margins	**0.033*****	**0.010**			
Panel B	**Starting-point bank characteristic effect:**				
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio
Without compressed liability margins	**0.027**	**-0.003**	**-0.005**	**0.001**	**0.008**
With compressed liability margins	**-0.041***	**0.002**	**0.001**	**0.007****	**0.003***
Panel C	**Overall effect on ROA evaluated at difference between p75 and p25 values:**				
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio
Without compressed liability margins	***0.004***	***-0.032***	***-0.045***	***0.009***	***0.042***
With compressed liability margins	***-0.005****	***0.021***	***0.007***	***0.046****	***0.018****

*Note: This table summarises the results from regression equation (2), where the outcome variable is the return on assets. The dummy variable "compressed liability margins" is equal to one if the liability margin <= 0 and zero otherwise. Panel (A) reports the coefficients of the short- and long-term interest rates directly. Panel (B) reports the transformed coefficients of the bank characteristic indicated in each column. The first row is without compressed margins and the second row accounts for compressed margins. Positive sign indicates that a decrease in the level of interest rates will have a negative effect on NIM. Panel (C) takes the coefficients from panel (B) and compares the 75th percentile bank with the 25th percentile bank for each of the characteristics. For example, the asset duration result suggests that for a 100 basis point decrease in short-term interest rates, the bank with a relatively higher asset duration ratio will experience less ROA pressure as it's ROA would decrease by 0.5 basis points less. Cluster robust standard errors by bank. *** p<0.01, ** p<0.05, * p<0.1*

Incorporating additional initial bank characteristics does not identify any noteworthy variables associated with ROA pressure (see Table 3c).[18] The only additional variable that is marginally statistically significant is initial bank size. The results suggest that larger banks face less ROA pressure when liability margins are compressed.

Given the lack of significance for other controls for diversification and operational efficiency, we interpret this as a proxy for scale economies (Blatter & Fuster, 2021). Finally, all remaining point estimates in Table 3c are consistent with those presented in Table 3b, although we lose statistical significance for the financial asset ratio and asset duration variables.

[18] We add the following proxies: (i) share of interest income as a proxy for diversification, (ii) cost-to-income ratio as a proxy for operational efficiency, (iii) interest rate risk exposure and credit loss provision ratio as additional proxies for risk appetite and (iv) bank size which can serve as a proxy across several dimensions, such as diversification, economies of scale and operational efficiency.

Table 3c: Impact of interest rates on ROA, depending on individual bank start-point characteristics

Panel A	**Interest rate level effect:**									
	Short-term rate *1-year swap*	Long-term rate *10-year swap*								
Without compressed liability margins	**-0.459****	**0.010**								
With compressed liability margins	**0.032****	**0.010**								
Panel B	**Starting-point bank characteristic effect:**									
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio	NII share	Credit loss ratio	IRR	Cost-to-income ratio	Size
Without compressed liability margins	**-0.065**	**0.002**	**-0.005**	**-0.000**	**0.004**	**-0.002**	**-0.107**	**0.002**	**-0.006**	**0.029**
With compressed liability margins	**-0.045**	**0.003**	**0.001**	**0.009****	**0.003**	**-0.001**	**-0.039**	**0.001**	**-0.002**	**-0.016***
Panel C	**Overall effect on ROA evaluated at difference between p75 and p25 values:**									
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio	NII share	Credit loss ratio	IRR	Cost-to-income ratio	Size
Without compressed liability margins	***-0.008***	***0.023***	***-0.047***	***-0.001***	***0.021***	***-0.032***	***-0.021***	***0.023***	***-0.076***	***0.071***
With compressed liability margins	***-0.006***	***0.031***	***0.008***	***0.054****	***0.016***	***-0.016***	***-0.008***	***0.013***	***-0.025***	***-0.038****

*Note: This table summarises the results from regression equation (2), where the outcome variable is the return on assets. The dummy variable "compressed liability margins" is equal to one if the liability margin <= 0 and zero otherwise. Panel (A) reports the coefficients of the short- and long-term interest rates directly. Panel (B) reports the transformed coefficients of the bank characteristic indicated in each column. The first row is without compressed margins and the second row accounts for compressed margins. Positive sign indicates that a decrease in the level of interest rates will have a negative effect on NIM. Panel (C) takes the coefficients from panel (B) and compares the 75th percentile bank with the 25th percentile bank for each of the characteristics. For example, the asset duration result suggests that for a 100 basis point decrease in short-term interest rates, the bank with a relatively higher asset duration ratio will experience less ROA pressure as it's ROA would decrease by 0.6 basis points less. Cluster robust standard errors by bank. *** p<0.01, ** p<0.05, * p<0.1*

To summarise, our results indicate that the initial bank characteristics associated with NIM pressure from falling interest rates do not necessarily map into ROA pressure. Furthermore, the results for ROA pressure are less precisely estimated, which means that they should be interpreted with the appropriate level of caution. For the remainder of the paper, we shift our focus back to the results presented in Tables 3a and 3b.

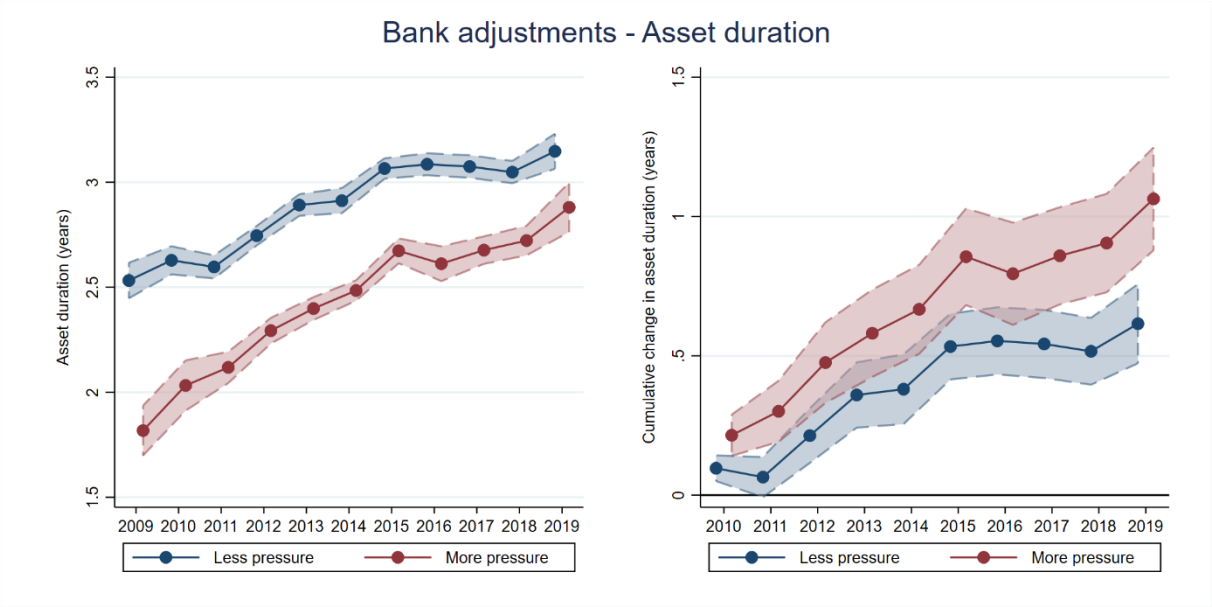
5.3. Banks' adjustments to offset profitability pressure

To study the adjustments banks made and their potential effects on profitability, we combine insights from two econometric approaches. The first approach estimates a simple fixed effects model on sample splits using the NIM pressure characteristics determined above. This allows us to compare adjustments made by a group of banks characterised as having a higher value of the given variable than the average bank in 2009 with adjustments made by banks with lower initial values (see Section 5.2). Chart 4 depicts the output from the first approach. The second approach uses a multivariate distance matching method to identify banks that are comparable on the basis of initial characteristics and the observed changes. The only difference between the matched banks was their endogenous reaction along a single dimension (e.g., change in mortgage ratio or customer deposit ratio), which we use to explain the observed change in NIM and ROA. This approach allows us to draw qualitative guidance on the directional impact of changes in bank characteristics on profitability (see Table 4).[19]

[19] See table notes for more details on how the results are calculated and prepared. Quantitative results are available upon request. Details on the matching process are provided in the technical appendix.

Chart 4: Bank adjustments conditional on pressure channels

Panel (A)



Panel (B)

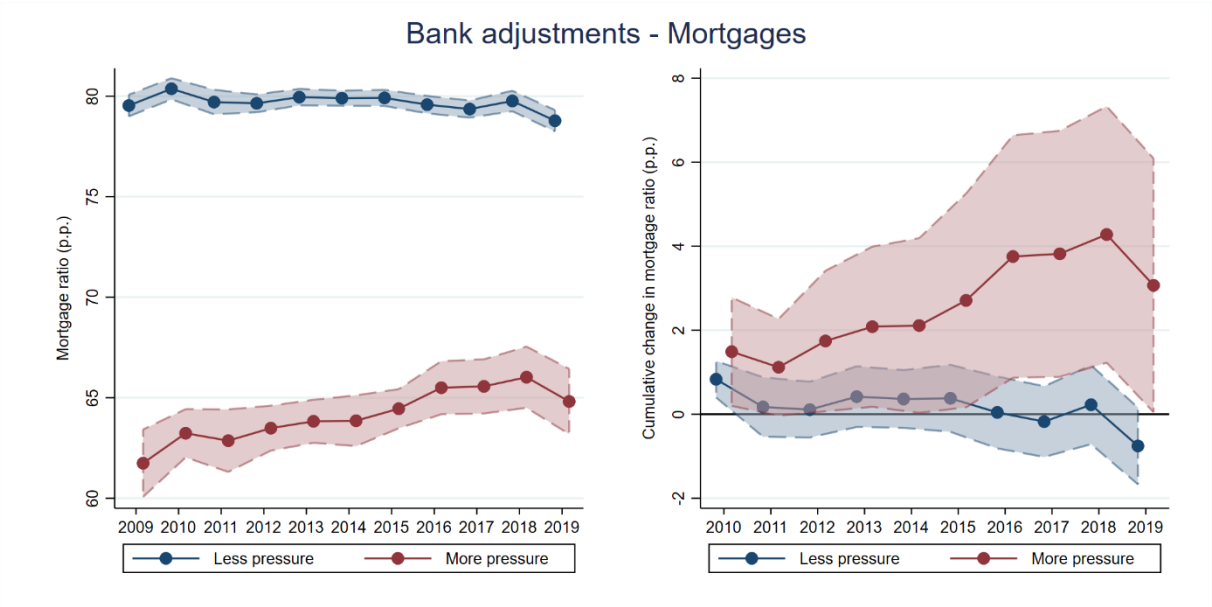


Chart 4: Bank adjustments conditional on pressure channels (cont'd)

Panel (C)

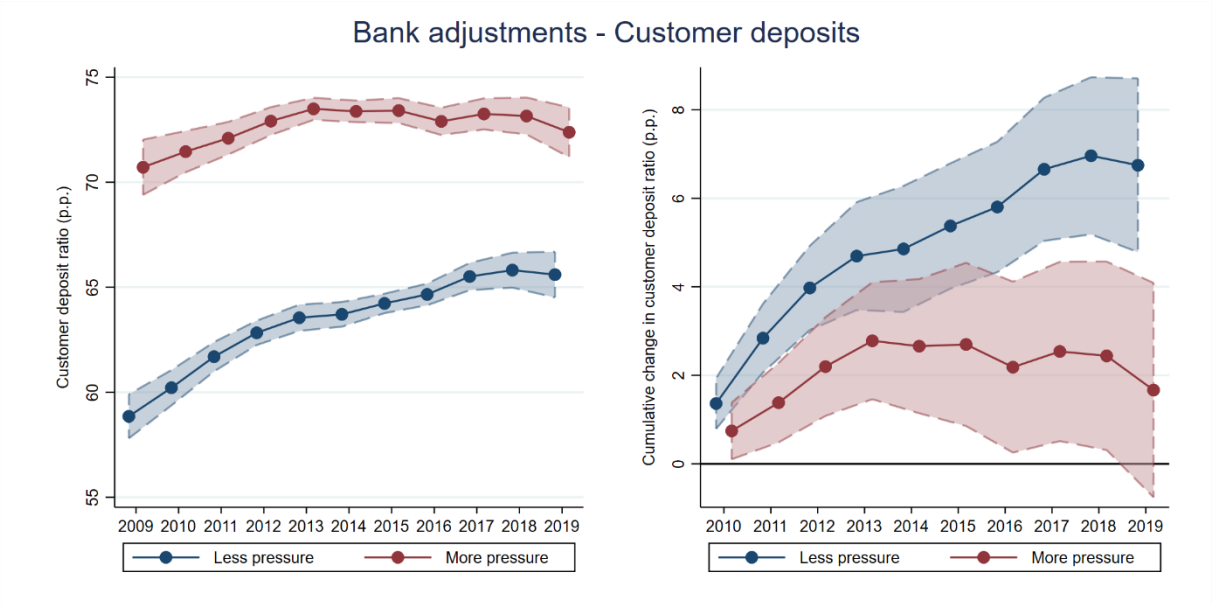


Chart notes: The charts are constructed using the definition of NIM pressure from Table 3a to classify banks into two groups: (i) *less pressure* and (ii) *more pressure*. We run separate simple fixed-effects regressions on the two samples. The regression specification is $y_{it} = \alpha_i + \alpha_t + \epsilon_{it}$. The outcome variables are the bank adjustment variables indicated in each panel. The charts plot the predicted average levels ($\hat{y}_{it}$) and coefficients associated with the time fixed effects (α_t) along with the 95% confidence interval. The left-hand chart reports the predicted levels for each year, and the right-hand chart reports the coefficients of the time fixed effects directly.

During the low interest rate period, all banks increased interest rate risk in their banking books by extending their initial asset durations (see Chart 4, Panel A). Banks that started with shorter initial asset durations increased their interest rate risk more than banks with longer initial asset durations[20]. These adjustments, particularly those made during the first half of the sample, had a positive effect on profitability (see Table 4).

Banks with lower initial mortgage ratios substantially increased their ratios (see Chart 4, Panel B), whereas the other group of banks maintained relatively constant ratios. The majority of the mortgage ratio adjustments took place in the second half of the sample period when interest rates were in negative territory. Table 4 suggests that these adjustments had a positive effect on profitability.

In terms of funding costs, the group of banks with initially high customer deposit ratios actively worked to curb deposit growth (see Chart 4, Panel C). This result is pertinent given that SNB monetary policy injected large amounts of liquidity into the banking system over the sample period. Efforts to curb deposit growth in the second half of the sample period had generally positive effects on profitability (Table 4).

[20] This finding is in line with previous studies that show that low monetary rates are believed to drive reach-for-yield behaviour in banks Rajan (2005), Taylor (2009), Martinez-Miera & Repullo (2017).

To summarise, we find that banks took measures to safeguard their profitability and, in doing so, alleviated some of the downward pressure from falling interest rates. All banks increased their risk-taking by significantly expanding their exposure to rising interest rates. Moreover, banks with initially lower mortgage ratios increased their ratios substantially, particularly when liability margins were compressed and deposit funding became comparatively expensive. In addition, banks (some more successfully than others) adjusted their customer deposit ratios at the time when other sources of funding became relatively cheaper. While these findings are both interesting and relevant, the analysis only considers, *ceteris paribus*, adjustments in bank pressure channels. In reality, these variables are likely to interact in multiple dimensions simultaneously.

Table 4: Pressure channel adjustment effects on NIM and ROA

Panel A	**Treatment effect on dNIM of above median adjustments in pressure channels**					
	Overall	Overall with controls	Change in first half	Change in first half with controls	Change in second half	Change in second half with controls
Asset duration	(-)	(-)	(+)	(+)	(-)	(-)
Mortgage ratio	(-)***	(-)***	(-)*	(-)	(+)	(+)
Customer deposit ratio	(+)**	(+)	(+)***	(+)**	(+)	(-)
Corporate credit ratio	(+)	(+)	(-)	(-)	(+)	(+)
Financial asset ratio	(+)	(+)	(-)	(-)	(+)	(+)

Panel B	**Treatment effect on dROA of above median adjustments in pressure channels**					
	Overall	Overall with controls	Change in first half	Change in first half with controls	Change in second half	Change in second half with controls
Asset duration	(+)***	(+)***	(+)***	(+)***	(+)	(+)
Mortgage ratio	(+)	(+)	(-)*	(-)	(+)***	(+)***
Customer deposit ratio	(+)	(-)	(+)	(+)	(+)	(-)
Corporate credit ratio	(+)	(+)	(-)	(-)	(+)	(+)**
Financial asset ratio	(+)	(+)	(+)	(-)	(+)	(+)

*Notes: The results in this table are based on a multivariate (Mahalanobis) distance matching process using 'kmatch'. Panel (A) measures the effect of adjustments in a single dimension on the observed changes in NIM and Panel (B) measures the effect of adjustments in a single dimension on the observed changes in ROA. Banks are matched based on their observable characteristics in 2009 (mortgage ratio, customer deposit ratio, corporate credit ratio, financial asset ratio and asset duration) as well as the observed changes in the remaining bank characteristics. Each row in the table represents the target treatment variable. In each row, we calculate three binary variables: (i) above median adjustment over the whole sample period, (ii) above median adjustment in the first half of the sample period, and (iii) adove median adjustment in the second half of the sample period. These binary variables act as treatment variables. Therefore, the matching process finds banks that are similar along the observable characteristics but differ in their observed adjustments, i.e. the three binary variables. The specifications without any controls simply attempt to explain the observed change in the outcome variable (NIM or ROA) with the binary treatment variables. This means that the matching only uses the adjustment variables in contrast to the specification with controls. For example, in panel (A), the above median customer deposit ratio adjustments (including controls) appeared to be beneficial for NIM in the first half of the sample period, i.e. positive sign, but negative in the second half of the sample period. Note that each row is a sub-sample based on the group of banks classified as being subject to that dimension of pressure. Statistical significance based on cluster robust standard errors. *** p<0.05, ** p<0.1, * p<0.15*

6. Conclusion

This paper assesses the impact of interest rates on Swiss banks' profitability during the decade of ultra-low interest rates in Switzerland. Assessing the impact of low rates on the NIM and ROA separately, our findings show that these profitability metrics exhibit different sensitivities to market interest rates. NIMs appear to react strongly to interest rates when the

lower bound on deposit rates is binding, whereas ROAs do not. The paper also highlights the non-linear effect of compressed liability margins on the NIM.

Furthermore, we find that initial bank characteristics affect the link between falling interest rates and bank profitability. For example, on average, banks that held more customer deposits at the start of the low-rate period (2009) were shown to have experienced greater NIM pressure from falling interest rates. However, relatively higher mortgage ratios at the start of the low interest rate period helped banks alleviate some of the NIM pressure. However, bank characteristics that amplify/alleviate NIM pressure from falling interest rates do not translate directly into ROA pressure.

We also find that banks took several measures to safeguard their profitability from the pressures of falling interest rates. First, with respect to risk-taking, all banks increased their exposure to rising interest rates. Moreover, banks that started with lower mortgage ratios increased these ratios considerably, particularly during the second half of the sample period (2015-2019). Second, some banks actively worked to curb deposit growth when other sources of funding became relatively cheaper. Overall, these adjustments helped alleviate the downward pressure of falling interest rates on bank profitability, albeit to varying degrees for the NIM and ROA.

These findings are important from a financial stability point of view. They shed light on the important relationship that exists between bank profitability and interest rates during phases of ultra-low and even negative nominal interest rates. In particular, they show that for the Swiss case, the ultra-low interest rate environment resulted in increased risk taking by banks as a means to counteract profitability pressure. Such unintended effects from the low-rate environment are a cause for concern for financial stability, particularly at a time when monetary policy tightens. Nevertheless, starting from a negative interest rate environment, banks' profitability will likely benefit from margin restoration in the short term, thereby dampening the generally anticipated negative effects of an upward interest rate shock.[21]

[21] In the event of a small to moderate upward interest rate shock, banks would benefit from the restoration of liability margins which would have a positive impact on their net interest income. For larger shocks, banks can influence the margin earned on assets and liabilities, as well as their maturity transformation to some extent, through pricing policy. Equally, they can hedge residual maturity mismatches using financial instruments (Swiss National Bank, 2016).

7. References

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Appendix

Robustness tables

Table R2: Effect of interest rate levels on bank profitability

VARIABLES	(1) NIM	(2) NIM	(3) ROA	(4) ROA
Swap rate 1-year	0.207***	-0.499***	0.027	-0.209
	(0.015)	(0.087)	(0.019)	(0.279)
Swap rate 1-year x compressed margins		0.705***		0.230
		(0.098)		(0.301)
Compressed margins		-0.295***		-0.134
		(0.032)		(0.085)
Spread (10y-1y)	0.090***	0.068***	0.027***	-0.001
	(0.006)	(0.006)	(0.010)	(0.015)
Real GDP growth rate	-0.056***	-0.084***	-0.004	-0.015
	(0.005)	(0.007)	(0.016)	(0.024)
Constant	1.428***	1.791***	0.332***	0.507***
	(0.011)	(0.044)	(0.043)	(0.121)
Observations	1,019	1,019	1,019	1,019
R-squared	0.635	0.655	0.010	0.014
Bank fixed effects	Yes	Yes	Yes	Yes
Number of banks	93	93	93	93

*Notes: The dummy variable "compressed margins" is equal to one if the liability margin <= 0 and zero otherwise. Cluster robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table R3a: Impact of interest rates on NIM, depending on individual bank start-point characteristics

Panel A	**Interest rate level effect:**	
	Short-term rate *1-year swap*	Spread *10y-1y swap*
Without fully compressed liability margins	**-0.500*** **	**0.064*** **
With fully compressed liability margins (^)	**0.201*** **	**0.064*** **

Panel B	**Starting-point bank characteristic effect:**				
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio
Without fully compressed liability margins	**0.129**	**0.002**	**0.005**	**-0.005**	**0.014** **
With fully compressed liability margins (^)	**0.086**	**-0.002**	**0.005*** **	**-0.007***	**0.008** **

Panel C	**Overall effect on NIM evaluated at difference between p75 and p25 values:**				
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio
Without fully compressed liability margins	***0.017***	***0.022***	***0.044***	***-0.033***	***0.076*** **
With fully compressed liability margins (^)	***0.011***	***-0.023***	***0.046*** **	***-0.045*** *	***0.043*** **

*Notes: This table summarises the results from regression equation (2), where the outcome variable is the net interest margin. The dummy variable "fully compressed liability margins" is equal to one if the liability margin <= 0 and zero otherwise. Panel (A) reports the coefficients of the short-term interest rate and spread directly. Panel (B) reports the transformed coefficients of the bank characteristic indicated in each column. The first row is without compressed margins and the second row accounts for compressed margins. Positive sign indicates that a decrease in the level of interest rates will have a negative effect on NIM. Panel (C) takes the coefficients from panel (B) and compares the 75th percentile bank with the 25th percentile bank for each of the characteristics. For example, the mortgage ratio result suggests that for a 100 basis point decrease in short-term interest rates, the bank with a relatively higher mortgage ratio will experience less NIM pressure as it's NIM would decrease by 2.8 basis points less. Cluster robust standard errors by bank. *** p<0.01, ** p<0.05, * p<0.1*

Table R3b: Impact of interest rates on ROA, depending on individual bank start-point characteristics

Panel A	**Interest rate level effect:**	
	Short-term rate *1-year swap*	Spread *10y-1y swap*
Without fully compressed liability margins	**-0.443** **	**0.010**
With fully compressed liability margins (^)	**0.042*** **	**0.010**

Panel B	**Starting-point bank characteristic effect:**				
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio
Without fully compressed liability margins	**0.058**	**-0.003**	**-0.005**	**0.002**	**0.008**
With fully compressed liability margins (^)	**-0.016**	**0.002**	**0.001**	**0.008** **	**0.004***

Panel C	**Overall effect on ROA evaluated at difference between p75 and p25 values:**				
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio
Without fully compressed liability margins	***0.007***	***-0.029***	***-0.046***	***0.011***	***0.045***
With fully compressed liability margins (^)	***-0.002***	***0.023***	***0.006***	***0.048*** **	***0.020*** *

*Note: This table summarises the results from regression equation (2), where the outcome variable is the return on assets. The dummy variable "fully compressed liability margins" is equal to one if the liability margin <= 0 and zero otherwise. Panel (A) reports the coefficients of the short-term interest rate and spread directly. Panel (B) reports the transformed coefficients of the bank characteristic indicated in each column. The first row is without compressed margins and the second row accounts for compressed margins. Positive sign indicates that a decrease in the level of interest rates will have a negative effect on NIM. Panel (C) takes the coefficients from panel (B) and compares the 75th percentile bank with the 25th percentile bank for each of the characteristics. For example, the asset duration result suggests that for a 100 basis point decrease in short-term interest rates, the bank with a relatively higher mortgage ratio will experience less ROA pressure as it's ROA would decrease by 0.5 basis points less. Cluster robust standard errors by bank. *** p<0.01, ** p<0.05, * p<0.1*

Table R3c: Impact of interest rates on ROA, depending on individual bank start-point characteristics

Panel A	**Interest rate level effect:**	
	Short-term rate *1-year swap*	Spread *10y-1y swap*
Without fully compressed liability margins	**-0.449****	**0.010**
With fully compressed liability margins (*)	**0.042*****	**0.010**

Panel B	**Starting-point bank characteristic effect:**									
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio	NII share	Credit loss ratio	IRR	Cost-to-income ratio	Size
Without fully compressed liability margins	**-0.036**	**0.002**	**-0.005**	**-0.000**	**0.004**	**-0.002**	**-0.109**	**0.002**	**-0.006**	**0.031**
With fully compressed liability margins (*)	**-0.024**	**0.003**	**0.001**	**0.009****	**0.003**	**-0.001**	**-0.041**	**0.001**	**-0.002**	**-0.014***

Panel C	**Overall effect on ROA evaluated at difference between p75 and p25 values:**									
	Asset duration	Mortgage ratio	Customer deposit ratio	Corporate credit ratio	Financial asset ratio	NII share	Credit loss ratio	IRR	Cost-to-income ratio	Size
Without fully compressed liability margins	***-0.005***	***0.024***	***-0.048***	***-0.000***	***0.023***	***-0.030***	***-0.021***	***0.017***	***-0.075***	***0.074***
With fully compressed liability margins (*)	***-0.003***	***0.033***	***0.008***	***0.055****	***0.018***	***-0.014***	***-0.008***	***0.009***	***-0.025***	***-0.035****

*Note: This table summarises the results from regression equation (2), where the outcome variable is the return on assets. The dummy variable "fully compressed liability margins" is equal to one if the liability margin <= 0 and zero otherwise. Panel (A) reports the coefficients of the short-term interest rate and spread directly. Panel (B) reports the transformed coefficients of the bank characteristic indicated in each column. The first row is without compressed margins and the second row accounts for compressed margins. Positive sign indicates that a decrease in the level of interest rates will have a negative effect on NIM. Panel (C) takes the coefficients from panel (B) and compares the 75th percentile bank with the 25th percentile bank for each of the characteristics. For example, the asset duration result suggests that for a 100 basis point decrease in short-term interest rates, the bank with a relatively higher mortgage ratio will experience less ROA pressure as it's ROA would decrease by 0.6 basis points less. Cluster robust standard errors by bank. *** p<0.01, ** p<0.05, * p<0.1*

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