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Digitalization and its Rapid Impact on Savings Banks in Germany

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Abstract- The German banking industry is facing major challenges due to digitalization. The digital transformation is significantly influenced by technological progress, tighter regulation and low-interest phases. The market entry of fintechs and changing customer behaviour is also a reality. To meet the challenge of the digitalization and to to reduce costs, savings banks are increasingly turning to mergers, staff cuts and branch closures. The purpose of this research is to investigate the impact of digitalization on German savings banks. Through an explorative literature review, scientific sources and real KPIs of savings banks in Germany were used. The impact of digitalization on savings banks in the period 1999 – 2018 was investigated using the study situation and the analysis of key business figures. The aim is to answer whether the cost-cutting actions of savings banks are justified from an economic point of view based on the KPIs operating result, cost-income ratio and return on equity. In recent years, it has become clear that German banks lack a clear strategy. The results may be of interest to researchers dealing with the digital transformation of savings banks in Germany.

Keywords: *savings banks | digital transformation | digitalization | german banking system.*

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Digitalization and its Rapid Impact on Savings Banks in Germany

Carsten Giebe [α] & Kevin Schulz [σ]

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Keywords: savings banks | digital transformation | digitalization | german banking system.

I. Introduction

Due to the current spread of the Coronavirus, economic activity around the world is significantly affected. According to Michel et al. (2020), it seems almost inevitable that the German economy will plunge into recession. However, the possible course and severity of the effects are unclear. The fact is that the uncertainty is reflected not least in the financial markets. Since the beginning of the pandemic, strong price losses and simultaneous implicit volatility have been recorded. The latter is often interpreted in the research literature to measure economic uncertainty (Michelsen et al., 2020).

Some banks that were already on shaky ground before the crisis may not survive the pandemic. The cost-income ratio, an important indicator of the efficiency of institutions, has deteriorated almost continuously over the past 15 years. This is not only due to declining earnings, but also to rising operating costs. In addition, digitalization is putting the business models of traditional banks to the test. According to Röseler, the Executive Director of Banking Supervision, German banks must cut their costs much more rigorously if they want to be competitive in the long run. The pandemic acts as an accelerator here (press release Federal Financial Supervisory Authority, 2021).

The German banking system traditionally consists of three pillars, private sector banks, savings banks and cooperative banks (see Figure 1). This structure makes the German banking system unique, only the Austrian banking system has a similar structure in Europe (Behr & Schmidt, 2015; Frank et al., 2014; Komorowski, 2020). The focus of this research paper is on the German savings banks (Pillar 02).

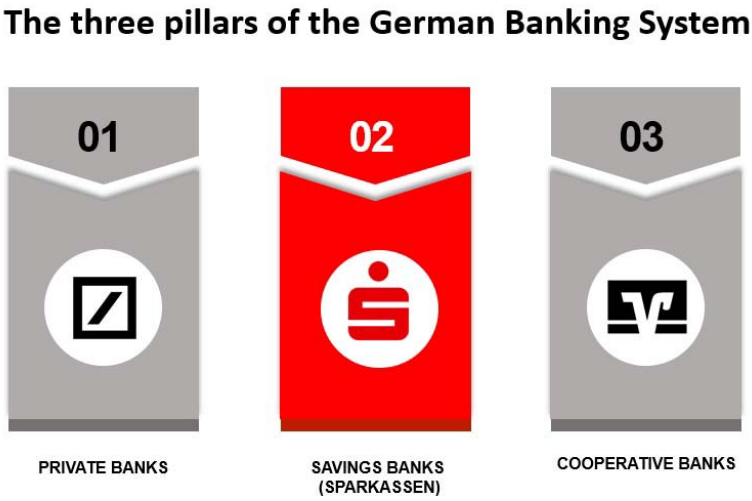

Figure 1: Own representation of the "German Banking System"

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Changing customer expectations, new competitors and a strong big technological change are influencing the banking market in Germany. We live in a working and living environment characterized by automation and digitalization. As a technical revolution, this also encompasses many areas of the savings banks. Digitalization is a priority in order to be able to ensure that we can catch up in terms of "digital skills" and not miss the boat. To realize their ambitions, savings banks are therefore well advised to create the necessary internal conditions for digital transformation. Today's banking services must be benevolently examined for feasibility, then embedded in processes and suitable technical architectures. A higher level of automation can reduce costs and open up further data sources (Damaschke & Giebe, 2020).

II. Literature Review

An exploratory literature search was conducted to find sources on the impact of digitalization on savings banks in Germany. The studies on savings banks in the age of digitalization are rudimentary.

The results of the literature search can be divided into four headings. The first heading contains the necessary data needed to study savings banks. These are data sets such as the number of savings banks, the number of branches, the number of employees as well as business management KPI's. The second section deals with the German banking market and the savings banks in Germany. Examples include the authors Behr & Schmidt (2015), Conrad et al. (2017), Damaschke & Giebe (2020) and Fischer & Arz (2016). In essence, a drastically changed situation for the savings banks, a low-interest rate level, changed competition and massive cost-cutting measures could be researched. The third category of literature deals with the digitalization of banks and savings banks. The authors Drummer et al. (2016), Giebe (2019), Henke et al. (2016), Komorowski (2020) and Sebastian et al. (2017) should be mentioned as examples. In the articles of the authors listed, it was possible to research that the digital transformation has also arrived in banks and savings banks. On the other hand, the urgent need for a strategy could be deduced. The fourth and last section of the literature research deals with other topics such as omnichannel management, brand or VR devices. Menrad (2020), Hammerström et al. (2019) and Zwerenz (2019) should be mentioned here as representatives to enable a discussion within the framework of this research.

III. Research Gap and Research Question

In their 2007 paper "The Impact of Bank Mergers on Efficiency: Empirical Evidence from the German Banking Industry", Georgiev & Burghof examine the impact of mergers on business efficiency (Georgiev & Burghof, 2007). This does imply the use of similar metrics as in this research. However, it can be noted that the research question is different from the focus on mergers. Furthermore, it can be noted that the working paper uses the time series 1991 - 2004, which allows for a research gap in terms of timeliness.

Based on the described research gap, the authors formulate the following research question:

Are the cost-cutting activities such as branch closures and staff reductions due to the rapid impact of digitalization of savings banks in Germany economically justified about the present operating result, cost-income ratio and return on equity?

IV. Hypotheses and Methodology

To answer the research question quantitatively, the following data on Statista (https://de.statista.com/) was used for our research and was narrowed down to the common period 1999-2018. In addition to the number of individual savings banks, branches and employees, real KPIs were used in this research. Specifically, we looked at operating profit, cost-income ratio and return on equity. The operating result usually describes the result from ordinary business activities. The cost-income ratio describes the cost-income ratio in the operational business of the savings banks and provides information on efficiency. The lower the cost-income ratio, the more efficiently the savings banks operate. The return on equity describes the result (net income after taxes) about the equity capital employed.

- Number of savings banks in Germany
- Number of branches of savings banks in Germany
- Number of employees of savings banks in Germany
- Operating income of savings banks in Germany
- Return on equity after taxes of the savings banks in Germany
- Development of the cost-income ratio of savings banks in Germany

The software R was used to evaluate the data. The vizualisations were generated in Python.

The following hypotheses were made:

1st hypothesis:

H_1: The operating profit of savings banks in Germany has changed statistically significantly in the years 1999-2018 due to digitalization.

2nd hypothesis:

H_1: The cost-income ratio of savings banks in Germany has changed statistically significantly in the years 1999 - 2018 due to digitalization.

3rd hypothesis:

H_1: The return on equity of the savings banks in Germany has changed statistically significantly in the years 1999 - 2018 due to digitalization.

Descriptive analyses

The number of institutes has decreased by about 34% over the entire period under consideration, from 587 in 1999 to 386 in 2018 (see Figure 2). The monotonic decrease is significant with a rank correlation coefficient of -1 and unbroken up to and including 2018. This reflects a long-lasting phase of consolidation.

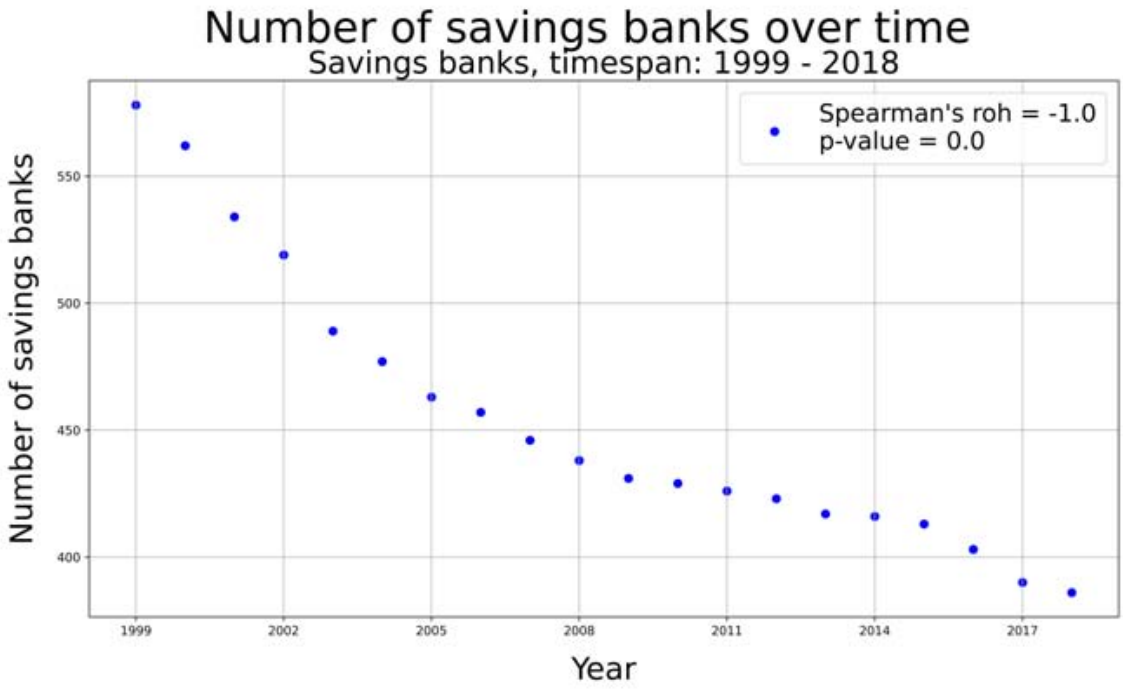

Figure 2: Own representation of the "Number of savings banks"

The consolidation of the savings banks is accompanied by a consolidation of the bank branches (see Figure 3).

Over the entire period under review, the branches were reduced to a similar extent as the institutions. With shrinkage of approx. 46%, this development is even more pronounced and affects the institutions that were still active on the market until 2018.

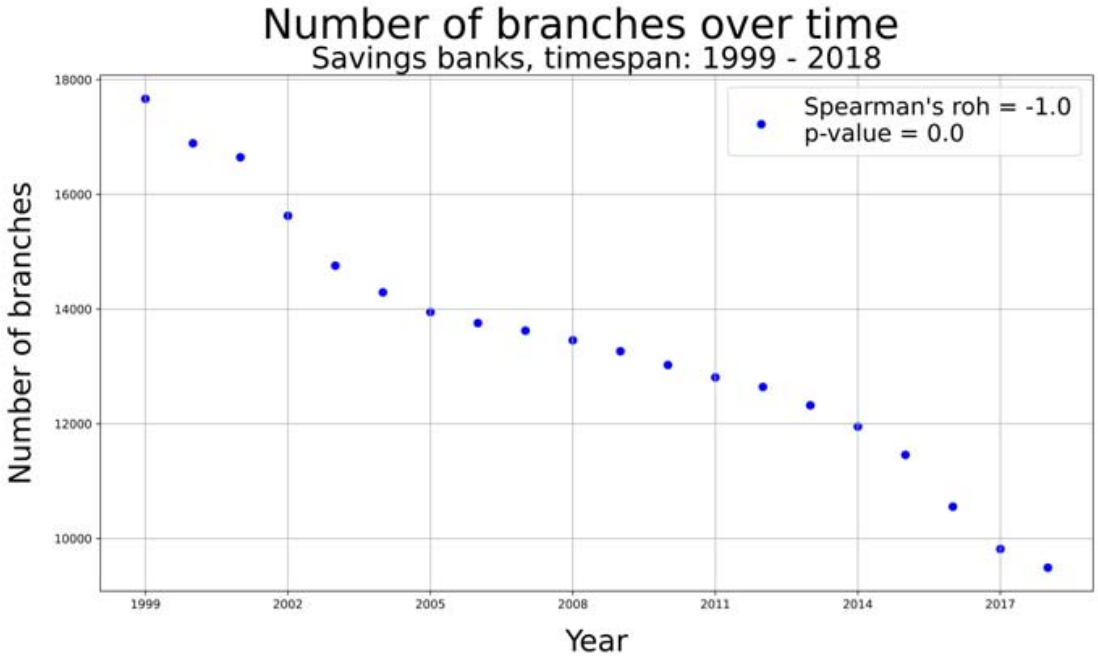

Figure 3: Own representation of the "Number of branches"

The number of employees has developed quite analogously (see Figure 4). Here, too, there is a very clear monotonous decline, which continued at an accelerated pace from 2015 onwards.

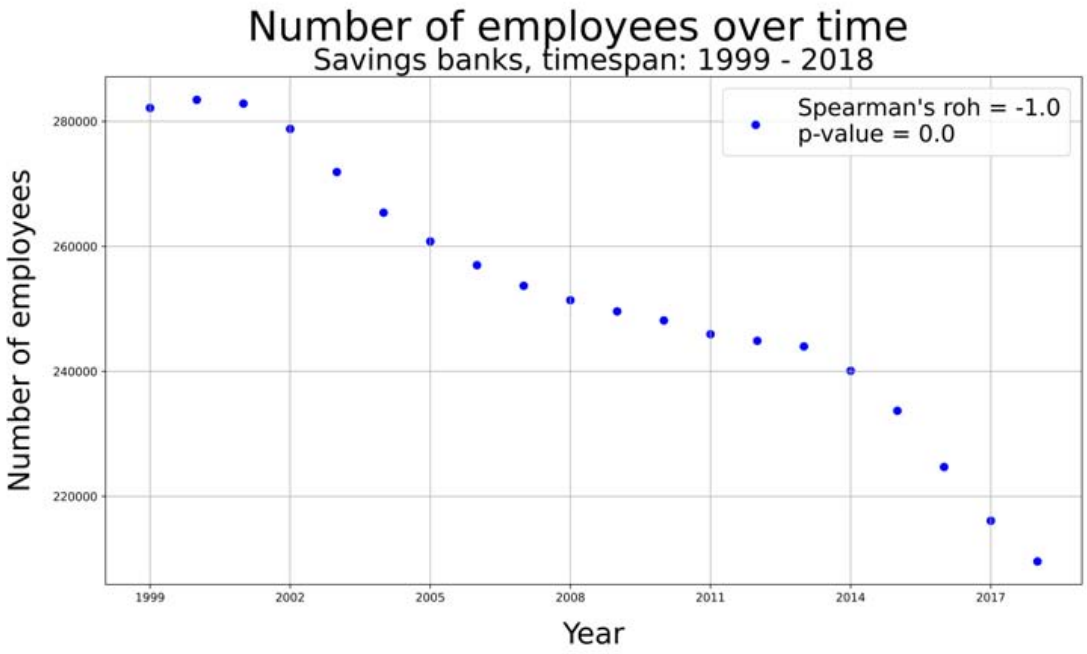

Figure 4: Own representation of the "Number of employees"

The similar trends in the number of institutions, branches and employees in the period under review from 1999 to 2018 are reflected in a high correlation between them.

	Number_of_institutes	Number_of_branches	Number_of_employees
Number_of_institutes	1.0000000	0.9623245	0.9312817
Number_of_branches	0.9623245	1.0000000	0.9842132
Number_of_employees	0.9312817	0.9842132	1.0000000

They express cost reduction measures in the savings banks finance group and are henceforth combined into one factor "cost reduction measures".

For this purpose, three factors are formed by linear combinations with the help of a Principal Component Analysis (PCA).

Importance of components:

	PC1	PC2	PC3
Standard deviation	1.7037	0.29264	0.10858
Proportion of Variance	0.9675	0.02855	0.00393
Cumulative Proportion	0.9675	0.99607	1.00000

The first factor PC1 already explains more than 95% of the variance and combines the statistics "number of institutions", "number of branches" and "number of employees". Consequently, we interpret this factor as a global measure of the cost reduction measures.

Inductive analyses

Methodology

A linear regression model is used to examine the operating ratio, cost-income ratio and return on equity to see whether they changed significantly during the period under review. If this is the case, a second linear regression is used to determine the influence of the cost-cutting measures on these KPIs to determine if a significant influence can be said to exist. The significance level is set to alpha = 0.05.

To take the time series character of the data into account, the tests are carried out with a HAC estimator (heteroskedasticity and autocorrelation consistent). The analysis of the residual plots justifies this methodological approach, since heteroskedasticity and autocorrelation of the residuals are present.

Statistical tests

The operating result of the savings banks fluctuated strongly between 1999 and 2018. For example in 2008 – during the global economic crisis –

the operating income fall back to the level of the year 2000. However, the operating result grew with a clear upward trend until 2018 (see Figure 5).

To distort the results of this analysis by an outlier, the operating result from 2011 was excluded from the analysis of the significance of this trend.

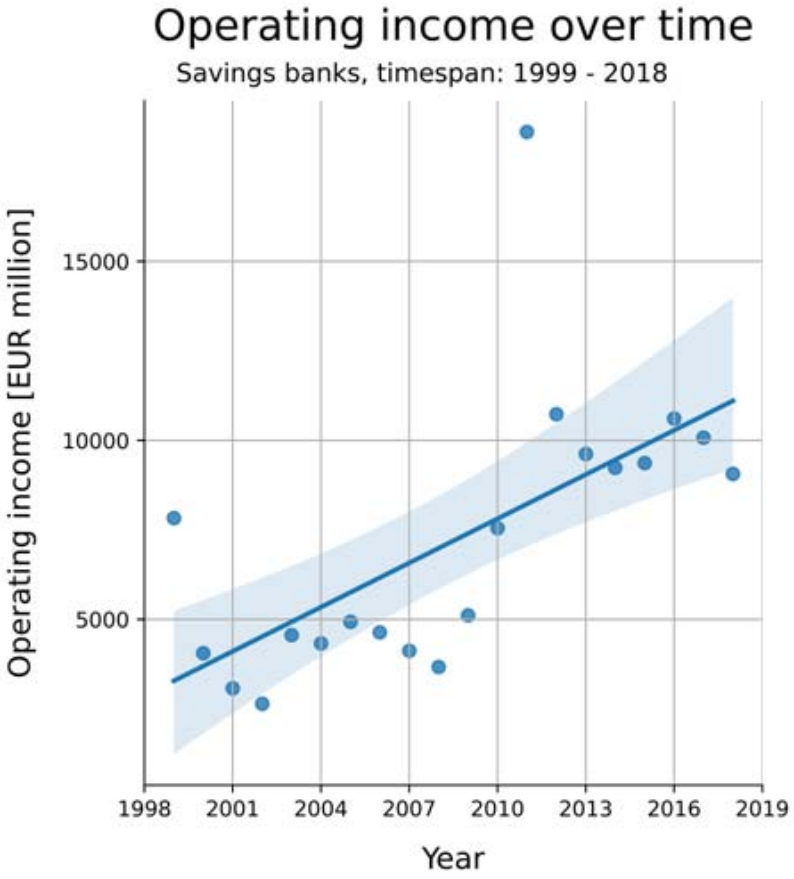

Figure 5: Own representation of the "Operating income"

On average, the operating result of the entire savings banks finance group grew by approximately 370 million euros per year between 1999 and 2018. The significance of the increase can be seen in the p-value $0.003341 < 0.05$ of the explanatory variable Year.

```
t test of coefficients:

              Estimate  Std. Error t value  Pr(>|t|)
(Intercept) -736760.089  166327.055 -4.4296 0.0003671 ***
Year            370.127      82.735  4.4736 0.0003341 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The influence of the cost reduction measures on this increase is later analyzed.

When looking at the residual plot, the autocorrelation of the residuals in the form of a periodic curve is striking (see Figure 6). The HAC estimator takes this anomaly into account.

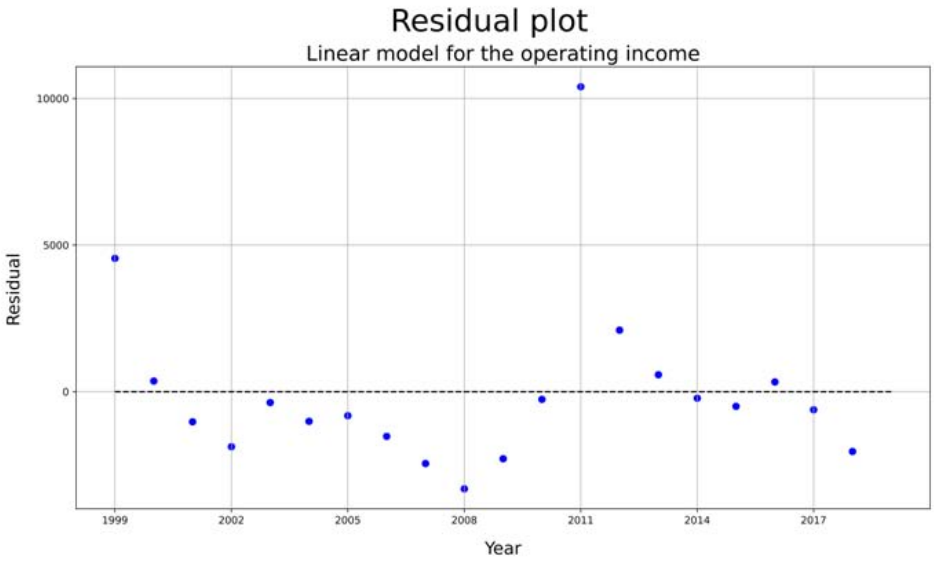

Figure 6: Own representation of the "Operating income" (Residual plot)

The return on equity also fluctuated strongly during the period under review. It reached a temporary minimum in 2008, then recovered again until 2010 and oscillated until 2018 (see Figure 7).

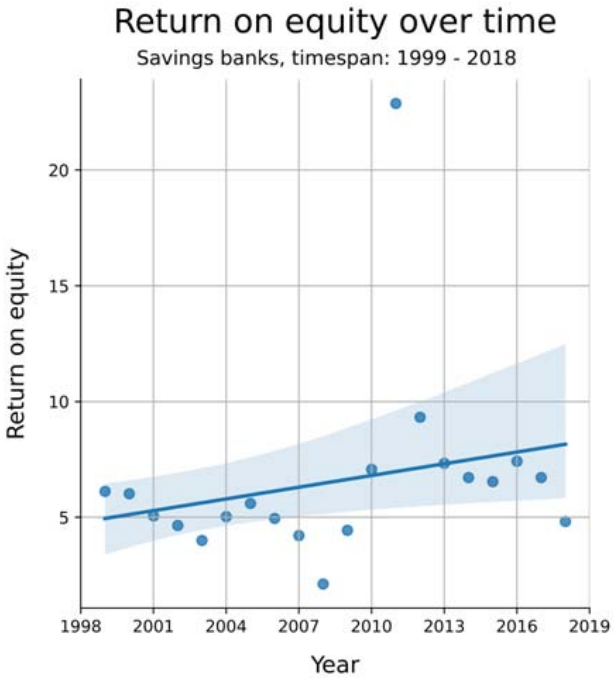

Figure 7: Own representation of the "Return on equity"

Again, the year 2011 is treated as an outlier and thus removed from the analysis.

The return on equity did not change significantly during the period under review, as shown by the p-value 0.07677 > 0.05. Consequently, this KPI is excluded from further analysis.

```
t test of coefficients:

              Estimate  Std. Error t value Pr(>|t|)
(Intercept) -205.445576  112.019049 -1.8340  0.08422 .
Year           0.105129    0.055798  1.8841  0.07677 .
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

The residual plot shows an autocorrelation of the residuals and also a weak form of heteroskedasticity (see Figure 8). The heteroskedasticity shows up as an increasing dispersion of the residuals, which leads to a funnel-shaped residual distribution. This anomaly is also taken into account by the HAC estimator.

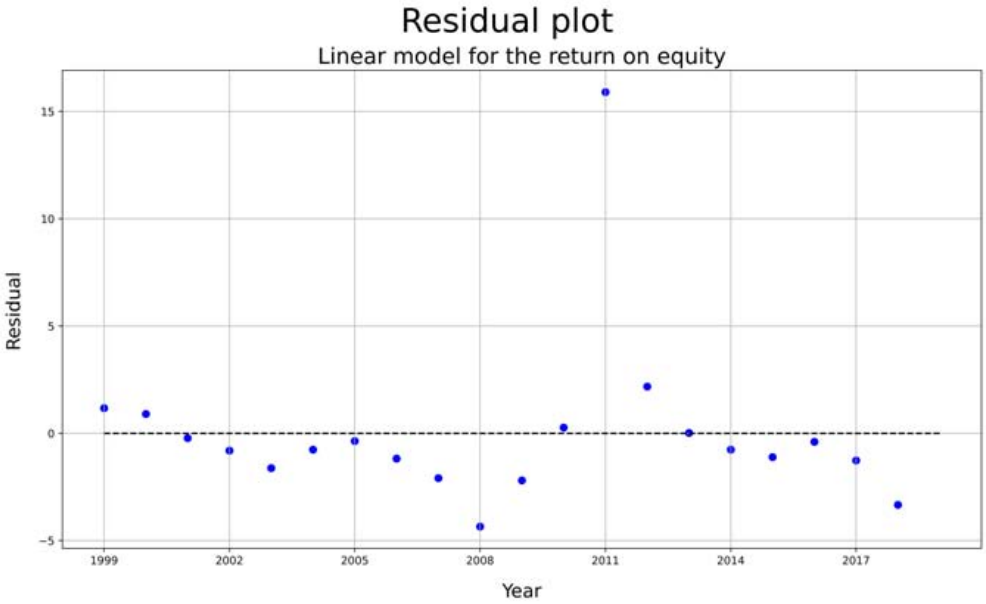

Figure 8: Own representation of the "Return on equity" (Residual plot)

The cost-income ratio also fluctuated strongly throughout the entire period under review (see Figure 9).

A clear trend, whether positive or negative, is not discernible. Here, The year 2008 is not considered an outlier in this time series, since it appears inconspicuous. Instead, a sharp drop in the cost-income ratio occurred with a time lag of two years in 2010, where it fell to the lowest level in the period under review.

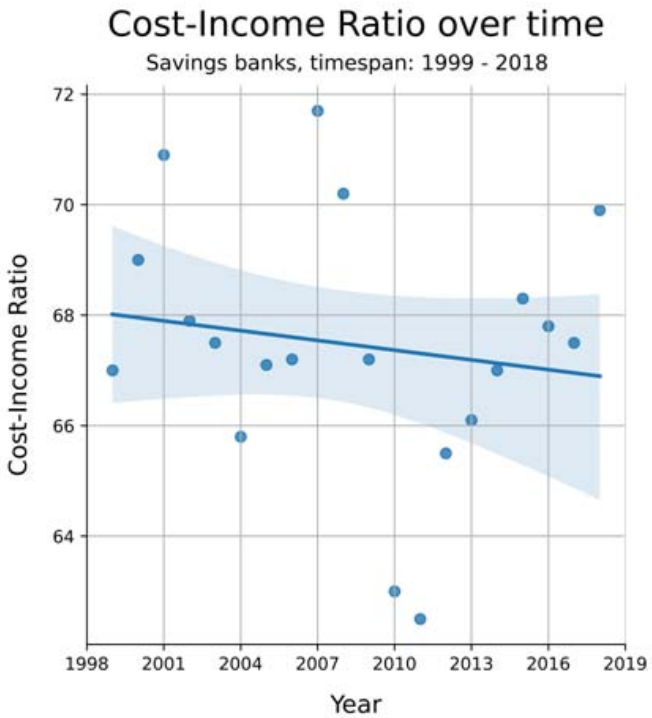

Figure 9: Own representation of the "Cost-income ratio"

The cost-income ratio did not change significantly during the period under review.

The p-value 0.5085 is greater than alpha = 0.05. Consequently, no further analysis is carried out for this KPI either.

```
t test of coefficients:

             Estimate Std. Error t value Pr(>|t|)
(Intercept) 185.699774 174.862382  1.0620   0.3023
Year         -0.058872   0.087269 -0.6746   0.5085
```

The residual plot reveals the autocorrelation of the residuals and again confirms the use of the HAC estimator (see Figure 10).

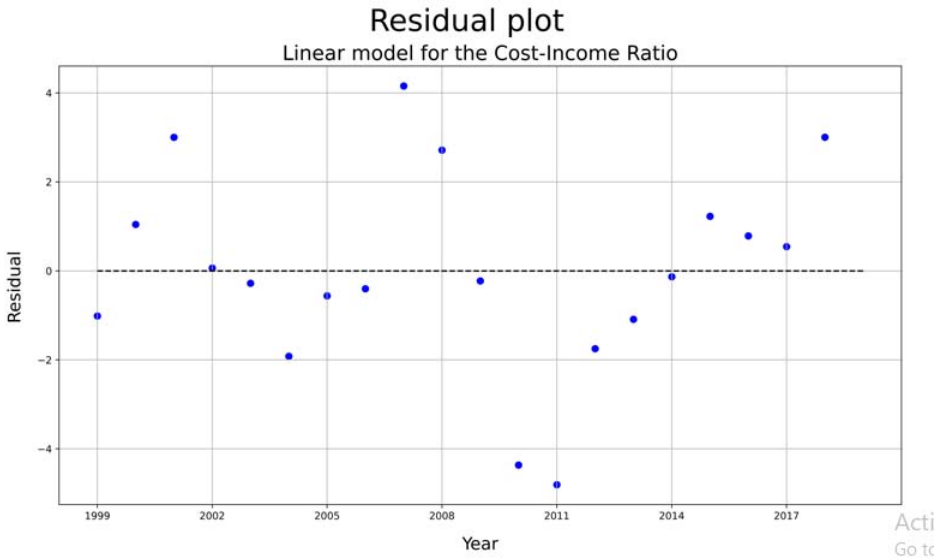

Figure 10: Own representation of the "Cost-income ratio" (Residual plot)

Only the operating result has changed significantly from 1999 to 2018. It is analyzed whether the cost reduction activities are significantly related to the increase in operating profit. The factor cost reduction measures (PC1) from the Principal Component Analysis is used as the explanatory variable.

The cost reduction measures had a significant impact on the operating profit. The p-value of 0.006756 is less than 0.05.

```
t test of coefficients:

            Estimate Std. Error t value  Pr(>|t|)
(Intercept)  6590.68     640.73 10.2862 1.022e-08 ***
PC1          1147.95     372.44  3.0823  0.006756 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

V. Discussion of The Results

To survive, savings banks are increasingly turning to mergers, staff cuts and branch closures to reduce costs. The President of the Federal Association of German Banks, Hans-Walter Peters, expects that up to a quarter of the branches of all banks and savings banks in Germany will be closed in the next few years (Peters, 2018).

As has been pointed out, savings banks have significantly reduced the number of institutions, branches and employees. There are various reasons for this, e.g. a historically unprecedented environment of lowest and negative interest rates in the euro area and Germany (Wolgast, 2016). Based on the available key figures, the reduction of savings banks, branches and employees can be described as a rapid impact due to digitalization.

It was found during the research that only the operating profit changed significantly in the years 1999-2018. For this KPI, a relationship can be established with the cost reduction measures that have taken place due to increasing digitalization. The KPIs cost-income ratio and return on equity, on the other hand, did not change significantly during the period under review. The following research question had to be answered: Are the

cost-cutting measures through branch closures and staff reductions due to the rapid impact of digitalization at savings banks in Germany economically justified about the present operating result, the cost-income ratio and the return on equity? Since two (cost-income ratio and return on equity) of the three ratios to be examined do not show any significant change, it can be stated that the cost-cutting measures are not economically justified.

The role of the branches is under discussion from an omnichannel perspective. Branch closures are without alternatives due to the ever-increasing cost pressure (Waschbusch et al., 2016). Banks and savings banks are also lagging behind other sectors in this context. Omni-channel management in German bank distribution will change significantly and is without alternative (Menrad, 2020).

In recent years, it has become clear that banks in Germany lack a concrete strategy. It would be desirable to find strategies that do not exclusively focus on cost reductions, e.g. through branch closures (Henke et al., 2016). However, the digital strategy of a savings bank only has added value if it promotes investments and bundles resources at the same time. The top management of many companies is hesitant to define a digital strategy. The best digital strategies guide both strategic and operational decisions (Sebastian et al., 2017).

VI. Conclusions

Many banks and savings banks in Germany could miss the boat in the age of digital transformation. On the one hand, external influences such as customer behaviour, customer expectations, technological change, willingness to pay and product life cycles are gaining importance. On the other hand, the internal expectations of employees, e.g. the acceptance of new technological solutions and processes, are rather sluggish. According to a study by the consulting firm McKinsey, traditional banks and savings banks could lose a third of their turnover through competition with FinTech companies (Drummer et al., 2016).

For other reasons, too, there is a need for action. The banking industry is facing an environment in which rapid environmental changes are linked to strict IT governance requirements. Banks have to face ever-stricter regulatory and more complex requirements to be able to limit business risks. To achieve this, robust governance and complex IT infrastructures must also be ensured (Gregory et al., 2018).

Unfortunately, German banks are increasingly neglecting proactive action and serving customer interests. The danger is that banks may no longer be optimally positioned for the future. The more entrenched a banks structures and organiszation are, the more passive it is. The focus will increasingly be on improving profitability alone (Fischer & Arz, 2016).

The banking sector would benefit from the development of different competencies. Commercial banks need to develop their own competencies for each activity in the value chain. This is the only way to make the most of the various technological innovations (Mavlutova & Volkova, 2019).

Examples of opportunities and competencies in the age of digitalization for German savings banks are Big Data & Analytics for forecasting closing probabilities or Virtual Reality Devices for innovative customer advice (Giebe et al., 2019; Hammerström et al., 2019).

In summary, it can be stated that digital transformation is a highly complex matter that affects the entire company. The formulation of a digital transformation strategy remains a crucial success factor (Hess et al., 2016). Digitalization is a process that will accompany banks from now on. Digitalization will continue to be a natural part of daily work and organiszation. From the cleaning lady to the CEO, every employee must develop and demonstrate digital skills (Giebe, 2019).

VII. Limitations and Directions for Further Research

One of the limitations of this research is the set of key performance indicators (KPIs). Only a selection of KPIs could be used. This could be the starting point for further research that examines other KPIs. Another methodological criticism is the selection of the time series. The time window investigated will be outdated and allows for an analogous investigation in the future. The results of this research may be useful as a benchmark paper in this regard.

The COVID-19 pandemic hit Europe at the beginning of 2020, whereas the time series studied ends in 2018. Research regarding the impact of the COVID-19 pandemic can be a value-added endeavour.

A study by Conrad et al. showed that inhabitants of sparsely populated rural regions in particular have comparatively poor digital access. It must be questioned to what extent the savings banks succeed in digitally mapping basic financial services promptly and across the board (Conrad et al., 2017). This means that a part of bank customers cannot be reached digitally by savings banks. The authors suggest taking the clientele of savings banks in Germany into account in further studies. Due to the different regional orientation of German savings banks, the age, gender and place of residence of bank customers, for example, lend themselves as study factors. Another aspect for further research could be the influence of the savings bank brand on possible KPIs. If the enthusiasm of employees for the savings banks (aka Sparkassen) brand grows, employee identification and performance will increase. This performance can in turn positively influence KPIs (Zwerenz, 2019).

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