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Abstract

This paper studies the impact of banks' dividend restrictions on the behavior of their institutional investors. Using an identification strategy that relies on the within investor variation and a difference in difference setup, I find that funds permanently decrease their ownership shares at treated banks during the 2020 dividend restrictions in the Eurozone and even exit treated banks' stocks. Using data before the introduction of the ban reveals a positive relationship between fund ownership and banks' dividend yield, highlighting again the importance of dividends for European banks' fund investors. This reaction also has pricing implications since there is a negative relationship between the dividend restriction announcement day cumulative abnormal returns and the percentage of fund owners per bank.

JEL Codes: G12, G21, G23, G28, G35
Keywords: Dividend Policy, Mutual Funds, Institutional Investors' Ownership, Banking Supervision, COVID-19 Pandemic

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1 Introduction

Institutional investors are usually not known to have a strong demand for dividends in contrast to their retail counterparts (Koijen and Yogo, 2019; Brav et al., 2005). Still, there is evidence that, for example, funds do exhibit a demand for dividends. While Larkin, Leary and Michaely (2017) suggest that funds focus on the second moment of payout streams, i.e the smoothness of dividends, Harris, Hartzmark and Solomon (2015) document that some mutual funds do have a demand for dividends and invest in stocks shortly before the dividend payment. These studies usually exclude financial stocks and focus on non-financial corporations. However, financial corporations, in particular banks, are known to have a higher propensity to pay dividends compared to non-financials (Floyd, Li and Skinner, 2015) and are also known to smooth dividends (Koussis and Makrominas, 2019). Furthermore, even during times of crisis banks are reluctant to cut their dividends (Cziraki, Laux and Lóránth, 2022; Acharya, Le and Shin, 2017; Floyd, Li and Skinner, 2015), making them a good investment object for dividend-demanding investors. This could attract institutional investors with a demand for dividends. Yet, little is known about the relationship between institutional investors of banks' stocks and banks' dividend payments and how they would react when facing exogenously imposed dividend restrictions.

This poses the following research questions, which I will analyze empirically in this paper: How do institutional investors of banks' stock react to exogenously imposed temporary dividend restrictions? If banks have dividend-demanding institutional investors, dividend restrictions could impose reductions in institutional investors' ownership of the affected banks' stocks, as they adjust their portfolio towards dividend-paying banks. Not only long-term dividend restrictions but also temporary restrictions could induce such behavior. As Matyunina and Ongena (2022) highlight, they increase the uncertainty about future policy interventions and therefore the uncertainty of future dividends. Conversely, if these restrictions are seen as a temporary measure, this could also lead to the inaction of investors, since portfolio adjustments in crisis periods can be very costly, and thus it might be better to just ride out the restriction period. Therefore, ownership shares would not be changed and the regulation would not have side effects on the ownership structure of banks. Which of the two mechanisms is at play needs to be tested empirically.

I address this question by analyzing the temporary dividend restrictions in the Eurozone by the Single Supervisory Mechanism in light of the Covid-19 pandemic. Due to financial stability considerations, supervisors around the world imposed dividend restrictions for banks (Hardy, 2021). Using investor-level data and a Khwaja and Mian (2008) style approach, I find that funds decrease their ownership shares after the announcement of the dividend restrictions. The identification strategy to add bank and also *investor times time* fixed effects allows me to control for time-varying investor demand factors and helps to pin down the effect by focusing on the within-investor variation in the data. The estimated effect is even persistent as fund investors do not revert back to their ownership level after the end of the recommendation for a comparable sample of Swiss banks. Furthermore, it is also economically meaningful as funds' ownership decreases by 10% for the restriction period. As this effect is not explained by banks' differences in their default risk, it is unlikely that dividend restrictions raised investors' expectations of higher bank defaults by transmitting a negative signal about the stability of the banks. Likewise, Price/Book values do not explain funds' ownership reductions. This suggests no impact of risk shifting considerations in the spirit of Jensen (1986).

Sample splits for the dividend smoothing proxies do not show a significant effect of high vs low smoothing banks. An analysis of dividend characteristics and fund ownership shares before the ban shows that the significant driver of fund ownership is the dividend yield, as a one percentage point increase in the dividend yield corresponds to an increase in fund ownership shares by 9%. This highlights that funds seem to be interested in dividends per se rather than a smooth cash flow stream provided by dividend-smoothing banks.

Lastly, I also investigate if this reduction in the ownership of fund investors has also implications for affected banks' equity valuations. I find a negative relation between the percentage of fund owners per bank and the banks' cumulative abnormal returns on the announcement of the policy. A higher share of fund owners led to a 7.4 percentage points lower CAR of treated banks. This negative effect still persisted during the announcement of capped dividend payouts and the abrogation of the policy. Highlighting also long-lasting effects on the equity valuation of banks.

This study is related to the literature on dividends and institutional investors. In their survey of firm executives Brav et al. (2005) find, that corporate managers think households are the ones who care about dividends. This is in line with the demand-side approach to asset pricing of Koijen, Richmond and Yogo (2020), where they verify that households have the strongest demand for dividend yields. This paper focuses on institutional investors of banks and finds that funds are the investors who are more interested in the dividend level rather than its stability, as there is no evidence for dividend smoothing impacting funds ownership shares. This is in contrast with the results of Larkin, Leary and Michaely (2017) for non-financial corporations.

Additionally, another related strand of the literature is that on banks' payout policies. Abreu and Gulamhussen (2013) find that dividend payments for US banks are in line with reducing the agency conflict of the free cash flow between shareholders and management (Jensen and Meckling, 1976; Jensen, 1986). Koussis and Makrominas (2019) analyze the dividend smoothing of European and US banks using the Lintner (1956) approach. They find that the agency conflict theory can explain dividend smoothing, but also that banks seem to smooth dividends a bit less than non-financials. Building on this literature, I find that banks are also engaged in dividend smoothing, but to a lesser extent. Cziraki, Laux and Lóránth (2022) analyze the dividend policy of US banks during the financial crisis and document that institutional investors did not push banks to increase their dividend payments in the crisis. While they look at institutional investors' impact on banks' behavior during the financial crisis, I investigate how dividends and their restrictions affect institutional investors' behavior.

This paper also contributes to the existing literature examining the impact of sector-wide dividend restrictions during the Covid-19 pandemic (Hardy (2021); Martinez-Miera and Vegas Sánchez (2021); Dautović, Gambacorta and Reghezza (2023); Andreeva et al. (2021); Kroen (2022); and Vadasz (2022)). Their work focuses on banks' risk-taking behavior and dividend restrictions. This paper is complementary to this literature by looking into institutional investors' reactions. Whereas Hardy (2021) gives a comprehensive overview of the reactions of policymakers around the world, Kroen (2022) finds evidence for a reversal in risk shifting for US banks after the introduction of mainly share repurchase related payout restrictions. The interaction of the regulator, banks, and their investors after the regulator started to intrude into the payout policy of banks is modeled by Vadasz (2022). He shows that such discretionary ex-post interventions could even reduce the positive effects of dividend smoothing on risk management and bank value. Complementary to his findings I document that the temporary dividend restrictions a long-term effect on the ownership structure of the banks. The lending channel of this policy is analyzed by Martinez-Miera and Vegas Sánchez (2021) and Dautović, Gambacorta and Reghezza (2023). While Martinez-Miera and Vegas Sánchez (2021) focus on Spanish banks and use as identification the separation of dividend payers and non-payers during the restriction, Dautović, Gambacorta and Reghezza (2023) use supervisory data on distribution plans of significant institutions in the Eurozone to identify the effect. Both studies find a positive effect of lending to non-financial corporations. Lastly, Andreeva et al. (2021) analyze the impact of this regulation on bank equity valuations using also the supervisory data on distribution plans as Dautović, Gambacorta and Reghezza (2023). They find a negative impact on banks' equity valuations, which is mostly driven by the uncertainty of future distributions and by banks that planned to pay out dividends but cannot live up to investors' demanded returns. Complementary to these findings, I focus on another dimension that could be affected by payout restrictions, the institutional ownership structure of banks and find that banks with a higher fund ownership experience higher drops in their equity valuations.

2 Data

To analyze the reaction of institutional investors to dividend restrictions on banks' I draw on several data sources. The building block of the dataset is the monthly ownership data obtained from FactSet's Ownership database, where I retrieve the total ownership shares of the group of institutional investors, funds, and insiders/stakeholders, but also individual-level ownership data for these three groups. FactSet's source for the ownership builds on quarterly 13F filings and the monthly sum of funds data. 13F filings are a requirement for institutional investors which manage more than $100 million in the US and have a quarterly filing frequency. Thus, I will in the empirical section 3.2 only rely on the sum of funds data when using the monthly frequency of the dataset. Applying this separation prevents the results in the monthly frequency from being downward biased by lower time variation since FactSet carries over values from 13F filings each month within each quarter if no change was reported. Furthermore, it alleviates issues related to selection bias in the owner dimension due to reporting requirements at the cost of lower ownership coverage (see e.g. Steuer (2022) who compares the different reporting requirements in the US and EU and the impact on Factset's reported ownership)[1]. This limitation is also not too restrictive since Table A3 shows that 85% of the observations are not from 13F filers and even for the group of institutional investors, which exhibit a larger share of 13F filers, the data still covers more than half of the observations in this group.

Since some listed institutional investors have associated funds in the data set, I clean the owner-level data for the funds and institution groups as follows: First I change the investor group type to "fund" if the type either contains the keyword "fund", "Mutual Fd" or "Private Eq Fd/Alt Invt". Next, I summarize for each holder group (i.e. *fund*, *institution*, *insider/stakeholder*) the holder type to reduce the number of types. For example, I summarize the types "Pension Fund", "Pension & Life Product" and "Pension Fund Manager" into *Pension Fund*. Given the specialness of pension funds and insurances, I group them into the institutions group for the event study to only capture mutual funds in this group[2][3].

1. In the empirical section 3.2 the identification relies on individual owner-level data and not the total amount of all owners, thus, not having full coverage of all investors is not an issue as long as these investors are not systematically different. This would be the case by only relying on 13F filings for European stocks
2. Figure A4 shows the event study results of pension funds. This group does not react to dividend restrictions. Unfortunately, due to data limitations separate results for insurance companies and insurance funds were not possible.
3. The different investor types for the investor group funds are: Closed-End Fund, ETF, Hedge Fund, Invest Management Corp., Non-Public Fund, Open-End Fund.
The different investor types for the investor group institutions are: Bank Inv. Division, Broker, Family Office, FoundationEndowment, Insurance Company, Insurance Fund, Investment Adviser, Pension Fund, Private Banking/Wealth, Sovereign Wealth Manager.
The different investor types for the investor group insiders/stakeholders are: Company, Emp. Stk. Owners.

To separate the funds from other institutional investors, I retrieve for each reported ownership the associated funds of the owner. Next, I match to each reported non-fund owner the associated funds as reported by FactSet and eliminate 13F sub-filers in case an associated fund is connected with two holders. Finally, I subtract the associated funds' amounts from the institutional owners' amounts and replace the institutional owners' amount with zero if the fund amount is larger. This ensures that the institution category excludes any fund holdings in the monthly data set.

Balance sheet data for the European banks are acquired from S&P Capital IQ, where I rely on the SNL Financials dataset. Market data and the data to calculate the dividend smoothing measures are taken from FactSet. This is then enhanced for the stock market reaction analysis with the daily Fama/French European 3 Factors available on Kenneth French's website[4]. For the analysis using yearly data on the ownership groups in section 3.2.2, I use the yearly reported averages of aggregate ownership by funds reported by FactSet.

To compile the different data sources into a consistent data set, I match the FactSet investor ownership data and market data with the SNL Financial data by using the ISIN of the companies and in case of missing ISINs I fill this with hand-matched data on the Legal Entity Identifier (LEI) and the name. Lastly, Single Supervisory Mechanism (SSM) significance status is matched for each bank by LEI. In case of missing LEIs in SNL I manually fill the matches by name. For the classification of significant institutions (SI) and less significant institutions by the SSM, I relate to the excel and pdf files of March 2020 available on the SSM webpage[5]

In total, the sample contains 66 European and Swiss banks of which four European banks already paid dividends and 12 European banks canceled their dividends before the restrictions leading to 50 sample banks for the empirical analysis. In the investor dimension, the sample covers 5467 fund investors and 1831 institutional investors as of February 2020.

I limit price-to-book values to 20 as Larkin, Leary and Michaely (2017) and omit in

Plan/Trust, Government, Individual, Joint Venture, Non-Profit Organization, Subsidiary, Venture Capital Private Equity.

4. See `https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html`.

5. See `https://www.bankingsupervision.europa.eu/press/publications/html/index.en.html?skey=list`.

the pre-intervention period analysis in section 3.2.2 aggregate ownership above 110 %. I assume that aggregate ownership between 100% and 110% is due to measurement errors and truncate them to 100%. All monetary variables are measured in EUR and the later estimated smoothing measures as defined in section Appendix A1 are winsorized at the 2.5% level.

Insert Tables 1 and 2 here.

Table 1 shows the descriptive statistics for the pre-intervention period for the sample of banks used in this study. Although the institutional investors hold on average 20% of the total share of each bank there are also banks where more than half of their shareholders are identified as institutional investors. Among the institutional investors funds are the largest shareholder as they hold 17% of bank shares. Again the maximum of Fund investors per bank is around 48% indicating that there are banks with almost half of their owners being funds. For the insider category, which also includes the government, we can see that there are banks that are almost completely held by this group. The dividend dimension of the data reveals a substantial dividend yield over the time period of on average 3.6%. The smoothness of the dividend is measured by the variables Speed of Adjustment (SOA) and Relative Volatility (RelVol), which are defined in the Appendix A1. For both measures, a lower value translates into more dividend smoothing. Whereas RelVol captures more how volatile dividends are to their target, SOA captures how fast dividends adjust to a payout target. So investors who prefer a certain dividend level might prefer lower SOA over lower RelVol, since in the latter case the dividend can still be far away from its target. On the other hand, if investors rather prefer a low volatile income they would select lower RelVol over lower SOA. Table 1 shows that the average speed of adjustment is around 0.5. This value is much larger than the one estimated by Leary and Michaely (2011) for non-financial firms in previous years but also compared to the estimate of Koussis and Makrominas (2019) who find an average of around 0.3 for the time period of 1998 to 2016. The measures presented could be higher through the inclusion of the crisis periods in its estimation and the shorter time period under study compared to the other studies. Furthermore, smoothing measured by the volatility of dividends to earnings, RelVol, shows that on average dividends are more volatile than earnings for banks over the time period from 2016 until 2019. Since the median is around 0.8 this indicates that the distribution of this measure is skewed.

3 How Do Institutional Investors React to Dividend Restrictions?

To study the impact of dividend restrictions on institutional investors of banks' stocks I will rely on a quasi-natural experiment to identify the causal mechanism in a difference in difference setup. In particular, I use the dividend restrictions implemented by the SSM in 2020 for the significant banks in the Eurozone as an exogenous shock to the payout policy, where Swiss banks are the control group. I restrict the period under study from 2018 to 2021 and use monthly data.

The SSM dividend restrictions are a good laboratory to analyze the implications of payout restrictions on the shareholder base. First, European banks conduct more dividend-smoothing compared to their US counterparts (Koussis and Makrominas, 2019), which makes them particularly sensitive to dividend restriction policies as they provide a smooth cash flow to their investors. Second, in the Eurozone payout restrictions banned both dividends and repurchases, thereby preventing any kind of payout to the shareholders. This equal treatment among payout methods is important to rule out any shifts to alternative payout methods during that period, which would yield investors still a smooth income stream. Hardy (2021) shows this was not the case for other jurisdictions, as the dividend payments of US banks were largely unaffected in contrast to repurchases which decreased a lot. Third, the Eurozone was among the first regions to implement dividend restrictions, which reduces possible anticipation of this measure by market participants as the Covid-19 pandemic spread out.

3.1 Restricting Dividends in the Eurozone

On the 27th of March, as a response to the threats to the banking sector caused by Covid-19, the ECB released a recommendation that stated that SIs[6] should refrain from dividend payments and share repurchases. This measure was introduced at the consolidated group level of the significant institutions and was at first set until the 1st of October 2020 (ECB/2020/19). The justification for this recommendation was to prevent banks to distribute the freed-up capital of the reduction in the buffer requirements to their shareholders which was announced on the 12th of March in a press release[7] and to make banks, in general, more resilient to the crisis by retaining capital. While at first aimed at SIs, the recommendation ECB/2020/19 also included the expectation that national supervisory authorities should implement this recommendation for the less significant institutions, which many of them did shortly afterward (Beck et al., 2020).

Due to the ongoing Covid-19 pandemic in Europe, also the ESRB issued a recommendation of limiting payouts for financial institutions until the end of the year at their 27th of May meeting (ESRB/2020/7)[8]. The recommendation of the ESRB was more strict since it banned payouts until the end of the year and also implemented restrictions on variable remuneration. The ECB issued, as a response, another recommendation on the 27th of July 2020, which then extended the measures implemented in March until the 1st of January (ECB/2020/35). Furthermore, the variable remuneration restrictions were then also passed on to the banks supervised directly by the ECB via a letter[9].

On the 15th of December the ECB extended the recommendation again since the macroeconomic situation was improving but threats to the banking sector still remained due to the postponed impact on banks' balance sheets (ECB/2020/62). In contrast to the previous

6. A financial institution is classified as significant and then subject to the direct supervision of the SSM by the following criteria: (1) Total assets exceed € 30 bn., (2) is important for the country's economy or the whole EU, (3) total assets exceed € 5 bn. and cross border assets/liabilities to its total assets exceeds 20%, (4) requested or received financial aid from the European Stability Mechanism or the European Financial Stability Facility. See: https://www.bankingsupervision.europa.eu/banking/list/criteria/html/index.en.html

7. See: https://www.bankingsupervision.europa.eu/press/pr/date/2020/html/ssm.pr200312~43351ac3ac.en.html

8. Note that the public was informed later at the 8th of June in a press release of the ESRB: https://www.esrb.europa.eu/news/pr/date/2020/html/esrb.pr200608~c9d71f035a.en.html

9. See ECB press release of 28th July 2020: https://www.bankingsupervision.europa.eu/press/pr/date/2020/html/ssm.pr200728_1~42a74a0b86.en.html

times, the supervisor acknowledged the improved economic situation and allowed again dividend payouts and repurchases, which were limited to a maximum of 15% of the cumulative profit of 2019 and 2020 or 20 basis points of their CET1 ratio at the end of 2020 (ECB/2020/62). This recommendation was valid until the end of September 2021. The official end of the restrictions was then set on the 23rd of July with the recommendation ECB/2021/31, which verified that all dividend restrictions in place were lifted after the 30th of September 2021.

In contrast to this interference into the payout policy of SIs, the Swiss banking supervisor FINMA took a different approach. On the 19th of March mentioned the FINMA for the first time that financial institutions should follow a prudent payout policy[10]. This comment was picked up on the 25th of March, where the warnings of non-prudent payout policies were intensified and recognized that Swiss banks suspended their share repurchase program[11]. Finally, by the end of March issued the FINMA the Guidance 02/2020 which again warned of non-prudent payout policies and summarized the capital relief measures which applied to banks' capital requirements. In contrast to banks supervised by the SSM, the FINMA explicitly stated that if banks make profit distributions, this would lead to a reduction in the capital relief measures by this amount. Therefore, dividend distributions were not ruled out in Switzerland.

These different approaches by the supervisory authorities in the SSM and in Switzerland are a candidate for a difference in difference setup. First, it is important to note that both regions implemented their measures around the same time, i.e. end of March 2020. Furthermore, both implemented relief measures for the capital requirements, which affect the stability and profitability of the institutions due to continued lending in times of crisis when capital ratios could fall. A recent study by Hager and Nitschka (2022) shows that Swiss stock markets behave similarly to ECB policy surprises as stock markets in the Eurozone. This also alleviates the issue that ECB policies like the Pandemic Emergency Purchase Programme (PEPP) drive the difference between the two groups.

10. See FINMA press release of 19th March 2020: `https://www.finma.ch/en/news/2020/03/20200319-mm-corona/`

11. See FINMA press release of 25th March 2020: `https://www.finma.ch/en/news/2020/03/20200325-mm-garantiepaket/`

To rule out voluntary dividend cuts of banks before the ban was announced I went through the bank's ad-hoc announcements and excluded from the treated sample all banks which announced before the dividend ban that they cut their dividends. This ensures that the treated sample only contains banks which are exogenously affected by the dividend restrictions. Furthermore, I leave out also banks that already paid their dividends since these banks pay quarterly or semi-annual dividends and thus the restriction would still apply for the remaining ones, but making the timing of the effect ambiguous[12]. This results in a sample of 50 banks, 26 treated banks and 24 control banks[13].

Figure 1 Panel A shows the dividend yield as dividends over year-end market value and the total dividend yield which includes repurchases for both groups. In the sample of banks, dividends decreased significantly for treated Eurozone banks in the fiscal year 2019, while their Swiss counterparts did not significantly change their dividend yields. This is in line with the recommendation since many banks have not yet decided on their 2019 dividends which would be paid out in 2020. The rebound in the dividend yield in 2020 shows that banks were using the margin given by the SSM in December 2020 for the limited dividend payments, but this resulted in lower dividend yields compared to 2018. Repurchases followed dividends very closely for the treated banks resulting in a parallel path of the dividend yield and the total dividend yield, whereas for the Swiss banks' average repurchases seem to increase over the years although the confidence bands are quite wide.

Insert Figure 1 here.

Since dividends could also just fall because of lower profits which can be distributed, Figure 1 Panel B shows the payout ratio as measured by DPS over EPS and the total payout ratio which includes repurchases in DPS for the two groups. For treated banks, we can see that for the 2019 dividend both payout ratios significantly fall, but in 2020 they already rebound to their previous values. The set of control banks has a quite stable

12. These banks are: Banco Bilbao Vizcaya Argentaria SA (ex-date 7th of April, announced 30th of January), Banco de Sabadell SA (ex-date 1st of April, announced 31st of January), Bankinter SA (ex-date 24th of March, announced 18th of February), CaixaBank SA (ex-date 9th of April, announced 30th of January). There were also banks from other countries that paid dividends in 2020, but these were non-listed banks and thus had missing data for relevant variables.

13. See appendix Table A4 for a list of the banks in the sample

payout ratio except for the year 2016 and 2017 where the payout ratios were not significantly different to zero for Swiss banks[14]. For the event year payout ratios even increased a bit for Swiss banks, which could be due to the pressure on the profitability during the covid crisis. Overall, this indicates that the recommendation was binding for the treated institutions, while Swiss banks' ratios were unaffected.

A first insight into the reaction of the market can be obtained from the dividend futures of European banks. I rely here on the Euro Stoxx Banks dividend future indices for different maturities to capture market expectations about Eurozone banks' dividends[15]. To isolate bank-specific changes from effects that affect the whole market, I divide the Euro Stoxx Banks dividend future indices by the respective Euro Stoxx 50 dividend future indices, where the latter would capture market-wide effects on dividend expectations.

Insert Figure 2 here.

The evolution of the standardized bank dividend future series can be seen in Figure 2 for 2020, 2021, and 2022 contracts. Values are normalized to the values of each series one day before the dividend restriction announcement, i.e. the 26th of March 2020. The announcement of the dividend restrictions at first only affects the expectations about the 2020 dividends since only the 2020 series is decreasing shortly after the announcement. Yet, this decrease is substantial, where after a couple of days the dividend future loses more than half of its value. The expectations about dividends after 2020, which are captured by the 2021 and 2022 series, only decline below their March 26th value at the end of April, coinciding with the release of the first quarter earnings reports of banks. This shows that this measure was at the beginning just seen as a temporary restriction.

Another shock to the expectations was the announcement of the ESRB recommendation on the 8th of June 2020, where all future series decreased. Taking the evolution of the standardized Div. Fut. Banks/Euro 20 into account, this seems to be the point where market participants expected that the SSM dividend restriction will be prolonged since it

14. Note that the negative average payout ratio for Swiss banks is driven by the outlier Bellevue Group AG, which had negative EPS in that period and positive DPS resulting in a payout ratio of -20

15. In February 2020 the constituents of the Euro Stoxx Banks index contained 24 Eurozone banks of which only 2 were not group heads of SI groups: Finecobank S.p.A and Natixis. Therefore, the index is a good proxy of treated banks' dividend expectations.

drops to a similar value as after the official announcement of the extension in July 2020. Interestingly the announcement of the extension seems to impact the futures of 2020 and 2022, but not the 2021 dividend future.

Towards the end of the year, some SSM officials gave interviews to the press, which are captured by the dotted lines in Figure 2. The first of these events occurred on the 5th of November when the head of banking supervision of the ECB Andrea Enria stated that they are in a wait-and-see phase regarding the relaxation of the measures for the next year. On this day the volume traded of the 2021 bank dividend future index increased remarkably as evident in Figure 2 right scale. Furthermore, the 2021 and 2022 standardized dividend future series increased also a lot on this and the following days. Another news article appeared on the 25th of November in the Financial Times, where it was stated, that dividends are possible again next year. Again on this date, both dividend future series increased remarkably, and also the traded volume of the 2021 contract was high. Lastly, one day after the official announcement date, which revealed constrained dividend payments for 2021, the 2021 series decreased while the 2022 series increased. This could be explained by the fact that market participants were not expecting such constrained payouts in 2021, but still, the outlook of making payouts increased the expectations for 2022. Furthermore, Figure A1 in the appendix, which plots the prices of the Euro Stoxx Banks dividend future series, shows that with the announcements of the relaxation measures in November, the dividend future series for 2021 and 2022 started to move back towards their pre-crisis values.

3.2 Event Study Analysis

Having established in the previous section that the restriction was binding for the treated group and that the control group was unaffected, I now turn to the main analysis of the paper, where I investigate investor-level behavior in response to the dividend restrictions. One caveat of this analysis is that there could be concurrent events that affect investor behavior after the announcement (e.g. PEPP announcement). To overcome this issue and to isolate the treatment effect on the investor level I rely on a Khwaja and Mian (2008) style identification strategy. Given the granular investor-level data, I include investor times month fixed effects. These fixed effects control for any time-varying effect per investor, i.e. investor demand side factors, and isolate effects within an investor. This approach is only valid if there are enough investors who invest in treated and control banks. The variable Ratio Treated-Control in Table A3 represents the share of treated banks to all banks in the data an investor is invested in. It is missing if an investor is not invested in any of the sample banks. This number is not zero or one for the 25th percentile to the 75th percentile for all groups except for the insider/stakeholder group, leaving enough heterogeneity in the data for the analysis. I also drop ETF funds for this analysis to prevent a mechanical adjustment in the ownership due to benchmark index constituent changes[16].

One possible issue in the proposed analysis could be that the sample of Swiss banks do not represent a good control group for significant banks in the Eurozone. On the one hand side, the significance status of Eurozone banks is mainly determined by size, whereas in the control group also a large share of small banks are included. On the other hand, Swiss banks could be more resilient by having higher capital ratios and Price/Book values. Although the FINMA mentions in its decision that the Swiss banking sector is resilient, also the ECB stated that European banks are resilient but nevertheless implemented the restrictions. In the end, it is not clear what measures moved the supervisors to their final decisions. It might be that the ECB took measures to limit banks' dividends because larger banks have a higher probability to pay dividends (in particular during crises) as Abreu and Gulamhussen (2013) show or because they have lower franchise values and thus are more exposed to the free cash flow problem. This issue might not be overcome by just controlling for size in the regressions via bank-fixed effects. Furthermore, there could be also unobserved confounders that affect the treatment status and the reaction of investors, for example, Swiss banks could have different business models.

To alleviate these issues I conduct a propensity score matching to make the treatment group and control group of banks more comparable. I use k-nearest neighbor matching with a maximum of two control banks per treated bank and set the threshold for the propensity score to 0.1. I match on the already mentioned size, Price/Book ratio, and the Tier1 capital

16. Figure A4 in the appendix indicates that ETFs were also not affected by the restriction.

ratio values one year before the dividend restrictions, i.e. in 2019. To overcome common support issues I trim the matched sample by excluding all control banks which have a lower propensity score as the lowest propensity score of the treated banks. This effectively drops only one bank. The sample means of the matched treated and control group can be found in Table 3. After trimming, the treated and control group averages are quite similar for the matched variables size, Price/Book ratio, and the Tier1 capital ratio. Additionally, the averages of the smoothing proxies RelVol and SOA, the proxy for the banks' business model Deposits/Assets, and also the percentage of institutional investors holding the bank's stock are very similar. The t-tests of the means for these groups are insignificant and indicate a good match.

Insert Table 3 here.

This matched sample can now be used to look into the overall impact of the regulation, by using a classical difference-in-difference approach. The treatment indicator is split in this setting into three different bins, each representing a different period of the regulation: March to November (restriction), December to June (relaxation), and July onwards (expiration). Since Ownership shares are right skewed and the investor level data also contains zeros, I follow the suggestions of Cohn, Liu and Wardlaw (2022) and apply instead of a $Log(1+y)$ transformation for the dependent variable a Poisson pseudo-maximum likelihood regressions to estimate the effect on ownership percentages. This approach allows me to also include multi-way fixed effects but circumvents the incidental parameter bias. The model is as follows:

$$
\begin{aligned}
Ownershare_{b,i,t} = exp\Big(\alpha &+ \hat{\delta_1} Treated_b \times \mathbb{1}(March - November)_t \\
&+ \hat{\delta_2} Treated_b \times \mathbb{1}(December - June)_t \\
&+ \hat{\delta_3} Treated_b \times \mathbb{1}(July)_t \\
&+ \psi_{11} Treated_b + \psi_{12} \mathbb{1}(MarchtoNovember)_t + ... + \psi_{14} \mathbb{1}(July)_t \\
&+ \phi' X_{b,i,t} + \gamma_{t,i} + \gamma_b + \varepsilon_{i,t}\Big) \qquad (1)
\end{aligned}
$$

Where $Ownershare_{b,i,t}$ is the $\%Ownershare_{b,i,t}$ for investor i at month t in bank b. $\mathbb{1}(March-November)_t$ is an indicator variable for the period March 2020 to November 2020, $\mathbb{1}(December-June)_t$ for the period December 2020 to June 2021, and $\mathbb{1}(July)_t$ for the period on and after July 2021. $Treated_b$ is the treatment group indicator for each bank b. $X_{b,t}$ are bank-level control variables, i.e. the change in the shares outstanding, to eliminate changes induced by the company by issuance or repurchases (for the control group), the exchange rate to EUR. In an additional specification I also add the stock return over the month of a bank, the volatility of the bank's daily stock returns over the past 21 business days to control changes due to the performance of the stocks. $\gamma_{t,i}$ is the investor times month fixed effect to control for investor demand-side effects and γ_b are the bank fixed effects. The coefficients of interest are $\hat{\delta_1}$, $\hat{\delta_2}$, and $\hat{\delta_3}$, which measure the restriction impact, relaxation impact, and the impact after the expiration of the restriction, respectively.

Insert Table 4 here.

Table 4 shows the results for the sample of funds. Column (1) shows the effects of the baseline controls, i.e. change in the shares outstanding and the exchange rates, using only bank and month fixed effects. Here no effect can be detected by the regulation since the interaction terms are all insignificant. Replacing in column (2) the month fixed effects with investor times month fixed effects shows that all the coefficients on the interaction terms become more negative and they all are significant at least at the 5% level, indicating a permanent reduction in the ownership shares of funds after the dividend restriction. Noteworthy is also that the effect seems to increase over time as the coefficient for the restriction phase to the expiration phase increases from -0.11 to -0.36. This represents a decrease in the average fund ownership in the announcement period of $(exp(-0.1057) - 1) * 100 = 10.03$ % per investor. Adding additional controls for risk and return, i.e. the monthly return and the stock volatility, in column (3) does not change the coefficients' magnitude in a meaningful way and has no impact on the significance of the coefficients.

While Funds seem to be immediately affected by the restriction, Table 5 shows the results for institutions other than funds. Again column (1) show the results with only bank and month fixed effects, while (2) and (3) use investor time month and bank fixed effects. Across the specification, there seems to be no effect on institutions as all interaction terms are insignificant. This is in line with the findings of Larkin, Leary and Michaely (2017) and Harris, Hartzmark and Solomon (2015) which find that funds are investors who demand dividends.

Due to the dynamic nature of the treatment effect of the restriction, I also estimate an event study Poisson pseudo-maximum likelihood regression to see the evolution of the treatment effect. In particular, I follow Freyaldenhoven et al. (2021), where the setting under study has the advantage of no staggered implementation. Let τ be the month of the implementation of the restriction, i.e. March 2020, then the event study model is as follows:

$$
\begin{aligned}
Ownershare_{b,i,t} = exp\Big(\alpha + \beta_{-14}\mathbb{1}(t \leq \tau - 14) + \sum_{k=-13}^{15} \beta_k \mathbb{1}(t = \tau + k) + \beta_{16}\mathbb{1}(t \geq \tau + 16) \\
+ \delta_{-14}\mathbb{1}(t \leq \tau - 14) \times Treated_b \qquad (2) \\
+ \sum_{k=-13}^{15} \delta_k \mathbb{1}(t = \tau + k) \times Treated_b \\
+ \delta_{16}\mathbb{1}(t \geq \tau + 16) \times Treated_b \\
+ \phi' x_{b,t} + \gamma_{t,i} + \gamma_b + \varepsilon_{i,t,b}\Big) \qquad (3)
\end{aligned}
$$

Where $Ownershare_{b,i,t}$ is the $\%Ownershare_{b,i,t}$ for investor i at month t in bank b. $Treated_b$ is the treatment group indicator for each bank b. $X_{b,t}$ are bank-level control variables, i.e. the change in the shares outstanding, to eliminate changes induced by the company by issuance or repurchases (for the control group), and the exchange rate to EUR.

$\gamma_{t,i}$ is the investor times month fixed effect to control for investor demand-side effects and γ_b are the bank fixed effects. The coefficients of interest are in the array of $\{\delta_k\}$, where δ_{-13} captures all time periods on and before February 2019 and δ_{-13} to δ_{-1} would capture pre-event trends one year before the implementation and help to identify if the parallel trend assumption is violated. The impact of the dividend restrictions is captured by the coefficients δ_0 to δ_{15} because they span the time horizon from March 2020 to July

2021, when it was announced that the dividend restriction was not extended. To overcome the multi-collinearity issues associated with the indicator variables, I follow the suggestion of Freyaldenhoven et al. (2021) and normalize the event study plots' coefficients to the February 2020 value, given that the impact of Covid-19 on financial markets in Europe began in February. Furthermore, I add sup-t confidence bands proposed by Montiel Olea and Plagborg-Møller (2019) for the event study plots to rather draw conclusions on the joint significance of the event path than its individual significance at certain points in time.

Insert Figures 3 here.

The event study plots of the regression model described in equation (2) can be found in Figures 3 Panel A and B for each sub-sample, while the regression tables are Table A1 and A2 in the Appendix A3. For funds, in Panel A of Figure 3 the pre-announcement coefficients are insignificant and are around zero. While the March 2020 coefficient shows no significant change, from April 2020 onwards the ownership shares of funds in treated banks decrease. The point estimates are also significant at the 5% level from May onwards and indicate a permanent decrease of funds ownership shares in treated banks. Also, the joint significance bands from June onwards are significant at the 5% level. The estimates show that individual funds decreased their ownership shares by around -19% in December 2020 which then even increased to around -30% in June 2021. In contrast to the effect evident in Figure 3 Panel A, the results for institutional investors in Panel B shows no significant effect.

As in Table 4 adding the stock return of the previous month and the daily return volatility does not alter the results as evident in Appendix A3 Figure A2 Panels A and B.

The previous estimates showed the combined effect on the intensive and extensive margin. While this shows the average treatment effect on fund ownership, it is also interesting to look into the extensive margin effect of this regulation. Appel, Gormley and Keim (2016) show for example a positive effect on governance by having fund investors and Pathan et al. (2021) show that fund investors reduce the riskiness of banks, and thus have a positive effect on the banks' stability. Therefore, an exit of fund investors could have negative side effects. Figure 3 Panel C, shows the linear probability model estimation of equation

(2) where the dependent variable has been replaced by an indicator variable being one if investor i is invested in the bank b at time t and the right-hand side of the equation has been transformed logarithmically. The pseudo probability significantly decreases after the dividend restrictions were in place until February 2021 when one considers the joint significance bands. In December the estimate is around -0.15, indicating an exit by fund investors. Panel D shows the results for institutional investors other than funds. Here we can also see a significant decrease in the pseudo probability, although the decrease is more abrupt, smaller, and reverts in March 2021. The effect is not as pronounced as for fund investors, since the largest effect is estimated in March 2021 and amounts to a reduction of 0.11.

Appendix A3 Figure A3 also shows the results for the unmatched sample. Here again, institutions do not adjust their ownership shares in banks. However, the reaction of funds is lower and not persistent. Only from June to August 2020 using the point estimates confidence bands there is a significant effect as evident in Figure A3 Panel A.

3.2.1 Are Some Banks More Affected Than Others?

Given the results in the previous section that fund investors reacted to dividend restrictions by reductions in the ownership share, we will now have a closer look if some banks are more affected than others. Given the evidence by Larkin, Leary and Michaely (2017) it could be that banks that smooth their dividend stream are more affected compared to non-smoothers. This would highlight the dividend smoothing channel of investors, as dividend restrictions are strongly impacting the smoothness of the cash flow streams to investors. If instead, funds are only interested in the dividend yield, we would expect that banks with higher pre-intervention dividends experience a higher reduction in the ownership of funds. Furthermore, low capitalization or low Price/Book values could also explain the exodus of funds if the underlying problem of the exit is instead the free cash flow problem between shareholders and management (Jensen and Meckling, 1976; Jensen, 1986). Lastly, if the dividend restrictions are signaling to investors that banks are not resilient, one would expect that banks with a lower distance to default or capitalization would experience a higher reduction in the ownership of fund investors.

Therefore, I introduce now a triple difference model where I interact the interaction terms of equation (1) with an additional indicator variable representing different bank characteristics:

$$\begin{aligned}
Ownershare_{b,i,t} = exp\Big(\alpha &+ \hat{\delta_1} Char_{b,t} \times Treated_b \times \mathbb{1}(March - November)_t \\
&+ \hat{\delta_2} Char_{b,t} \times Treated_b \times \mathbb{1}(December - June)_t \\
&+ \hat{\delta_3} Char_{b,t} \times Treated_b \times \mathbb{1}(July)_t \\
&+ \hat{\delta_2} Char_{b,t} \times \mathbb{1}(March - November)_t + ... \\
&+ \hat{\delta_3} Char_{b,t} \times Treated_b \\
&+ \psi_{11} Treated_b \times \mathbb{1}(March - November)_t + ... \\
&+ \phi' X_{b,i,t} + \gamma_{t,i} + \gamma_b + \varepsilon_{i,t}\Big) \qquad (4)
\end{aligned}$$

Where $Ownershare_{b,i,t}$ is again $\%Ownershare_{b,i,t}$ and $Char_{b,t}$ is the indicator variable for the different bank characteristics under study: The below median value of the matched sample of either RelVol, SOA or the dividend yield in the fiscal year 2018, the below median value of the Price/Book, the Tier 1 capital ratio and the logarithm of the Z-score in 2019. $Treated$ is one for banks who are subject to the restrictions and did not already pay out dividends in 2020 or cut their dividends before. $X_{b,t}$ are the same controls as in equation (1).

Insert Table 6 here.

Table 6 shows the results for the average effect of $Char_{b,t}$ being the below-median value of either RelVol, SOA or the dividend yield. For the speed of adjustment measure of smoothing, column (1) shows that there is no significant effect for the triple interaction terms during the whole period. The same holds for the smoothing measure of RelVol in column (2) as there is no significant effect on all conventional significance levels. Taken together, this indicates that dividend smoothing does not seem to drive the results, since there is no significant effect across the smoothing proxies. Regarding the dividend yield, we would expect that banks with lower dividend yields should have a positive coefficient for the triple interaction term. Column (3) of Table 6 shows that for the announcement period and the relaxation period, the point estimates are negative but insignificant. However, there is a negative significant coefficient for the relaxation period from December to June. This effect should be taken with caution as the event study plots for this specification in Figure A5 show that there was a slight negative trend before the interaction and also the monthly estimates are also insignificant using the joint significance bands for the whole event study path.

Insert Table 7 here.

Table 7 shows the results for banks with low Price/Book values in column (1), low distance to default as measured by $Log(Z - Score)$ in column (2), and low capitalization in columns (3). If risk shifting is the driver of the results one would expect a negative coefficient on the low Price/Book values. However, column (1) 7 displays no significant effect of the triple interaction term of the Price/Book value. Conversely, if investors are exiting the bank only because the dividend restrictions are a negative signal about banks' resilience one would expect a stronger reduction for banks with a low $Log(Z - Score)$ or capital ratio. Columns (2) and (3) indicate that there is no differential effect for these two measures suggesting that the negative signal story is not at play.

3.2.2 What Affected Fund Ownership Before The Intervention?

The previous findings suggest that fund investors of banks have a demand for dividends, but not smooth dividends, and thus exit banks' stocks after the announcement of the dividend restrictions. One drawback of the previous analysis could be that there is not enough variation left to identify the effect of the dividend smoothing due to the small sample size of the matched sample in this specification. To still shed further light if fund investors have a demand for the dividend yield or smooth dividends, I buttress the analysis by looking at the determinants of fund ownership of European banks before the dividend restriction period. If the driver of the exit was that fund investors want to receive a smooth cash flow stream, I would find a negative impact of the dividend smoothing proxies on fund ownership already before the restriction period. Conversely, if fund ownership is rather driven by the dividend yield, there would be a positive relation between the dividend yield and fund ownership even before the restriction. To disentangle the two mechanisms, I use a similar approach as Larkin, Leary and Michaely (2017) and regress aggregate fund ownership at the bank level on dividend smoothing proxies, the dividend yield, and other control variables over the period from 2016 until 2019 using the following model:

$$FundShare_{b,t} = exp\Big(\beta_0 + \beta_1 Smooth_{b,t-1} + \beta_2 Div.Yield_{b,t-1} + \delta' X_{b,t-1} + \gamma_c + \varepsilon_{b,t}\Big) \quad (5)$$

Where $Smooth_{b,t-1}$ is either $SOA_{b,t-1}$ or $RelVol_{b,t-1}$ of bank b at year $t-1$. $Div.Yield_{b,t-1}$ is the dividend yield of bank b at year $t-1$. $FundShare_{b,t}$ is the ownership share of funds for each bank and year. I control in this setting for lagged investor controls contained in $X_{b,t-1}$. Namely, the Price/Book ratio, the stock return over each last fiscal year as a proxy for momentum, the daily stock price volatility over the last year for risk, size as measured by the logarithm of total assets at the end of the fiscal year, and return on assets as a measure of profitability. On top of these investor-level controls, I add bank-specific controls which are the Tier 1 capital ratio as a measure of riskiness and proxy for being affected by regulatory payout restrictions due to insufficient capital, and the deposits to asset ratio as a proxy for banks' business model but also liquidity. Finally, I also include country-level fixed effects γ_c to account for the existing time-invariant differences in the ownership structure of banks in each country driven by for example its legal framework.

During the time period under study, banks received bailout money or were still funded with these funds. Given that Tsyplakov et al. (2021) show that some European banks received capital injections, also via common stock, and have subsequently been subject to dividend restrictions in the aftermath of the financial crisis, I check if any bank in the sample was affected by it. While dividend restrictions would not be an issue per se, since these are captured by the smoothing and dividend yield variables, one serious concern could be that omitting these equity capital injections could lead to omitted variable bias and endogeneity.

Any capital injection via common shares leads to a reduction in the ownership share of the existing investors. If these injections are also accompanied by common dividend restrictions, then they simultaneously affect ownership shares and the dividend variables. Relying on the information presented by Tsyplakov et al. (2021) and Homar (2016), for the time period under study, none of the sample banks were affected by bailouts.

Insert Table 8 here.

The results are presented in Table 8. The estimations in columns (1)-(2) use the SOA measure for dividend smoothing, while columns (3)-(4) use RelVol. Column (1) reveals that the only significant drivers of fund ownership are the dividend yield, the previous years' return volatility, and the size of the bank. Dividend smoothing does not significantly impact fund ownership, although the sign is as expected. The point estimates of the dividend yield show that a one percentage point increase in the dividend yield leads to a 9.9 % increase in the average aggregate ownership of bank stocks by funds. Using the additional set of controls in column (2) confirms the findings in column (1) although the point estimates are slightly lower. In the specification with RelVol in columns (3)-(4) there is a significant negative effect at the 10% level for the dividend smoothing proxy RelVol. As in columns (1)-(2), the dividend yield, the previous years' return volatility, and the size of the bank also show positive significant coefficients, which are similar in magnitude. Column (4) using RelVol and the full set of controls also shows a positive significant effect at the 10% level of the return on assets.

All in all, Table 8 indicates that fund ownership seems to be driven rather by the dividend yield than the smoothness of the dividends as there is no consistent significant effect across the smoothing proxies. This corroborates the previous findings and shows that dividend smoothing is not the main motive for fund investors to invest in banks' stocks. Furthermore, it shows that the findings of Larkin, Leary and Michaely (2017) do not hold for non-financial corporations. and that funds invested in banks' stocks do have a demand for dividends that motivated them to exit the stocks during the dividend restriction period in 2020.

These findings indicate two things. At first, dividend smoothing banks have higher ownership shares of funds. This is also in line with the findings of Larkin, Leary and Michaely (2017) for non-financial firms. Second, the dividend yield does not seem to be important for the ownership shares of these groups. This suggests that only the second moment of the dividend stream seems to matter and not the dividend yield for fund investors.

3.3 Implications of Funds' Exit On Treated Banks Equity Values

Kroen (2022), Hardy (2021) and Andreeva et al. (2021) analyzed the impact of the announcement of the dividend restrictions across different jurisdictions. They all find that the announcement had a negative impact on the stock returns of banks. Different from their approaches, I study how funds reduction in bank stock holdings impacted the stock market reactions to the dividend restrictions.

To estimate the effect I follow the standard event study literature to calculate cumulative abnormal returns for the event (see e.g. MacKinlay (1997)) using daily data. The events under study are the announcement date and the two stages where the dividend restrictions have been relaxed. To identify the relevant event dates I use FactSet's News 2.0 database to select all news related to the dividend ban[17].Furthermore, I included interviews given by the SSM which also include the relaxation of the dividend restrictions available on their webpage[18]. This strategy reveals that the announcement on the 27th of March 2020 came surprising since I could not identify news before the announcement regarding dividend restrictions of the SSM. On the other hand, before the dividend restrictions have been officially reduced or completely abandoned I could identify a couple of news articles and interviews that already indicated a relaxation of the dividend restrictions. These are for the first relaxation in December: The 5th of November where Enria pointed towards the wait-and-see strategy regarding the lifting of the restrictions, the 25th of November 2020 where the Financial Times article pointed to the possibility of payouts in 2021, the 3rd of December 2020 where in El Confidential the limits to the 2021 dividends were first

17. I filtered the news by the keywords "ECB", "European Central Bank" and "dividend" and used them as relevant sources Street Account, Press Releases, Events, Sector focus News, Crunshbase News, and FactSet Flashwire.
18. See: `https://www.bankingsupervision.europa.eu/press/interviews/html/index.en.html`

mentioned, and the official announcement on 15th of December 2020[19]. For the official abrogation of the policy in 2021 these are: The 16th of June 2021 Enria mentioned that the ban ends soon, 1st of July 2021 where the outlook of end in October was given, and the official announcement on the 23rd of July 2021.

To calculate abnormal returns I use daily stock returns from stock prices adjusted for splits and dividends of the 50 sample banks in EUR. I subtract the one-month Euribor, transformed to daily returns, to get the excess return $R_{i,t}$ over the risk-free rate. The abnormal returns are then defined as:

$$AR_{i,\tau+t} = R_{i,\tau+t} - E[R_{i,\tau+t}] \tag{6}$$

Where $AR_{i,\tau+t}$ is the abnormal return of bank i, t days after the event date τ and $E[R_{i,\tau+t}]$ is the expected stock return. For the three policy changes, I set τ to the above-mentioned event dates under study[20].

$E[R_{i,t}]$ is estimated using the Fama French 3 Factors from Kenneth French website[21].

$$E[R_{i,t}] = \hat{\alpha}_i + \hat{\beta}_i Mkt_t + \hat{\gamma}_i HML_t + \hat{\delta}_i SMB_t \tag{7}$$

where the $\hat{\alpha}_i, \hat{\beta}_i, \hat{\gamma}_i, \hat{\delta}_i$ are the estimated coefficients of the Fama French 3 Factors model run independently on each stock. Since I am looking at EUR returns and European investors, I transform the US dollar Fama French factors to EUR factors using the approach of Glück, Hübel and Scholz (2020).

I use three different estimation windows for $E[R_{i,t}]$. For the restriction event, I use 250 trading days before the 27th of March until the 25th of March 2020, for the relaxation

19. I focused after the 25th of November only on the news which mentioned a relaxation of the restrictions or included additional information about it.

20. To incorporate possible anticipation effects of the news I start the event windows one day before the news announcement. For the official announcements, I use the event day as starting point since the official announcements were released after market closing.

21. During the estimation period, the CAPM only achieved an adjusted R^2 of less than 0.04 on average using the European market factor of Kenneth French, whereas the 3 Factors model has an adjusted R^2 of more than 0.16 on average. This indicates that the CAPM might not be a good model to explain stock returns in this period

I use 250 trading days before the 4th of November until the 2nd of November 2020, and for the last event the relief of the measure I use 250 trading days before the 15th of June until the 11th of June 2021. This ensures that I use 248 days for the estimation and that the estimation windows are very close to the first announcement date of the three specific events[22]. Cumulative abnormal returns $CAR_{i,-1,1}$ for bank i starting 1 day before and ending one day after the event days mentioned above are then calculated as follows:

$$CAR_{i,-1,1} = \sum_{t=-1}^{1} AR_{i,\tau+t} \tag{8}$$

These are then used in a cross-sectional regression where I interact the treatment indicator with an indicator variable that is equal to one for high fund ownership to test if there is a differential effect on the valuations:

$$CAR_{i,-1,1} = \alpha + \beta_1 Treated_i + \beta_2 D_{i,k} + \beta_3 Treated_i \times Fund_i + \gamma MktValue_i + \epsilon_i \tag{9}$$

Where $Treated_i$ is an indicator variable for being in the treated sample and $Fund_i$ is an indicator variable for the median split share of the percentage of fund owners in February 2020 of the bank, $MktValue_i$ is the market value of the bank in Euro at the beginning of the event.

Insert Table 9 here.

The results for the different event days are displayed in Table 9. Panel A shows the estimates for the average treatment effects of the dividend restrictions on banks' stock returns. The announcement of dividend restrictions, on the 27th of March, shows an insignificant negative point estimate. Although the sign of the estimate is expected, this suggests that the dividend restrictions did not have a negative impact on banks' stock returns. Also, the announcements of the relaxation of the policy, where limited dividend payments were allowed, show no significant impact. Lastly, for the relief announcement event days there is no

22. Note that this ensures for example that the announcement of the SNB's COVID-19 refinancing facility for banks and the Swiss government's loan guarantee program on the 25th of March are included in the estimation window. These measures would have positively affected Swiss banks' stock returns. See: https://www.snb.ch/en/mmr/reference/pre_20200325/source/pre_20200325.en.pdf

significant impact on the two days where the abrogation of the policy was indicated. However, on the official announcement day, there is a positive significant effect of 2.46 percentage points in abnormal returns at the 1 % level.

Panel B focuses on the interaction of the fund ownership share and the average treatment effects. Given the results in the previous section, we would expect a negative impact of fund ownership on the treatment effect. Indeed, the first column in Panel B shows that banks with high fund ownership have 7.4 percentage points lower treatment effect compared to banks with low fund ownership. Taken together with the positive treatment effect estimate of 1.7 these results indicate that the treatment effect for banks with a high fund ownership on the CAR is -5.7 percentage points. This indicates that the previously identified reduction in the ownership of funds also has pricing implications for the banks.

For the first relaxation event date, i.e. the 5th of November when the relaxation was first mentioned in the news, there is no significant differential effect by fund owners. This holds also for the news announcement on the 25th of November. However, on the 3rd of December, when the limits of the possible distributions were first mentioned in the news, and also on the official announcement date on the 15th of December, there is again a significant negative coefficient on the interaction term of the treatment indicator and high fund ownership at the 5% level. For the 3rd of December, the treatment effect for banks with a high fund ownership is around 4.8 percentage points lower indicating a negative treatment effect of -1.9 percentage points for banks with high fund ownership. For the official announcement date, the coefficient has a magnitude of around 3.2 percentage points indicating a negative treatment effect for high fund ownership banks of only -0.9 percentage points. Interestingly banks with low fund ownership have a significant positive treatment effect at the 10% level on the official announcement date of 2.4 percentage points. This suggests that fund investors were expecting higher payouts in 2021, compared to the payouts allowed by the supervisor.

Lastly, on the days associated with the final abrogation of the policy, i.e. the 16th of June, the 1st of July, and the 23rd of July 2021, only the official announcement date has a significantly different treatment effect for high fund ownership banks at the 5% significance level. Treated banks with high fund ownership have around 3 percentage points lower CAR than treated banks with low fund ownership.

The results presented so far suggest that fund investors sold their stocks on the announcement of the dividend restriction period, resulting in lower CARs for treated banks with more fund owners although there is not an overall significant negative CAR observed for treated banks. This finding is in line with the permanent decrease in ownership shares for the matched sample. The results of the release of the information about the level of the restricted dividends in December 2020 and the official announcement of it indicate that there were higher expectations about the level of restricted dividends by fund investors. The official announcement of the abrogation of the policy led to an overall significant CAR for treated banks of 2 percentage points. Still, banks with a higher share of fund owners did not experience such a strong increase, as probably fund investors were not that optimistic about the end of the policy, as they experienced a 3 percentage point lower CAR. This can be rationalized by future expectations about dividend policy intrusions.

4 Conclusion

As a response to the 2020 COVID crisis, regulators around the world restricted banks' dividends to increase their resilience. This policy intervention created a laboratory to investigate if institutional investors of banks' stocks have a demand for (smooth) dividends, as previous evidence on institutional investors' dividend demand is mixed. In this paper, I analyzed how banks' investors reacted to the dividend restrictions announced in March 2020 in the Eurozone.

Relying on the quasi-natural experiment set up by the action of the SSM, I detect a decrease in funds' ownership shares in treated banks' stocks, whereas other institutional investors do not change their ownership shares. Results from a matched sample show that this effect seems to be permanent, leading to a decrease of around 19 percent in December 2020. Regarding the extensive margin, event study results also showed that funds exited treated banks over time. While the restrictions only have been temporary, the permanent decrease of funds ownership shares can be explained by the expectations about future payout policy intrusions, that shy away dividend demanding fund investors. Further evidence on the pre-intervention determinants of fund's ownership indicates that the effect is driven by fund investors' demand for the dividend yield rather than smooth dividends. Therefore, the findings of Larkin, Leary and Michaely (2017) do not seem to hold for non-financial corporations.

The reaction of funds also had an impact on banks' valuations at the announcement of the dividend restriction. A higher share of fund owners led to a 7.4 percentage points lower CAR of treated banks on the announcement of the restriction. This negative effect still persisted during the announcement of the limited dividend payouts and the abrogation of the policy. Implying also long-lasting effects on the equity valuation of banks.

These findings also have policy implications. If dividend-demanding fund investors represent a large share of the ownership base of banks, dividend restrictions lead to large drops in the equity valuation of these banks. While the restrictions were advertised to increase the resilience of the banks, the drop in market values could offset the positive effect of the retainment of the dividend in the crisis period. Thus, possibly increasing the fragility of the banks in these times. Therefore, policymakers should take into account the ownership structure of the banking sector when conducting such policies.

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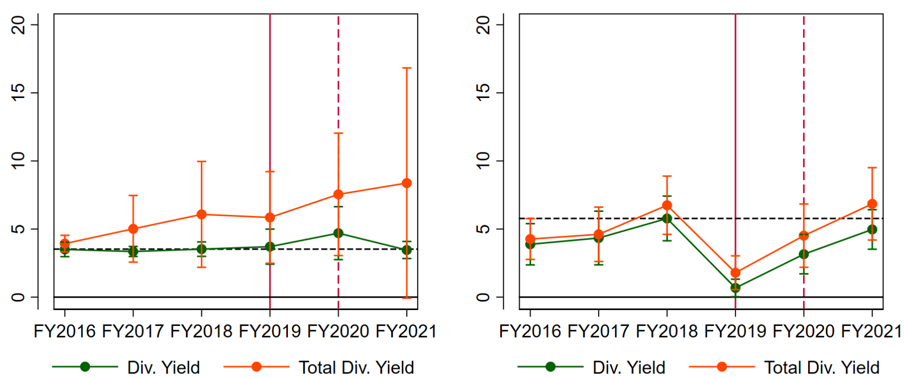
5 Figures

Figure 1
Dividend Yields of Treated and Control Banks

Figure 1 shows the mean dividend yield in percentage points and dividend payout ratios in percentage points for the control and treated banks over the timer period 2016-2021 for 50 banks. Panel A displays the dividend yield in percentage points, measured by dividends over the fiscal year-end market value of the bank, and the total dividend yield in percentage points, measured by the dividends and repurchases over the fiscal year-end market value of the bank. Panel B displays the dividend payout ratio in percentage points, measured by DPS over EPS, and the total payout ratio in percentage points, measured by DPS and Repurchases per outstanding share divided by EPS. The left-hand side graph displays the values for the control group, whereas the right-hand side graph displays the values for the treated group. The dashed horizontal line indicates the average value of the plotted variable in 2018. The whiskers report the 95% confidence bands of the unconditional means.

Panel A Dividend Yields

Control Treated



Panel B Payout Ratios

Control Treated

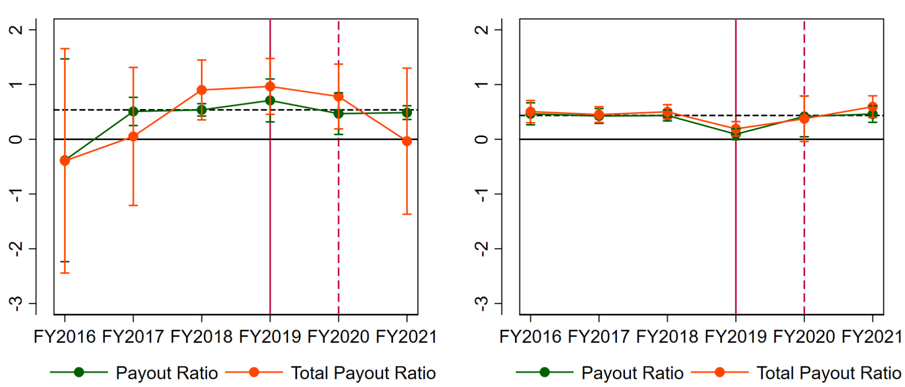


Figure 2
Normalized Bank Dividend Future Response 2020

Figure 2 plots the ratio of the Euro Stoxx Banks over the Euro Stoxx 50 dividend future indices for different maturities and the volume of the Euro Stoxx Banks dividend future for the year 2021. The dividend future series are normalized to their respective values on the 26th of March 2020. The solid red lines indicate the official announcement dates related to the dividend restrictions, the dashed lines indicate ESRB dividend recommendation and the dotted lines indicate news regarding the dividend restriction relaxation.

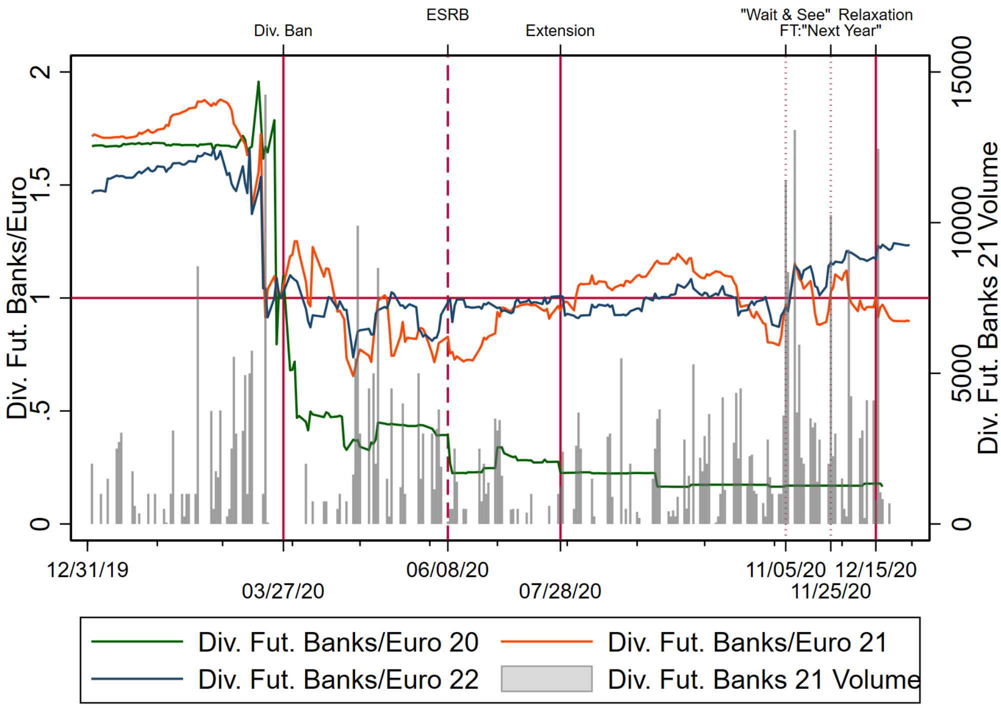
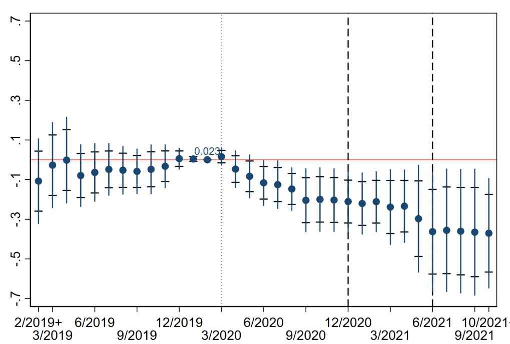


Figure 3

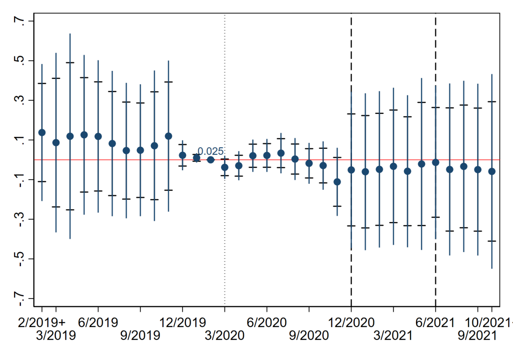
Event Study Plots: Funds and Institutions Matched

Panels A and B of Figure 3 plot the evolution of the coefficients $\{\delta_k\}$ of Equation (2). Panel A and B show the estimates using the poisson pseudo-maximum likelihood regression on $\%Ownershare_{i,j,t}$ for funds and institutions on the matched sample. Panel C and D show the estimates using a linear probability model on an indicator variable being one if investor i is invested in bank b at time t for the matched sample. The sample includes 26 banks. The regression uses bank and investor times month fixed effects and controls for the exchange rate to EUR, FX to EUR, and the monthly change in shares outstanding per bank $\triangle_t O.S._b$. The outer bands represent the sup-t 95% confidence bands according to Montiel Olea and Plagborg-Møller (2019), the inner bands are the 95% confidence intervals for clustered standard errors on banks. All coefficients measure the impact compared to February 2020. The average value of the dependent variable on February 2020 is reported above the coefficient of the time. The dotted line marks the month of the implementation, whereas the dashed lines mark the different relief announcements.

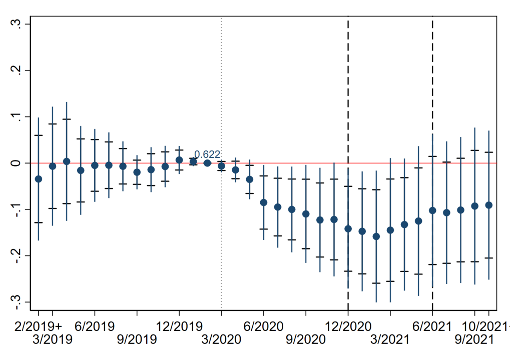
Panel A. Funds



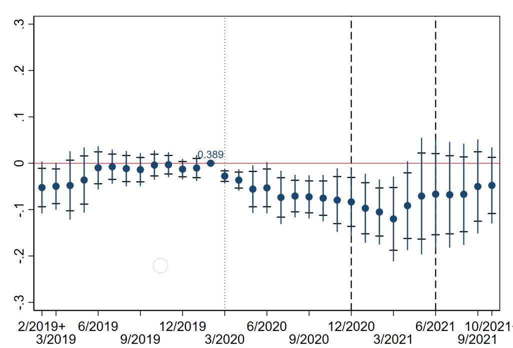
Panel B. Institutions



Panel C. Funds LPM



Panel D. Institutions LPM



6 Tables

Table 1
Descriptive Statistics: Annual Data

Table 1 shows the mean, standard deviation, minimum, median and maximum of the variables used in this study of the annual bank-level variables over the time period 2016-2019. % Inst. is the percentage ownership of institutional investors per bank. % Fund is the percentage ownership of funds per bank. % Insider is the percentage ownership of insiders and stakeholders per bank. Price/Book is the ratio of the stock price over book equity in percentage points. Return is the stock market return over the last year in percentage points. Div. Yield is the ratio of dividends per share over the market value in percentage points. Size (Assets) is the logarithm of total assets. ROA is defined as net income over average total assets in percentage points. $Vol.Return_b^d$ is the daily stock price volatility over 270 business days. Deposits/Assets is defined as the ratio of deposits over assets. Tier1 Cap. Ratio is defined as the total capital as defined by the latest regulatory and supervisory guidelines divided by total risk-weighted assets as defined by the latest regulatory and supervisory guidelines. SOA is the speed of adjustment estimate, i.e. β in (A2), winsorized at the 2.5% level. RelVol is the relative volatility of DPS to EPS as in (A3), winsorized at the 2.5% level.

	mean	sd	min	p50	max	count
% Inst.	20.176	16.707	0.000	17.716	57.326	201
% Funds	16.947	14.581	0.000	14.353	47.952	201
% Insider	32.034	28.158	0.000	28.825	99.805	204
Price/Book	97.246	63.791	5.056	81.046	354.740	194
Return	-3.859	30.865	-87.760	-2.882	198.209	189
Div. Yield	3.598	3.085	0.000	3.380	24.187	193
$Vol.Return_b^d$	1.917	1.248	0.000	1.557	7.540	195
Size (Assets)	24.683	1.993	18.458	24.777	28.362	270
ROA	0.494	0.781	-3.073	0.438	4.647	269
Tier1 Cap. Ratio	18.023	9.751	7.014	16.065	87.967	260
Deposits/Assets	56.893	20.703	0.000	61.952	98.711	268
SOA	0.520	0.452	-0.173	0.470	1.507	135
RelVol	1.050	1.146	0.078	0.788	6.399	128

Table 2
Descriptive Statistics: Monthly Data

Table 2 shows the mean, standard deviation, 1st quartile, median, 3rd quartile, and the number of observations of the monthly variables used in this study per investor group over the period 2018-2021. % of $\%Own_{\cdot b,i}$ is the percentage ownership of each investor. $\mathbb{1}(\%Own_{b,i} > 0)$ is an indicator variable that is one is investor i is invested in bank b. $\%Own_{\cdot b,i}$ in EUR is the EUR amount invested per bank of each investor. *churnratio* is the one year average of the quarterly churn ratio in 2019 per investor. $Price/Book_b$ is the banks price-to-book value. $Return_b^m$ is the monthly stock return of the bank. $Vol.Return_b^d$ is the banks' daily stock return volatility per month. $\triangle_t$ O.S. is the change in outstanding shares per bank over time.

	mean	sd	p25	p50	p75	count
Fund						
$\%Own_{\cdot b,i}$	0.024	0.181	0.000	0.001	0.009	1705865
$\mathbb{1}(\%Own_{b,i} > 0)$	0.607	0.488	0.000	1.000	1.000	1705865
$\%Own_{\cdot b,i}$ in EUR	345.327	2401.035	0.000	16.711	146.704	1693031
churnratio	0.423	0.297	0.205	0.346	0.562	1535699
$Price/Book_b$	0.824	0.590	0.464	0.681	0.949	1704374
$Return_b^m$	0.049	11.240	-5.017	0.879	6.262	1704362
Vol. $Return_b^d$	1.949	1.185	1.250	1.645	2.230	1704653
$\triangle_t O.S._{\cdot b}$	0.001	0.014	0.000	0.000	0.000	1691718
Insider						
$\%Own_{\cdot b,i}$	3.107	10.910	0.000	0.018	0.459	19935
$\mathbb{1}(\%Own_{b,i} > 0)$	0.768	0.422	1.000	1.000	1.000	19935
$\%Own_{\cdot b,i}$ in EUR	18232.509	94968.550	1.501	73.415	3169.464	19759
churnratio	.	.	.	.	.	0
$Price/Book_b$	1.015	0.822	0.556	0.783	1.250	19851
$Return_b^m$	0.406	10.049	-3.526	0.804	5.481	19849
Vol. $Return_b^d$	1.761	1.147	1.048	1.478	2.107	19865
$\triangle_t O.S._{\cdot b}$	0.001	0.019	0.000	0.000	0.000	19744
Institution						
$\%Own_{\cdot b,i}$	0.020	0.232	0.000	0.000	0.001	708381
$\mathbb{1}(\%Own_{b,i} > 0)$	0.400	0.490	0.000	0.000	1.000	708381
$\%Own_{\cdot b,i}$ in EUR	271.789	3807.562	0.000	0.000	19.129	702758
churnratio	0.488	0.307	0.269	0.418	0.634	686316
$Price/Book_b$	0.827	0.600	0.466	0.679	0.948	707411
$Return_b^m$	-0.047	11.139	-5.166	0.750	6.154	707390
Vol. $Return_b^d$	1.933	1.165	1.249	1.640	2.214	707564
$\triangle_t O.S._{\cdot b}$	0.001	0.015	0.000	0.000	0.000	702222
Total						
$\%Own_{\cdot b,i}$	0.048	1.044	0.000	0.000	0.006	2434181
$\mathbb{1}(\%Own_{b,i} > 0)$	0.548	0.498	0.000	1.000	1.000	2434181
$\%Own_{\cdot b,i}$ in EUR	470.248	9199.607	0.000	5.244	100.134	2415548
churnratio	0.443	0.302	0.223	0.366	0.581	2222015
$Price/Book_b$	0.827	0.595	0.466	0.681	0.952	2431636
$Return_b^m$	0.024	11.202	-5.052	0.804	6.231	2431601
Vol. $Return_b^d$	1.943	1.180	1.249	1.642	2.227	2432082
$\triangle_t O.S._{\cdot b}$	0.001	0.014	0.000	0.000	0.000	2413684

Table 3
Matching Results

Table 3 shows the averages of the matched treated and control group after applying the propensity score matching one year before the policy. SOA is the speed of adjustment estimate, i.e. β in (A2), winsorized at the 2.5% level. RelVol is an indicator variable for below-median RelVol estimates in 2018, i.e. high smoothing. RelVol is the relative volatility of DPS to EPS as in (A3), winsorized at the 2.5% level. % Inst. is the percentage ownership of institutional investors per bank. Size (Assets) is the logarithm of total assets. Deposits/Assets is defined as the ratio of deposits over assets. Tier1 Cap. Ratio is defined as the Tier1 capital divided by total risk-weighted assets as defined by the latest regulatory and supervisory guidelines.

Post-Trimming Means

	$diff(t-c)$	t	$mean_c$	N_c	$mean_t$	N_t
Size	-0.7219	-1.1553	24.5886	9	25.3105	17
Price/Book	2.0071	0.1544	70.8405	9	68.8334	17
Tier1 Cap. Ratio	1.2782	1.4197	18.0058	9	16.7276	17
SOA	0.3401	1.4352	0.7857	7	0.4456	13
RelVol	0.3893	1.2445	1.2506	7	0.8613	12
% Inst.	-11.8951	-1.6066	18.5723	9	30.4673	17
Deposits/Assets	-1.7397	-0.2925	58.6724	9	60.4121	17
ROA	-0.0943	-1.0549	0.4475	9	0.5418	17

Table 4
Matched Sample: Panel Difference in Difference Results Funds

Table 4 shows the results from the difference in difference panel poisson pseudo-maximum likelihood regressions for different fixed effects on $\%ofOwn._{b,i,t}$ for funds. Mar.-Dec. is an indicator equal to one from March 2020 to December 2020. Jan.-Jun. is an indicator equal to one from January 2021 to June 2021. Jul.- is an indicator equal to one from July 2021 onwards. Treated is an indicator equal to one for banks subject to dividend restrictions. $\triangle_t O.S._b$ is the monthly change in shares outstanding per bank. FX to EUR is the exchange rate to EUR for Swiss banks, for other banks, it is 1. L.$Return_b^m$ is the monthly stock return of the previous month of the bank. L.$Vol.Return_b^d$ is the banks' daily stock return volatility of the previous month. Standard errors are clustered on bank. ***, **, and * indicate statistically different from zero at the 1%, 5%, and 10% level of significance, respectively.

	(1)	(2)	(3)
Mar.-Nov. x Treated	-0.0409	-0.1057**	-0.1086**
	(0.0580)	(0.0450)	(0.0471)
Dec.-Jun. x Treated	-0.0505	-0.2099***	-0.1981***
	(0.0779)	(0.0725)	(0.0715)
Jul.- x Treated	0.0015	-0.3593***	-0.3440***
	(0.0798)	(0.1152)	(0.1168)
$\triangle_t O.S._b$	-0.5441***	-0.7661***	-0.7739***
	(0.1089)	(0.1666)	(0.1674)
FX to EUR	0.3413	-2.0001***	-1.8215***
	(0.8865)	(0.6548)	(0.6707)
L.$Return_b^m$			-0.0010*
			(0.0006)
L.$Vol.Return_b^d$			0.0241
			(0.0208)
Constant	-3.8937***	0.0187	-0.2060
	(0.8656)	(0.6395)	(0.6641)
Observations	784,520	675,516	675,516
ajd. R^2			
FE	Bank Month	InvestorMonth Bank	InvestorMonth Bank
Cluster	Bank	Bank	Bank
# Banks	25	24	24

Table 5
Matched Sample: Panel Difference in Difference Results Institutions

Table 5 shows the results from the difference in difference panel poisson pseudo-maximum likelihood regressions for different fixed effects on $\%ofOwn._{b,i,t}$ for institutions other than funds. Mar.-Dec. is an indicator equal to one from March 2020 to December 2020. Jan.-Jun. is an indicator equal to one from January 2021 to June 2021. Jul.- is an indicator equal to one from July 2021 onwards. Treated is an indicator equal to one for banks subject to dividend restrictions. $\triangle_t O.S._b$ is the monthly change in shares outstanding per bank. FX to EUR is the exchange rate to EUR for Swiss banks, for other banks, it is 1. L.$Return_b^m$ is the monthly stock return of the previous month of the bank. L.$Vol.Return_b^d$ is the banks' daily stock return volatility of the previous month. Standard errors are clustered on bank. ***, **, and * indicate statistically different from zero at the 1%, 5%, and 10% level of significance, respectively.

	(1)	(2)	(3)
Mar.-Nov. x Treated	0.0519	-0.0605	-0.0727
	(0.0631)	(0.0817)	(0.0803)
Dec.-Jun. x Treated	0.1450	-0.1136	-0.1109
	(0.1218)	(0.1969)	(0.1957)
Jul.- x Treated	0.2194	-0.0870	-0.0806
	(0.1596)	(0.2099)	(0.2098)
$\triangle_t O.S._b$	-0.9655***	-1.0206***	-1.0542***
	(0.1674)	(0.1184)	(0.1271)
FX to EUR	-0.9125	-0.1777	-0.0116
	(1.4816)	(1.0977)	(1.1844)
L.$Return_b^m$			0.0008
			(0.0007)
L.$Vol.Return_b^d$			0.0313
			(0.0223)
Constant	-2.3440	-0.1967	-0.4204
	(1.4401)	(1.0747)	(1.1703)
Observations	244,639	190,006	190,006
ajd. R^2			
FE	Bank Month	InvestorMonth Bank	InvestorMonth Bank
Cluster	Bank	Bank	Bank
# Banks	26	26	26

Table 6

Matched Sample: Panel Triple Difference Results Dividend

Table 6 shows the results from the triple difference panel poisson pseudo-maximum likelihood regressions for different fixed effects on $\%ofOwn._{b,i,t}$. Column (1) uses the median split of the smoothing measure SOA, column (2) uses the median split of the smoothing measure RelVol, and column (3) uses the median split of the dividend yield. Mar.-Dec. is an indicator equal to one from March 2020 to December 2020. Jan.-Jun. is an indicator equal to one from January 2021 to June 2021. Jul.- is an indicator equal to one from July 2021 onwards. Treated is an indicator equal to one for banks subject to dividend restrictions. Low SOA is an indicator variable for below-median SOA estimates in 2018, i.e. high smoothing. SOA is the speed of adjustment estimate, i.e. β in (A2), winsorized at the 2.5% level. Low RelVol is an indicator variable for below-median RelVol estimates in 2018, i.e. high smoothing. RelVol is the relative volatility of DPS to EPS as in (A3), winsorized at the 2.5% level. $\triangle_t O.S._b$ is the monthly change in shares outstanding per bank. FX to EUR is the exchange rate to EUR for Swiss banks, for other banks, it is 1. L.$Return_b^m$ is the monthly stock return of the previous month of the bank. L.$Vol.Return_b^d$ is the banks' daily stock return volatility of the previous month. Standard errors are clustered on bank. ***, **, and * indicate statistically different from zero at the 1%, 5%, and 10% level of significance, respectively.

	(1)	(2)	(3)
	$Char$= SOA	$Char$= RelVol	$Char$= Div. Yield
Mar.-Nov. x Treated x Low Char	-0.0173	-0.1211	-0.1797
	(0.0760)	(0.0940)	(0.1463)
Dec.-Jun. x Treated x Low Char	0.0355	-0.1133	-0.3342**
	(0.0993)	(0.1047)	(0.1482)
Jul.- x Treated x Low Char	0.0982	0.0267	-0.2678
	(0.1118)	(0.1202)	(0.1670)
Mar.-Nov. x Treated	-0.0553*	-0.0146	-0.0342
	(0.0334)	(0.0369)	(0.0655)
Dec.-Jun. x Treated	-0.1411**	-0.0649*	-0.0724
	(0.0552)	(0.0376)	(0.0871)
Jul.- x Treated	-0.3631***	-0.3138***	-0.2576*
	(0.0878)	(0.0968)	(0.1394)
Observations	488,149	521,531	675,516
Controls	Yes	Yes	Yes
FE	InvestorMonth Bank	InvestorMonth Bank	InvestorMonth Bank
Cluster	Bank	Bank	Bank
# Banks	17	18	24

Table 7

Matched Sample: Panel Triple Difference Results Risk

Table 7 shows the results from the triple difference panel poisson pseudo-maximum likelihood regressions for different fixed effects on $\%ofOwn._{b,i,t}$ of funds. Column (1) uses the median split of the Price/Book ratio, column (2) uses the median split of the Log(Z-Score), and column (3) uses the median split of the Tier 1 ratio. Mar.-Dec. is an indicator equal to one from March 2020 to December 2020. Jan.-Jun. is an indicator equal to one from January 2021 to June 2021. Jul.- is an indicator equal to one from July 2021 onwards. Treated is an indicator equal to one for banks subject to dividend restrictions. Low Price/Book is an indicator variable for the Price/Book ratio being below one in December 2019. Low Tier1 is an indicator variable for the below-median Tier 1 capital ratio in 2019, i.e. low capitalization. Low Log(Z-Score) is an indicator variable for the below-median distance to default in 2019, i.e. high risk. $\triangle_t O.S._b$ is the monthly change in shares outstanding per bank. FX to EUR is the exchange rate to EUR for Swiss banks, for other banks, it's 1. L.$Return_b^m$ is the monthly stock return of the previous month of the bank. L.$Vol.Return_b^d$ is the banks' daily stock return volatility of the previous month. Standard errors are clustered on bank. ***, **, and * indicate statistically different from zero at the 1%, 5%, and 10% level of significance, respectively.

	(1) Char=Low Price/Book	(2) Char=Low Log(Z-Score)	(3) Char=Low Tier 1 ratio
Mar.-Nov. x Treated x Low Char	-0.1111	0.0895	0.1351
	(0.1417)	(0.0986)	(0.1235)
Dec.-Jun. x Treated x Low Char	-0.1870	-0.0137	0.1317
	(0.1376)	(0.1336)	(0.1471)
Jul.- x Treated x Low Char	-0.1192	-0.2138	0.1462
	(0.1540)	(0.1641)	(0.1714)
Mar.-Nov. x Treated	-0.0283	-0.1715**	-0.1500**
	(0.0707)	(0.0747)	(0.0744)
Dec.-Jun. x Treated	-0.0820	-0.1777	-0.2122*
	(0.0866)	(0.1187)	(0.1112)
Jul.- x Treated	-0.2378*	-0.1792	-0.3304**
	(0.1251)	(0.1272)	(0.1454)
Observations	675,516	675,516	675,516
Controls	Yes	Yes	Yes
FE	InvestorMonth Bank	InvestorMonth Bank	InvestorMonth Bank
Cluster	Bank	Bank	Bank
# Banks	24	24	24

Table 8

Institutional Investors and Dividend Smoothing: Funds

Table 8 displays the estimation results of dividend smoothing on fund ownership from 2016 to 2019. % of Funds is the aggregate ownership share of the fund investor group for bank b. SOA is the speed of adjustment estimate, i.e. $\hat{\beta}$ in (A2), winsorized at the 2.5% level. RelVol is the relative volatility of DPS to EPS as in (A3), winsorized at the 2.5% level. Price/Book is the ratio of the stock price over book equity. Return is the stock market return over the last year in percentage points. Div. Yield is the ratio of dividends per share over the market value in percentage points. Size (Assets) is the logarithm of total assets. ROA is defined as net income over average total assets in percentage points. $Vol.Return_b^d$ is the daily stock price volatility over 270 business days. Deposits/Assets is defined as the ratio of deposits over assets. Tier1 Cap. Ratio is defined as the Tier1 capital divided by total risk-weighted assets as defined by the latest regulatory and supervisory guidelines. L. indicates the lag operator. Standard errors are clustered on the bank level. ***, **, and * indicate statistically different from zero at the 1%, 5%, and 10% level of significance, respectively.

	(1) % Funds	(2) % Funds	(3) % Funds	(4) % Funds
L.SOA	-0.050	-0.085		
	(0.164)	(0.158)		
L.RelVol			-0.133*	-0.145*
			(0.076)	(0.077)
L.Div. Yield	0.099**	0.088**	0.097**	0.090**
	(0.043)	(0.039)	(0.045)	(0.041)
L.Price/Book	0.000	0.000	-0.000	-0.000
	(0.002)	(0.002)	(0.002)	(0.002)
L.Return	0.002	0.002	0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.002)
L.$Vol.Return_b^d$	0.148***	0.132***	0.142***	0.147***
	(0.048)	(0.044)	(0.055)	(0.053)
L.Size (Assets)	0.196**	0.173**	0.196**	0.183**
	(0.089)	(0.077)	(0.088)	(0.077)
L.ROA	0.078	0.093	0.139	0.176*
	(0.105)	(0.088)	(0.089)	(0.092)
L.Tier1 Cap. Ratio		0.014		0.017
		(0.013)		(0.014)
L.Deposits/Assets		0.003		0.007
		(0.005)		(0.006)
Constant	-2.714	-2.395	-2.608	-2.896
	(2.426)	(2.088)	(2.363)	(2.108)
Observations	174	169	165	160
ajd. R^2	0.520	0.536	0.514	0.532
S.E.	cluster	cluster	cluster	cluster
FE	Country	Country	Country	Country

Table 9
CAR Regressions: Event Days

Table 9 presents the regressions of equation 9 for the three events under study using the matched sample of 26 banks. Each column shows the CAR for a different event date where the event window is set to $[-1, 1]$ and the start date is displayed in the first row. Abnormal returns are calculated using the Fama French factor model. Standard errors are robust. ***, **, and * indicate statistically different from zero at the 1%, 5%, and 10% level of significance, respectively.

	Restriction	Relaxation				Relief		
Event Window Start:	03/27/20	11/04/20	11/24/20	12/02/20	12/15/20	06/15/21	06/30/21	07/22/21
Panel A: Treatment Effects								
Treated	-1.892	-0.477	-1.403	0.161	1.194	0.857	1.001	2.085***
	(1.533)	(0.865)	(1.106)	(1.037)	(0.787)	(0.664)	(0.627)	(0.707)
N	27	27	27	27	27	27	27	27
$adjR^2$	0.029	-0.061	-0.030	-0.002	0.066	0.049	0.009	0.166
Panel B: Fund Share								
Treated	1.666	-1.253	-0.143	2.935	2.439*	0.814	1.482	3.203***
	(2.205)	(1.104)	(1.985)	(1.998)	(1.186)	(1.110)	(1.266)	(0.981)
High Fund Share	3.535	-0.379	-3.050*	0.480	2.103**	2.065*	1.254	2.535**
	(2.638)	(1.986)	(1.544)	(0.955)	(1.004)	(1.132)	(0.762)	(0.913)
Treated × High Fund Share	-7.381**	1.289	-0.562	-4.789**	-3.252**	-0.727	-1.318	-2.988**
	(3.327)	(2.218)	(2.271)	(2.211)	(1.474)	(1.420)	(1.314)	(1.240)
N	26	26	26	26	26	26	26	26
$adj.R^2$	0.102	-0.131	0.084	0.191	0.088	0.093	-0.050	0.180

Appendices

Appendix A1 Dividend Smoothing Measures

To measure the dividend smoothing of European banks I rely on the approach of Leary and Michaely (2011). They show that their two measures of dividend smoothing, i.e. speed of adjustment (SOA) and relative volatility (RelVol), can partially offset the small sample bias which is usually an issue for the SOA using the approach of Lintner (1956). Given the short time horizon under study, such an adjustment is necessary for the analysis.

SOA according to Leary and Michaely (2011) is very similar to the classical partial adjustment model of Lintner (1956), where in this case a two-step approach is used. So SOA is defined in a two-step approach according to the following formulae:

$$dev_{i,t} = TPR_{i,t} * EPS_{i,t} - D_{i,t-1} \tag{A1}$$

$$\triangle D_{i,t} = \alpha + \beta * dev_{i,t} + \epsilon_{i,t}, \tag{A2}$$

Where $D_{i,t}$ is dividends per share (DPS) of bank i at time t, $EPS_{i,t}$ is the earnings per share (EPS) of bank i at time t, $TPR_{i,t}$ is the target payout ratio of bank i at time t, and $\epsilon_{i,t}$ is the error term. In the first stage, an estimate of the target payout ratio is needed. This is captured by $TPR_{i,t}$, which is calculated as the median of the payout ratio, i.e. DPS over EPS, from $t-4$ to t[23]. In the second stage, equation (A2) is then estimated using rolling regressions, to receive an estimate of the adjustment of the target payout ratio to changes in dividends β. Using dividends per share in the target payout ratio is in line with the finding that dividends per share are an important proxy for payout policy Brav et al. (2005).

The alternative non-parametric measure of dividend smoothing used by Leary and Michaely (2011) is RelVol which is defined as follows:

$$RelVol = \frac{\sigma_{\eta^d_{i,t}}}{\sigma_{\eta^e_{i,t}}} \tag{A3}$$

Where $\sigma_{\eta^d_{i,t}}$ and $\sigma_{\eta^d_{i,t}}$ are the root mean squared errors of the respective quadratic time trend estimations on DPS and targeted earnings based dividends:

$$D_{i,t} = \alpha_d + \beta_d * t + \gamma_d t^2 + \eta^d_{i,t}, \tag{A4}$$

$$TPR_{i,t} * EPS_{i,t} = \alpha_e + \beta_e * t + \gamma_e t^2 + \eta^e_{i,t} \tag{A5}$$

Therefore, RelVol measures how volatile dividends are to the targeted dividends. These two measures both capture dividend smoothing, but different parts of it. Whereas RelVol captures more how volatile dividends are to their target, SOA captures how fast dividends adjust to a payout target. So investors who prefer a certain dividend level might prefer lower SOA over lower RelVol, since in the latter case the dividend can still be far away from its target. On the other hand, if investors rather prefer a low volatile income they would select lower RelVol over lower SOA.

To obtain the measures SOA and RelVol I estimate the rolling window regressions of equations (A2), (A4), (A5) using an eight-year window. Similar to Leary and Michaely (2011) I drop observations in the sample where the banks did not yet initiate dividends (i.e. the first observations with zero dividends) and when

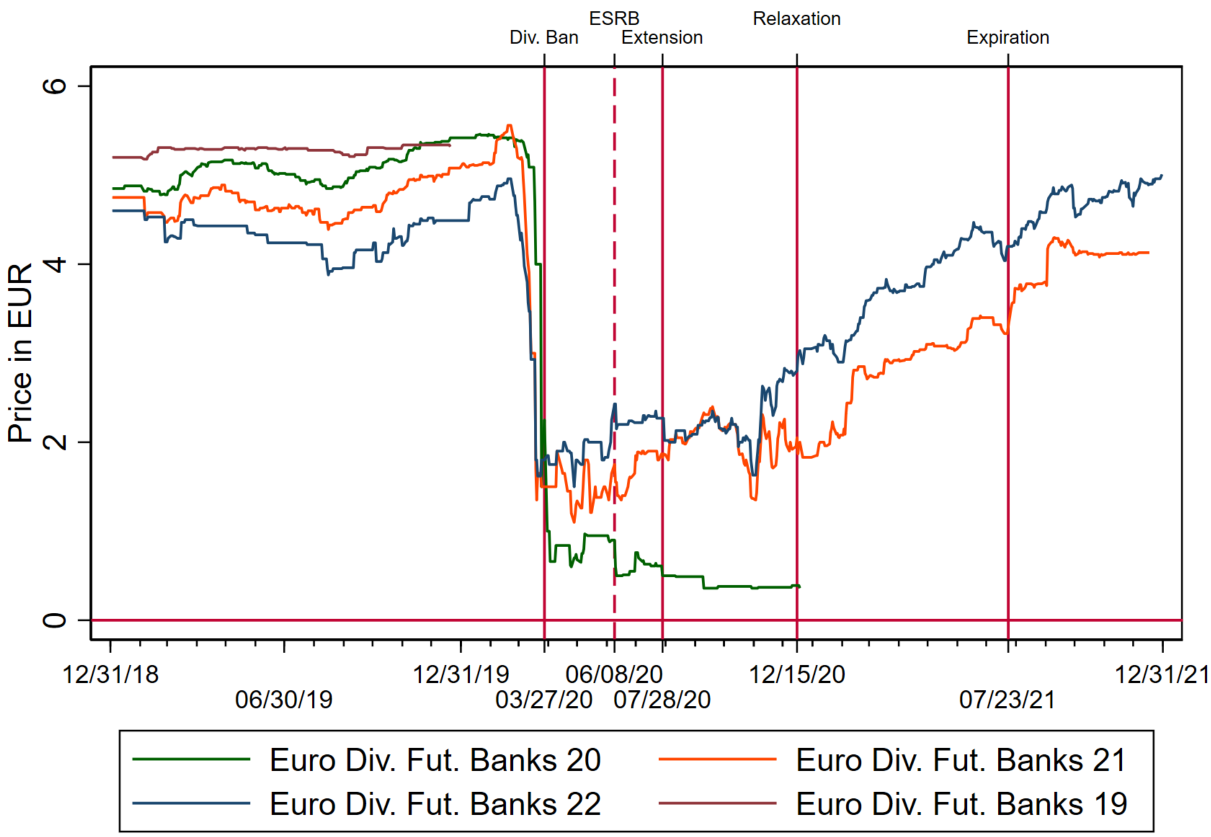
23. Leary and Michaely (2011) highlight in a footnote that using only five years for the estimation of TPR instead of ten does not alter the results

banks stopped paying dividends (i.e. the last observations with zero dividends). Furthermore, I dropped observations where the TPR was negative and when banks did not pay any dividend in the estimation window. These two measures are then also winsorized at the 2.5% level to eliminate outliers.

Appendix A2 Dividend Future Prices

Figure A1
Bank Dividend Future Prices

Figure A1 plots the price for the Euro Stoxx Banks dividend future indices for different maturities in EUR. The solid red lines indicate the official announcement dates related to the dividend restrictions, the dashed line indicates the ESRB dividend recommendation.



Appendix A3 Event Study Results

Table A1
Event Study Regressions: Funds

Table A1 shows the results from the panel event study regressions for the Poisson pseudo-maximum likelihood regressions and the linear probability model for funds. Only the interaction term coefficients and the controls are reported. $\triangle_t O.S._b$ is the monthly change in shares outstanding per bank. FX to EUR is the exchange rate to EUR for Swiss banks, for other banks, it is 1. L.$Return_b^m$ is the monthly stock return of the previous month of the bank. L.$Vol.Return_b^d$ is the banks' daily stock return volatility of the previous month. Standard errors are clustered on bank. ***, **, and * indicate statistically different from zero at the 1%, 5%, and 10% level of significance, respectively.

	$\%Own.b,i$	$\mathbb{1}(\%Own_{b,i} > 0)$	$\%Own.b,i$	$\mathbb{1}(\%Own_{b,i} > 0)$
2019m3 × Treated	-0.0270	-0.0067	0.0321	0.0397
	(0.0778)	(0.0441)	(0.0673)	(0.0438)
2019m4 × Treated	-0.0015	0.0036	0.0527	0.0513
	(0.0782)	(0.0440)	(0.0663)	(0.0485)
2019m5 × Treated	-0.0795	-0.0158	-0.0194	0.0329
	(0.0567)	(0.0329)	(0.0563)	(0.0327)
2019m6 × Treated	-0.0638	-0.0050	-0.0066	0.0412
	(0.0528)	(0.0270)	(0.0486)	(0.0268)
2019m7 × Treated	-0.0484	-0.0046	-0.0070	0.0365
	(0.0474)	(0.0243)	(0.0446)	(0.0239)
2019m8 × Treated	-0.0527	-0.0068	0.0077	0.0414
	(0.0439)	(0.0185)	(0.0474)	(0.0247)
2019m9 × Treated	-0.0586	-0.0197	0.0056	0.0335
	(0.0411)	(0.0127)	(0.0469)	(0.0233)
2019m10 × Treated	-0.0481	-0.0142	0.0110	0.0308
	(0.0450)	(0.0166)	(0.0465)	(0.0223)
2019m11 × Treated	-0.0326	-0.0074	0.0337	0.0391*
	(0.0395)	(0.0153)	(0.0427)	(0.0224)
2019m12 × Treated	0.0057	0.0066	0.0721**	0.0421**
	(0.0198)	(0.0104)	(0.0360)	(0.0161)
2020m1 × Treated	0.0041	0.0033	0.0635*	0.0408***
	(0.0062)	(0.0034)	(0.0328)	(0.0122)
2020m3 × Treated	0.0158	-0.0062	0.0539	0.0239
	(0.0160)	(0.0047)	(0.0358)	(0.0165)
2020m4 × Treated	-0.0469	-0.0147	0.0048	0.0252*
	(0.0342)	(0.0092)	(0.0553)	(0.0135)
2020m5 × Treated	-0.0834**	-0.0352**	-0.0468	0.0069
	(0.0396)	(0.0147)	(0.0525)	(0.0147)
2020m6 × Treated	-0.1161***	-0.0851***	-0.0698	-0.0426**
	(0.0418)	(0.0278)	(0.0514)	(0.0187)
2020m7 × Treated	-0.1253***	-0.0949***	-0.0792	-0.0455**
	(0.0440)	(0.0301)	(0.0556)	(0.0189)
2020m8 × Treated	-0.1471***	-0.1000***	-0.0868	-0.0702**
	(0.0395)	(0.0317)	(0.0560)	(0.0271)

2020m9 × Treated	-0.2041***	-0.1097***	-0.1586**	-0.0700**
	(0.0578)	(0.0363)	(0.0629)	(0.0284)
2020m10 × Treated	-0.1998***	-0.1228***	-0.1606**	-0.0666**
	(0.0583)	(0.0386)	(0.0743)	(0.0294)
2020m11 × Treated	-0.2030***	-0.1217***	-0.1524**	-0.0749**
	(0.0574)	(0.0421)	(0.0660)	(0.0337)
2020m12 × Treated	-0.2105***	-0.1418***	-0.1645***	-0.1102**
	(0.0552)	(0.0443)	(0.0621)	(0.0403)
2021m1 × Treated	-0.2205***	-0.1473***	-0.1609**	-0.0941**
	(0.0560)	(0.0444)	(0.0674)	(0.0397)
2021m2 × Treated	-0.2112***	-0.1584***	-0.1112*	-0.0877
	(0.0550)	(0.0488)	(0.0630)	(0.0528)
2021m3 × Treated	-0.2384***	-0.1448**	-0.1664**	-0.0925*
	(0.0685)	(0.0534)	(0.0723)	(0.0510)
2021m4 × Treated	-0.2339***	-0.1327**	-0.1646**	-0.0819*
	(0.0664)	(0.0489)	(0.0723)	(0.0452)
2021m5 × Treated	-0.2972***	-0.1251**	-0.2435**	-0.0855
	(0.0974)	(0.0554)	(0.0994)	(0.0502)
2021m6 × Treated	-0.3627***	-0.1024*	-0.3083***	-0.0599
	(0.1089)	(0.0564)	(0.1046)	(0.0562)
2021m7 × Treated	-0.3558***	-0.1070*	-0.2972***	-0.0611
	(0.1117)	(0.0528)	(0.1102)	(0.0439)
2021m8 × Treated	-0.3601***	-0.1013*	-0.2844**	-0.0490
	(0.1124)	(0.0541)	(0.1131)	(0.0495)
2021m9 × Treated	-0.3651***	-0.0927	-0.3113***	-0.0582
	(0.1147)	(0.0581)	(0.1129)	(0.0559)
$\triangle_t O.S._b$	-0.7564***	0.0333	-0.7623***	0.0607
	(0.1711)	(0.0468)	(0.1707)	(0.0526)
CHFtoEUR	-0.7423	-0.2294	-0.7227	-0.4706
	(0.8273)	(0.5012)	(0.8504)	(0.5239)
L.$Returnb^m$			-0.0010	-0.0015***
			(0.0006)	(0.0005)
L.Vol. $Returnb^d$			0.0261	-0.0042
			(0.0215)	(0.0046)
pre 2019m3 × Treated	-0.1075	-0.0344	-0.0474	0.0206
	(0.0773)	(0.0456)	(0.0729)	(0.0487)
post 2021m9 × Treated	-0.3707***	-0.0908	-0.3045***	-0.0543
	(0.0998)	(0.0552)	(0.1053)	(0.0491)
Constant	-1.1717	0.8625*	-1.2862	1.0704**
	(0.7885)	(0.4739)	(0.8425)	(0.4964)
Observations	675,516	737,575	675,516	737,575
ajd. R^2		0.318		0.318
# Banks	24	24	24	24

Table A2
Event Study Regressions: Institutions

Table A2 shows the results from the panel event study regressions for the Poisson pseudo-maximum likelihood regressions and the linear probability model for institutions. Only the interaction term coefficients and the controls are reported. $\triangle_t O.S._b$ is the monthly change in shares outstanding per bank. FX to EUR is the exchange rate to EUR for Swiss banks, for other banks, it is 1. L.$Return_b^m$ is the monthly stock return of the previous month of the bank. L.$Vol.Return_b^d$ is the banks' daily stock return volatility of the previous month. Standard errors are clustered on bank. ***, **, and * indicate statistically different from zero at the 1%, 5%, and 10% level of significance, respectively.

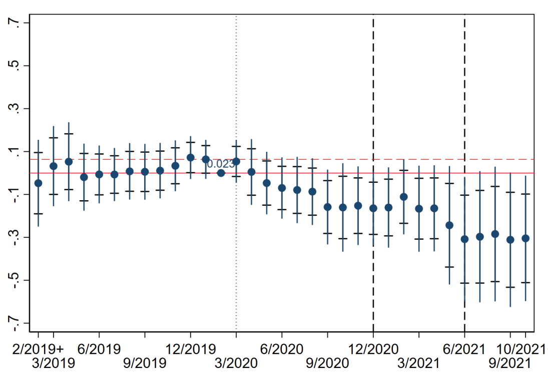
	$\%Own.b,i$	$\mathbb{1}(\%Own_{b,i} > 0)$	$\%Own.b,i$	$\mathbb{1}(\%Own_{b,i} > 0)$
2019m3 × Treated	0.0866	-0.0497**	0.1124	-0.0335*
	(0.1655)	(0.0182)	(0.1735)	(0.0172)
2019m4 × Treated	0.1188	-0.0480*	0.1390	-0.0324
	(0.1894)	(0.0265)	(0.1971)	(0.0257)
2019m5 × Treated	0.1259	-0.0362	0.1504	-0.0197
	(0.1473)	(0.0252)	(0.1489)	(0.0238)
2019m6 × Treated	0.1179	-0.0098	0.1422	0.0063
	(0.1405)	(0.0167)	(0.1459)	(0.0146)
2019m7 × Treated	0.0820	-0.0076	0.0917	0.0055
	(0.1340)	(0.0132)	(0.1401)	(0.0119)
2019m8 × Treated	0.0465	-0.0115	0.0689	0.0047
	(0.1249)	(0.0137)	(0.1371)	(0.0115)
2019m9 × Treated	0.0482	-0.0139	0.0698	0.0037
	(0.1216)	(0.0128)	(0.1356)	(0.0110)
2019m10 × Treated	0.0708	-0.0040	0.0900	0.0116
	(0.1388)	(0.0114)	(0.1484)	(0.0101)
2019m11 × Treated	0.1195	-0.0031	0.1550	0.0134
	(0.1393)	(0.0097)	(0.1454)	(0.0094)
2019m12 × Treated	0.0227	-0.0128	0.0652	0.0015
	(0.0277)	(0.0080)	(0.0597)	(0.0101)
2020m1 × Treated	0.0098	-0.0104	0.0361	0.0039
	(0.0086)	(0.0101)	(0.0445)	(0.0123)
2020m3 × Treated	-0.0381*	-0.0277***	-0.0131	-0.0180***
	(0.0214)	(0.0055)	(0.0563)	(0.0062)
2020m4 × Treated	-0.0298	-0.0363***	-0.0121	-0.0222**
	(0.0268)	(0.0084)	(0.0597)	(0.0097)
2020m5 × Treated	0.0205	-0.0558***	0.0183	-0.0434**
	(0.0298)	(0.0185)	(0.0403)	(0.0174)
2020m6 × Treated	0.0220	-0.0531**	0.0338	-0.0398**
	(0.0304)	(0.0198)	(0.0530)	(0.0186)
2020m7 × Treated	0.0335	-0.0737***	0.0335	-0.0587***
	(0.0372)	(0.0206)	(0.0545)	(0.0198)
2020m8 × Treated	0.0038	-0.0708***	0.0395	-0.0582***
	(0.0387)	(0.0165)	(0.0699)	(0.0166)
2020m9 × Treated	-0.0178	-0.0725***	-0.0144	-0.0602***
	(0.0377)	(0.0167)	(0.0508)	(0.0164)
2020m10 × Treated	-0.0291	-0.0752***	-0.0436	-0.0596***

	(0.0446)	(0.0180)	(0.0633)	(0.0174)
2020m11 × Treated	-0.1114*	-0.0795***	-0.0927	-0.0650**
	(0.0628)	(0.0246)	(0.0757)	(0.0239)
2020m12 × Treated	-0.0511	-0.0834***	-0.0270	-0.0721***
	(0.1441)	(0.0256)	(0.1330)	(0.0252)
2021m1 × Treated	-0.0603	-0.0971***	-0.0553	-0.0798***
	(0.1446)	(0.0267)	(0.1312)	(0.0271)
2021m2 × Treated	-0.0482	-0.1052***	-0.0140	-0.0796**
	(0.1442)	(0.0252)	(0.1356)	(0.0294)
2021m3 × Treated	-0.0330	-0.1200***	-0.0039	-0.1016***
	(0.1449)	(0.0328)	(0.1323)	(0.0341)
2021m4 × Treated	-0.0577	-0.0915**	-0.0331	-0.0736**
	(0.1402)	(0.0344)	(0.1271)	(0.0346)
2021m5 × Treated	-0.0212	-0.0708	0.0140	-0.0569
	(0.1585)	(0.0451)	(0.1466)	(0.0450)
2021m6 × Treated	-0.0131	-0.0667	0.0121	-0.0521
	(0.1413)	(0.0425)	(0.1309)	(0.0434)
2021m7 × Treated	-0.0488	-0.0680	-0.0370	-0.0528
	(0.1586)	(0.0409)	(0.1533)	(0.0407)
2021m8 × Treated	-0.0334	-0.0670*	-0.0011	-0.0479
	(0.1579)	(0.0392)	(0.1518)	(0.0404)
2021m9 × Treated	-0.0496	-0.0501	-0.0334	-0.0373
	(0.1584)	(0.0364)	(0.1503)	(0.0372)
$\triangle_t O.S._b$	-1.0190***	-0.0900	-1.0437***	-0.0854
	(0.1243)	(0.0532)	(0.1316)	(0.0534)
CHFtoEUR	-1.5281	0.1038	-1.2842	0.0472
	(1.3116)	(0.3600)	(1.3123)	(0.3723)
L.$Returnb^m$			0.0007	-0.0004**
			(0.0008)	(0.0002)
L.Vol. $Returnb^d$			0.0331	0.0019
			(0.0234)	(0.0043)
pre 2019m3 × Treated	0.1375	-0.0524**	0.1560	-0.0346*
	(0.1263)	(0.0201)	(0.1414)	(0.0195)
post 2021m9 × Treated	-0.0587	-0.0478	-0.0158	-0.0339
	(0.1795)	(0.0294)	(0.1746)	(0.0299)
Constant	1.0599	0.3265	0.7409	0.3656
	(1.2542)	(0.3446)	(1.2708)	(0.3575)
Observations	190,006	234,056	190,006	234,056
ajd. R^2		0.336		0.336
# Banks	26	26	26	26

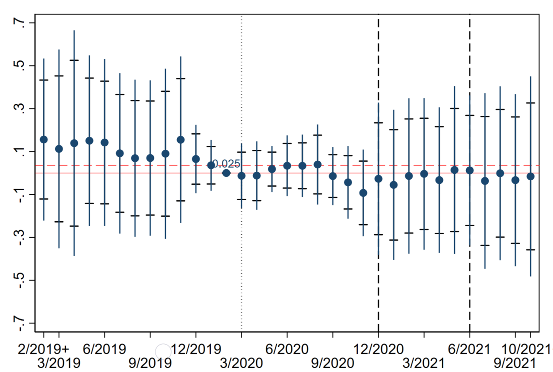
Figure A2
Event Study Plots: Funds and Institutions Addtional Controls

Panels A and B of Figure A2 plot the evolution of the coefficients $\{\delta_k\}$ of Equation (2) including the return and return volatility controls. Panels A and B show the estimates using the poisson pseudo-maximum likelihood regression on $\%Ownershare_{i,j,t}$ for funds and institutions on the matched sample. Panel C and D show the estimates using a linear probability model on an indicator variable being one if investor i is invested in bank b at time t for the matched sample. The sample includes 26 banks. The regression uses bank and investor times month fixed effects and controls for the exchange rate to EUR, FX to EUR, the monthly change in shares outstanding per bank $\triangle_t O.S._b$, the past stock return, and the past stock return volatility . The outer bands represent the sup-t 95% confidence bands according to Montiel Olea and Plagborg-Møller (2019), the inner bands are the 95% confidence intervals for clustered standard errors on banks. All coefficients measure the impact compared to February 2020. The average value of the dependent variable on February 2020 is reported above the coefficient of the time. The dashed horizontal line uses January 2020 as a benchmark instead of February 2020. The dotted vertical line marks the month of the implementation, whereas the dashed vertical lines mark the different relief announcements.

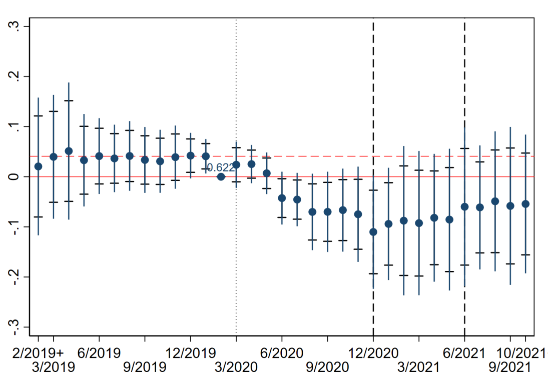
Panel A. Funds



Panel B. Institutions



Panel C. Funds LPM



Panel D. Institutions LPM

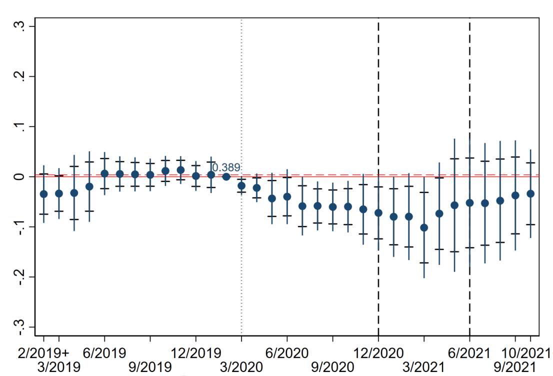
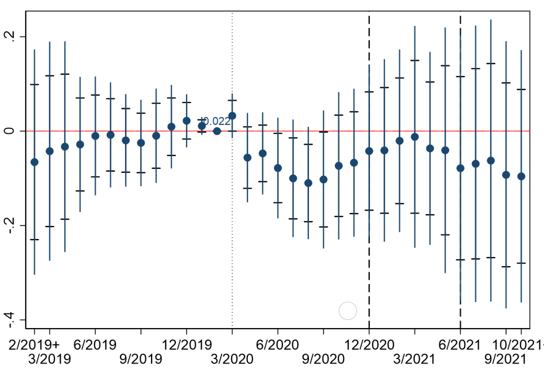


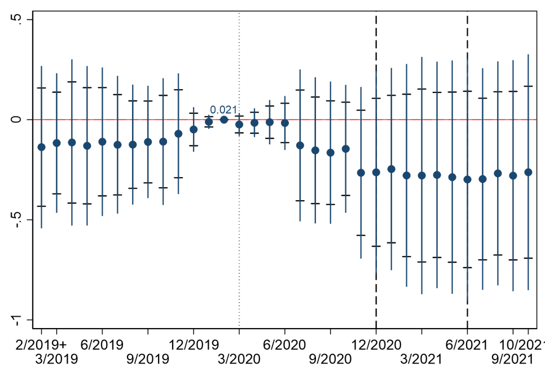
Figure A3
Event Study Plots: Funds and Institutions Unmatched Sample

Panels A and B of Figure A2 plot the evolution of the coefficients $\{\delta_k\}$ of Equation (2) . Panels A and B show the estimates using the poisson pseudo-maximum likelihood regression on $\%Ownershare_{i,j,t}$ for funds and institutions on the unmatched sample. Panel C and D show the estimates using a linear probability model on an indicator variable being one if investor i is invested in bank b at time t for the matched sample. The sample includes 50 banks. The regression uses bank and investor times month fixed effects and controls for the exchange rate to EUR, FX to EUR, the monthly change in shares outstanding per bank $\triangle_t O.S._b$. The outer bands represent the sup-t 95% confidence bands according to Montiel Olea and Plagborg-Møller (2019), the inner bands are the 95% confidence intervals for clustered standard errors on banks. All coefficients measure the impact compared to February 2020. The average value of the dependent variable on February 2020 is reported above the coefficient of the time. The dashed horizontal line uses January 2020 as a benchmark instead of February 2020. The dotted vertical line marks the month of the implementation, whereas the dashed vertical lines mark the different relief announcements.

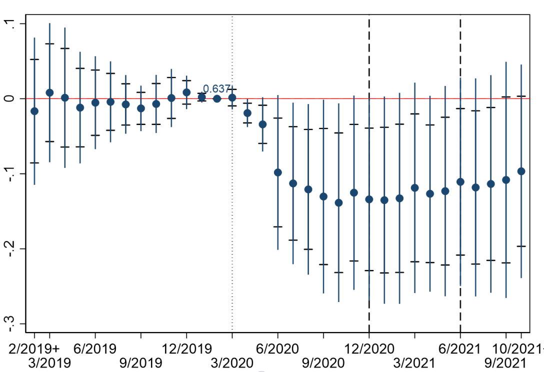
Panel A. Funds



Panel B. Institutions



Panel C. Funds LPM



Panel D. Institutions LPM

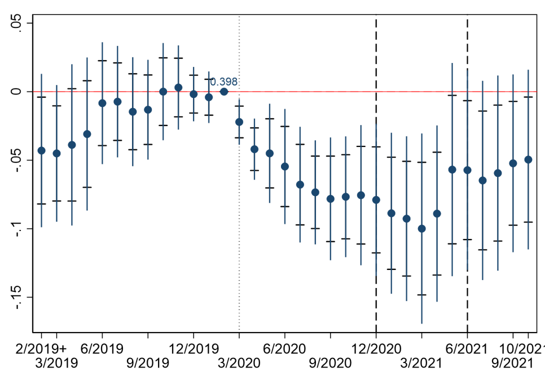
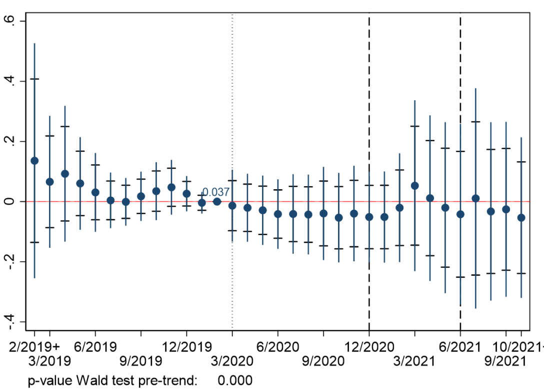


Figure A4
Event Study Plots: ETFs, Pensions and Insurance

Panels A and B of Figure A4 plot the evolution of the coefficients $\{\delta_k\}$ of Equation (2) show the estimates using the poisson pseudo-maximum likelihood regression on $\%Ownershare_{i,j,t}$ for ETFs and pension funds, respectively. Panel A shows the results for ETFs and Panel B shows the results for pension funds. The sample includes 26 banks. The regression uses bank and investor times month fixed effects and controls for the exchange rate to EUR, FX to EUR, and the monthly change in shares outstanding per bank $\triangle_t O.S._b$. The outer bands represent the sup-t 95% confidence bands according to Montiel Olea and Plagborg-Møller (2019), the inner bands are the 95% confidence intervals for clustered standard errors on banks. All coefficients measure the impact compared to February 2020. The average value of the dependent variable on February 2020 is reported above the coefficient of the time. The dotted line marks the month of the implementation, whereas the dashed lines mark the different relief announcements.

Panel A. ETFs



Panel B. Pension Funds

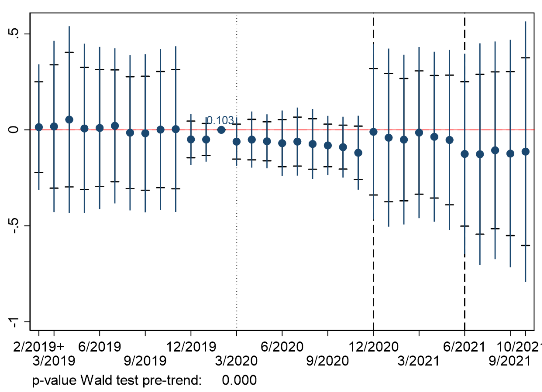
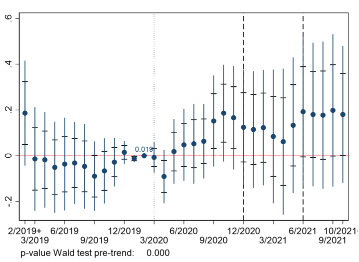


Figure A5

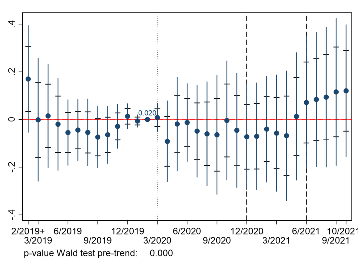
Event Study Plots Triple Difference: Funds Dividend Dimension

The sample includes 26 banks. The regression uses bank and investor times month fixed effects and controls for the exchange rate to EUR, FX to EUR, and the monthly change in shares outstanding per bank $\triangle_t O.S._b$. The outer bands represent the sup-t 95% confidence bands according to Montiel Olea and Plagborg-Møller (2019), the inner bands are the 95% confidence intervals for clustered standard errors on banks. All coefficients measure the impact compared to February 2020. The average value of the dependent variable on February 2020 is reported above the coefficient of the time. The dotted line marks the month of the implementation, whereas the dashed lines mark the different relief announcements.

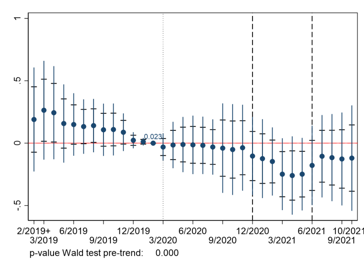
Panel A. RelVol



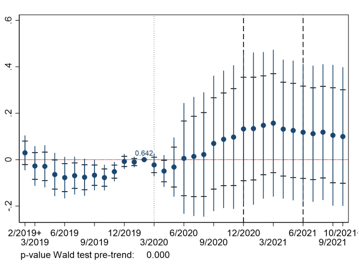
Panel B. SOA



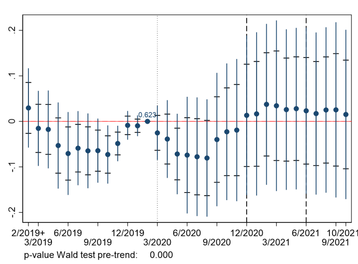
Panel C. Div. Yield



Panel A. LPM RelVol



Panel B. LPM SOA



Panel B. LPM Div. Yield

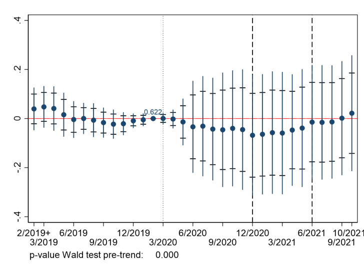
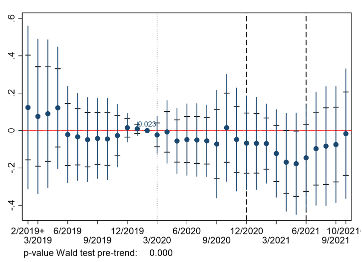


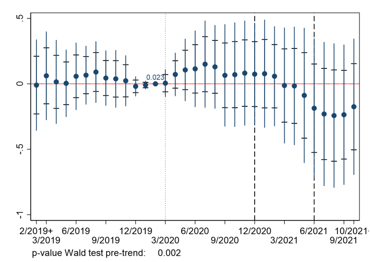
Figure A6
Event Study Plots Triple Difference: Funds Risk Dimension

The sample includes 26 banks. The regression uses bank and investor times month fixed effects and controls for the exchange rate to EUR, FX to EUR, and the monthly change in shares outstanding per bank $\triangle_t O.S._b$. The outer bands represent the sup-t 95% confidence bands according to Montiel Olea and Plagborg-Møller (2019), the inner bands are the 95% confidence intervals for clustered standard errors on banks. All coefficients measure the impact compared to February 2020. The average value of the dependent variable on February 2020 is reported above the coefficient of the time. The dotted line marks the month of the implementation, whereas the dashed lines mark the different relief announcements.

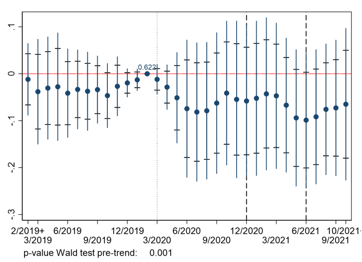
Panel A. Price/Book



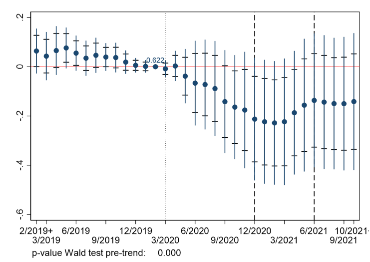
Panel B. Log(Z-Score)



Panel A. LPM Price/Book



Panel B. LPM Log(Z-Score)



Appendix A4 Data

Table A3
Descriptive Statistics Dataset: Monthly Data

Table A3 shows the mean, standard deviation, 1st quartile, median, 3rd quartile, and the number of observations of the additional variables describing the investor ownership dataset. US Filings is an indicator being one if the source of the data comes from US filings. Non 13F Based is an indicator if the source of the investor's ownership does not come from 13F filings. Ratio Treated-Control is the ratio of treated banks an investor is invested in compared to all banks in the sample.

	mean	sd	p25	p50	p75	count
Fund						
$USFilings_i$	0.257	0.437	0.000	0.000	1.000	1705825
$non13FBased_i$	0.959	0.199	1.000	1.000	1.000	1705865
$RatioTreated - Control$	54.002	34.680	22.581	63.636	76.923	1036311
Insider						
$USFilings_i$	0.025	0.155	0.000	0.000	0.000	6799
$non13FBased_i$	0.992	0.091	1.000	1.000	1.000	19935
$RatioTreated - Control$	44.327	49.002	0.000	0.000	100.000	15315
Institution						
$USFilings\_i$	0.390	0.488	0.000	0.000	1.000	708200
$non13FBased\_i$	0.610	0.488	0.000	1.000	1.000	708381
$RatioTreated - Control$	55.802	34.075	40.000	65.217	77.778	283306
Total						
$USFilings_i$	0.296	0.456	0.000	0.000	1.000	2420824
$non13FBased_i$	0.858	0.349	1.000	1.000	1.000	2434181
$RatioTreated - Control$	54.273	34.775	22.581	63.636	77.778	1334932

Table A4
List of Sample Banks

Table A4 lists the banks in the sample for the event study analysis and the matched sample. Banks marked with ⋆ were omitted in the event study to have a balanced panel.

	Full sample	Matched sample	Omitted
AIB Group PLC	Treated	Treated	
Aareal Bank AG	Treated	Treated	
BAWAG Group AG	Treated	Treated	
BNP Paribas S.A. Class A	Treated		
BPER Banca S.p.A.	Treated	Treated	
Banca Popolare di Sondrio S.c.p.A.	Treated	Treated	
Banco BPM SpA	Treated	Treated	
Banco Santander, S.A.	Treated		
Bank of Ireland Group Plc	Treated	Treated	
Bank of Valletta P.L.C.	Treated	Treated	
Commerzbank AG	Treated		
Credit Agricole SA	Treated		
Deutsche Pfandbriefbank AG	Treated	Treated	
HSBC Bank Malta P.L.C.	Treated	Treated	
ING Groep NV	Treated	Treated	
Intesa Sanpaolo S.p.A.	Treated	Treated	
KBC Group N.V.	Treated	Treated	
Liberbank SA	Treated		⋆
Mediobanca - Banca di Credito Finanziario S.p.A.	Treated	Treated	
Nordea Bank Abp	Treated		⋆
Nova Ljubljanska banka d.d.	Treated		⋆
Raiffeisen Bank International AG	Treated	Treated	
Societe Generale S.A. Class A	Treated		
UniCredit S.p.A.	Treated	Treated	
Unicaja Banco S.A.	Treated	Treated	
Vseobecna uverova banka, a.s.	Treated		⋆
Banque Cantonale Vaudoise	Control		
Banque Cantonale de Bale Campagne Kantonalbank-Zertifikat	Control		
Banque Cantonale de Geneve SA	Control	Control	
Banque Cantonale du Jura	Control	Control	
Basler Kantonalbank Partizipsch	Control	Control	
Bellevue Group AG	Control		
Berner Kantonalbank AG	Control	Control	
Cembra Money Bank AG	Control		
Credit Suisse Group AG	Control	Control	
EFG International AG	Control		
Glarner Kantonalbank	Control		
Graubuendner Kantonalbank	Control		
Hypothekarbank Lenzburg AG	Control		
Julius Baer Gruppe AG	Control		
Luzerner Kantonalbank AG	Control	Control	
ONE swiss bank SA	Control		
St.Galler Kantonalbank AG	Control	Control	
Swissquote Group Holding Ltd.	Control		
Thurgauer Kantonalbank	Control	Control	
UBS Group AG	Control	Control	
Valiant Holding AG	Control	Control	
Vontobel Holding AG	Control		
Walliser Kantonalbank	Control		
Zuger Kantonalbank AG	Control		

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