Dividend Restrictions and Search for Income*

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Abstract

We measure the reaction of search for income in mutual funds to supervisory-induced dividend restrictions on euro area banks during the Covid-19 pandemic, which operated as an exogenous shock to payouts in this sector. Using granular data on euro area-based mutual funds´ holdings, we show that demand for dividends motivated portfolio decisions in this period and that these decisions had implications for stock returns. Specifically, we document that there were more sales of bank stocks by income-oriented funds after payout restrictions started operating. These funds were however less prone to dispose of bank CoCos, an alternative high income-generating asset issued by credit institutions and not subject to supervisory distribution limits. Finally, we analyze the price impact of these portfolio adjustments, documenting negative abnormal returns in bank stocks more exposed to income-oriented funds after the policy announcement. Our research evidences that search for income is relevant in asset allocation decisions and price formation, and quantifies some of the side effects of dividend restrictions policies.

Keywords: search for income, dividends, asset allocation, abnormal returns, mutual funds

JEL Codes: G12, G14, G21, G35

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Introduction

The hypothesis that dividends are irrelevant to the firm value under some ideal conditions (Miller and Modigliani, 1961) has motivated voluminous research in the asset pricing literature for decades.[1] An important implication of dividend irrelevance is that investors should only be concerned with the total return of stocks, regardless of whether it stems from dividend payments or from changes in the stock price level, and even after taking into account frictions (e.g., taxes). However, this proposition seems at odds with some evidence that investors are willing to pay higher prices for dividend-paying stocks (Baker and Wurgler, 2004), sometimes pushing up stock returns just before dividend payments are made (Hartzmark and Solomon, 2013). Indeed, at least in certain situations, investors appear to form and manage their portfolios as if dividends were "a free income stream" (Hartzmark and Solomon, 2019), rather than being neutral regarding these payouts.[2] That is, there are valid reasons to believe that investors search for income.

In our paper, we provide new evidence on the relevance that dividend payments have to investors´ asset allocation decisions and to stock prices. Specifically, we use dividend restrictions on euro area banks during the pandemic as a plausible policy experiment to uncover the role of search for income in mutual funds´ portfolios. In March 2020, the European Central Bank (ECB) recommended banks in this region not to pay dividends or buy back shares in the context of the Covid-19 pandemic (European Central Bank, 2020a).[3][4] The objective of this policy was to improve the loss absorption and lending capacities of the banking sector (more details in section 2). In practice, the policy

[1] Miller and Modigliani (1961) refer to an ideal economy with "perfect capital markets, rational behavior, and perfect certainty".

[2] Hartzmark and Solomon (2019) show that, among others, investors are less likely to remove shares that pay out large dividends from their portfolios.

[3] The ECB announced these restrictions in March 2020 (firstly until October 2020, being the measure subsequently extended). Large banks in the US were also subject to payout restrictions, but these constraints were announced later on (in June 2020). See ESRB (2020b) and Svoronos and Vrbaski (2020) for an overview of these measures worldwide.

[4] The European Systemic Risk Board (ESRB) reiterated this recommendation in ESRB (2020a), which included other financial institutions different from banks (e.g., insurance firms), and applied to all jurisdictions under the surveillance of the ESRB, and not just to euro area countries.

suppressed 15% of planned dividend distributions of listed companies in this region for 2020.[5]

In general, dividend announcements have implications for firms as they convey news about their situation (H. DeAngelo and L. DeAngelo, 1990). In particular, dividend reductions can be viewed as negative information shocks associated with future distress (Baker et al., 2016). Dividend reductions also convey other type of information. H. DeAngelo et al. (1992) point to binding debt covenants, the presence of growth opportunities managers are willing to exploit, and even strategic motivations such as improving the bargaining power with unions. Against this backdrop, market reaction to dividend cuts or omissions, which is usually negative (Baker et al., 2016), may not be explained by *disappointed* dividend-seeking investors but, for example, by a reassessment of firm fundamentals.

The ECB decision is however different from other dividend reduction announcements. First, it induced a supervisory-driven restriction, which did not depend on managerial decisions. Second, the supervisory distribution limits were a response to an exogenous shock to the economy (the pandemic) and not a reaction to, for instance, existing vulnerabilities in the banking industry, which would raise endogeneity concerns. Third, *all* banks were asked to cancel dividend payments, which was done on purpose to avoid the stigma effects that could surge from targeting specific institutions (Katsigianni et al., 2021). Therefore, the particular design of dividend restrictions in the euro area could not add much information on the situation of *individual* banks. We argue that this setting is ideal to isolate search for income, or the importance that investors give to dividends, from other motivations to trade (bank) stocks following shocks to (bank) payouts.[6]

Dividend restrictions on banks represent an interesting case study. Bank assets are inherently

[5]Planned payouts as of December 2019. We multiply the number of shares that month by dividends per share expected for the next 12 months in the EuroStoxx 600 index to calculate the share of planned distributions of banks. We use Datastream (Refinitiv) for these calculations.

[6]One could still think that the policy announcement, while silent about individual institutions, could raise a red flag about the situation of the banking sector as a whole, impacting portfolio decisions. For instance, Flannery et al. (2017) show that the supervisor has access to private information about banks and that its disclosure may influence market participant perceptions. As discussed later, the design of our empirical strategy, which focuses on how investors trade stocks of the same bank, alleviates this concern.

opaque, which results, among other aspects, from the competitive advantage of these institutions in extracting private information about their borrowers. This situation implies that it is difficult for banks´ shareholders to evaluate the quality of credit institutions´ balance sheets (Forti and Schiozer, 2015). By paying out dividends, banks can compensate investors for this. In this vein, dividend payments can also signal market strength, which is important due to the informational asymmetries between banks´ managers and shareholders (Floyd et al., 2015). Against this backdrop, it is not striking that the dividend yield of banks has been traditionally higher compared to non-financial corporations, including during crisis periods (see Figure 1, which compares the distribution of the dividend yield of the stocks of these two groups of firms, in Europe).[7] Given the incentives for keeping distributions at bad times (Acharya et al., 2017) and the historical patterns in bank payouts during these episodes, it is likely that without the ECB's policy bank managers would not have set these payments to zero during the pandemic.[8]

On the investors' side, mutual funds provide a good testing ground for our analysis. First, they can have a demand for dividend payments (Hartzmark and Solomon, 2019).[9] Many funds are not long-horizon investors (Cella et al., 2013), so it should be easier for some of them to disinvest from bank stocks following bad news about payouts. This is not the case of, for instance, strategic investors, who represent an important share of the ownership of euro area banks.[10] In addition, mutual funds are not subject to capital requirements, as opposed to banks or insurance companies, so their trades should not be driven by this regulation (Becker and Ivashina, 2015). Finally, mutual funds are large players in the marketplace and present large exposures to bank stocks: according to the last available data, around 30% of the total holdings of bank stocks by euro area investors are

[7] See the works of Acharya et al. (2011) or Gambacorta et al. (2020) for more evidence on large payouts by banks in other jurisdictions.

[8] Criticism against the ECB decision supports this view: a global bank chair expressed concerns about the supervisory distribution limits and the possibility they could make banks "*uninvestable*", while another top manager of a large bank alleged that these measures involve "*a major breach of trust with our shareholders, one they will not quickly forget*" (FinancialTimes, 2020).

[9] For example, Hartzmark and Solomon (2019) demonstrate that mutual funds (among other investors) show lower responsiveness to price returns in stocks that pay higher dividends.

[10] Verón (2017) shows that ownership in many large banks of the euro area is concentrated in cooperatives, individuals, the public sector or semi-public entities like foundations.

in the hands of mutual funds.[11] This means that the portfolio decisions of these vehicles can have price implications.

The aim of this paper is to take advantage of the particular design of dividend restrictions in the euro area to measure the importance of this income source in the investment behavior of mutual funds. To this end, we use Lipper for Investment Management (Lipper), a large data repository that offers a breakdown of mutual funds´ portfolios, at the fund-security level, and that reports some attributes of these vehicles as well.

First, we study trading decisions of income-oriented funds ("income funds"), or funds that distribute dividends to their shareholders, and those of other funds (that reinvest dividends or the interest earned on debt securities) following supervisory distribution limits.[12] To regularly pay out dividends, income funds invest in dividend-paying stocks and other income-paying securities (such as coupon bonds), passing on the resulting income stream to their owners. The importance for these funds of gaining exposure to income-generating assets is evidenced by, for instance, their investment policies, which sometimes require their managers to seek exposure to high dividend-yielding stocks.[13] Additional evidence in this regard is provided by strategies known as "juicing" that some of these vehicles pursue, as described by Harris et al. (2015). These strategies consist of increasing the fund´s portfolio dividend yield by buying stocks before the ex-dividend date, and selling them right after collecting the dividend. Given these conditions, we expect search for income to be an important driver of the trading decisions of income funds, which might be accordingly more responsive to dividend restriction policies.[14]

[11] Ratio calculated from public information of the Securities Holdings Statistics of the ECB, available at the Statistical Data Warehouse of the ECB. It is not possible to calculate the same ratio for non-euro area investors, since holdings data for these holders is less accurate in this dataset.

[12] Lipper flags whether share classes are "paid", which means that they distribute dividends, or "retained", which means that they do not make distributions. We classify an income fund as such if its primary share class is "paid".

[13] For instance, the CPR Euro High Dividend (Amundi Group), which issues income-oriented shares, seeks to outperform a benchmark index "*by investing in companies that are paying out higher dividends than the European average*" (https://www.cpr-am.fr/institutionals/product/view/FR0007024047).

[14] In theory, income funds could also pay out dividends to their shareholders by liquidating part of their portfolio. However, this remuneration policy would increase portfolio turnover and transaction costs, eroding the fund´s profitability and its net asset value (per share).

We find that income funds were more likely to sell stocks than other funds after the activation of the supervisory distribution limits, a result that we explain in light of the search for income channel outlined above. This outcome is only present during the policy period and not before or when the policy was terminated. Indeed, over time, income funds ended up repurchasing some of the bank stocks they disposed of during the kick-off of this policy. Our results are validated by a battery of placebo tests, and hold not only for the cross-section of bank stocks, but also for stocks issued by the *same* bank (i.e., for regressions with bank or bank-month fixed effects). Our *within-bank* analysis is important. If dividend restrictions are not informative about the situation of individual banks (contrary to managerial dividend cuts, which are negative information shocks), one should look at portfolio decisions *within* the same institution: at this level, investors cannot trade on new information and we can isolate search for income from any information shock (which is present in, for example, dividend announcements by firms). Besides, by looking at how funds trade stocks of the *same* bank, we are able to control for time-varying shocks to banks. This is especially important during our sample period, as authorities restricted payouts at the beginning of the pandemic, that is, in a situation in which economic conditions were changing rapidly.

We next analyze what income funds do with their portfolios when selling bank stocks. In particular, we study preferences between holding bank stocks and other securities issued by banks and not subject to distribution constraints. The latter should be more attractive for income investors after the supervisory distribution limits.[15] Within this group of bank instruments, we focus on Additional Tier 1 (AT1) contingent convertible debt or CoCos, since they present some equity-like characteristics. First, CoCos offer substantial compensation to their investors. As a matter of fact, the coupon rate in bank CoCos was more elevated than the dividend yield of bank stocks before the introduction of the supervisory distribution limits (Figure 2). CoCos continued paying coupons during the policy period, making it an attractive alternative to stocks. Like stocks, CoCos are capital, going-concern and perpetual instruments, and are expected to absorb losses when banks fail,

[15]We focus on comparing bank stocks to other *bank* securities, rather than comparing bank stocks to non-bank dividend-paying stocks, because gaining exposure to the latter asset may not only align with search for income but also with other motivations, such as non-banks being perceived as more profitable investments at the onset of the pandemic.

even when stocks are junior claims.[16] Therefore, although CoCos may not be perfect substitutes for stocks and may theoretically bear less credit risk, we argue that gaining exposure to these instruments could have been seen as an alternative to bank shares for search for income investors.

We show that, coinciding with the introduction of dividend constraints, income mutual funds were less prone to sell CoCos than other funds.[17] This means that when income funds got rid of bank stocks, they were not simply reducing their exposure to bank risk. Otherwise they would also be dumping bank CoCos (to a higher extent than other funds). We take this result as additional evidence that appetite for income motivates trading decisions of these investors, and draw that it is possible that the supervisory distribution limits had an effect on securities beyond bank stocks. Importantly, our results remain the same for holdings of instruments (stocks and CoCos) issued by the *same* bank (with bank-month fixed effects) and even held by the *same* fund (with fund-bank-month fixed effects), which allows us to conclude that the distributions constraints set by the ECB potentially induced some substitution between stocks and other securities with unconstrained payouts.[18]

Finally, we explore the price consequences that income funds exposure had for bank stocks after the supervisory intervention. We show that, after the policy announcement, banks more exposed to income funds (i.e, banks in which the ownership of these funds is more prominent) experienced negative abnormal returns in the stock market, while abnormal returns were flat for the other banks. This latter result underpins our view that the information content of the ECB policy was rather limited. Otherwise, the ECB announcement should have triggered price adjustments in

[16] One should bear in mind that banks are leveraged companies with sometimes tiny capital levels. Accordingly, loss absorption exercises can involve shareholders and other bank´s creditors at the same time, including CoCos holders (e.g., resolution of Banco Popular or, more recently, Credit Suisse). This might be especially true in crisis times when the erosion of bank capital is greater. Besides, the vast majority of CoCos issued in our sample of banks have write-down clauses, meaning that in theory they could see a reduction in their principal amount when the capital ratio of the bank hits a certain trigger, regardless of shareholders' losses (see Avdjiev et al., 2020 for a detailed study of CoCos issued by banks in the euro area and in other jurisdictions).

[17] Specifically, income funds were less likely to sell CoCos (when compared with stocks), while results for non-income funds are less clear cut.

[18] Although stocks are more liquid than CoCos, and thus easier to sell to increase cash holdings, this characteristic does not explain why income funds sold more bank stocks and less bank CoCos during the supervisory distribution limits, as we document in the paper. Income funds did not suffer more outflows at the beginning of the pandemic (which could trigger more sales of stocks by these investors, to obtain liquidity and meet redemptions), and present indeed similar attributes to other funds (see section 3 for data details).

all bank stocks, not just in those in which the ownership of income funds is greater. Thus, dividend restrictions offer an ideal natural experiment to investigate search for income reaction after a shock in firm payouts.

Taken together, our research extends the literature on search for income as a fundamental driver of trading decisions by some investors (see, for instance, Daniel et al., 2021; Harris et al., 2015; or Jiang and Sun, 2020). To the best of our knowledge, we are the first to uncover investor demand for income from a policy shock unrelated to managerial decisions. This is a direct proxy for appetite for dividends contrary to other measures used in the literature (see Hartzmark and Solomon, 2019, and the discussion in section 1, "Related literature"). Our results confirm that dividend payments are not irrelevant to (income) investors and, perhaps more important, that search for income impacts price formation in the stock market.

Our work also contributes to understanding the potential side effects associated with dividend restrictions policies, a topic largely unexplored in the literature. In particular, the negative price reaction that we find for bank stocks exposed to income funds suggests that banks´ managers may cater to investors by paying out dividends (Becker et al., 2011). Not making these distributions has implications for the price of certain stocks.

The paper is organized as follows. Section 1 presents the related literature. Section 2 describes the dividend restrictions policy set by the ECB and the context in which it was activated. Section 3 displays holdings data and summary statistics. Section 4 outlines the identification strategy. Section Section 5 contains the main results of the paper and lists some extensions to these results, which are developed in the annexes to the paper. Section 6 concludes.

1 Related literature

Our paper sheds light on the importance of the demand for dividends in shaping investors´ portfolios, a strand of the literature which has gained attention in recent years. For instance, Hartzmark and Solomon (2013) document a pricing anomaly whereby firms present positive abnormal returns when they declare a dividend. As explained before, Harris et al. (2015) show that some income funds engage in "juicing" to increase the portfolio dividend yield. More recently, Daniel et al. (2021) indicate that income-generating assets are more appealing to investors when interest rates are low, while Jiang and Sun (2020) or Hartzmark and Solomon (2019) conclude that search for income is higher when past market performance is low. The context in which the supervisory distribution limits were introduced was characterized by low rates and poor market performance, which should strengthen search for income motivations in trading decisions.

We extend this literature by exploiting an exogenous policy shock to firm distributions. The shock is exogenous because it was supervisory-driven and not a consequence of manager decision-taking. Other studies point to adverse price reaction to announcements of dividend omissions or cuts by non-financial firms (Baker et al., 2016) and by banks (Bessler and Nohel, 1996), where this reaction is more negative. But dividend reductions are usually signals about company prospects. These announcements thus do not isolate search for income motivations in trading decisions as our setting does.

Our research overcomes difficulties in the identification of search for income. Contrary to other market variables, search for income is not observable and is thus not easy to pinpoint when it is actually motivating portfolio decisions. Existing proxies for search for income (for instance, the short-term price pressure on stocks before dividend payments identified by Hartzmark and Solomon, 2013) are indirect and marketwide (Hartzmark and Solomon, 2019).[19] We enhance the identification

[19]Accordingly, Hartzmark and Solomon (2019) recognize that its market impact analysis of demand for income "*requires stronger assumptions* [than the investor-level analysis carried out in their paper] *and is not cleanly identified*".

of search for income by leveraging on a policy intervention that prompts variation in dividends, and also by categorizing groups of investors that are more sensitive and less sensitive to payouts (income and non-income funds). This approach enables us to establish a strong causal link between variation in demand for income and its consequences for asset prices (in our case, the underperformance of bank stocks more exposed to income investors). This link has important implications for the asset pricing literature given that, although there are studies that analyze the role of dividends in the predictability of stock returns,[20] they have not been explicitly incorporated into important generally-accepted asset pricing models (see, for example, the 5-factor model of Fama and French, 2015). One explanation is that while dividend yields explain some of the variance of returns (Fama and French, 1988), the cross-section of stock returns is well characterized by a number of other market factors (Fama and French, 1993). Without overlooking these findings, our point is that time-varying demand for dividends, rather than dividends themselves, may shape returns as well, being the asset pricing literature mostly silent about this issue.

Our work also complements the literature that states that investors search for yield when choosing their investments (Becker and Ivashina, 2015). Our results indicate that search for income motivates investment decisions as well. That is, investors make asset allocation decisions in light of the income-generating capacity of securities, and not only taking into account compensation for risk (this finding is supported by Jiang and Sun, 2020, among others).

Finally, the paper also provides interesting insights for the banking regulation literature since it helps to better understand the potential side effects of dividend restrictions, which should be taken into account in the complex cost-benefit analysis of these measures. Surprisingly, there are not many papers exploring the impact of these policies. Among the ones that do it, Matyunina and Ongena (2020) argue that cancelling or delaying dividends should lead to lower bank valuations. Andreeva et al. (2023) study euro area bank stock prices after the ECB dividend restrictions decision, finding

[20] Naranjo et al. (1998) demonstrate that returns are positively related to a constructed dividend yield, while Boudoukh et al. (2007) find an insignificant relation between returns and dividend yield, but a positive one between the former and the payout yield, that includes repurchases.

that they underperformed other market segments. ESRB (2020b) documents that euro area banks underperformed non-euro area banks in this same period. Lastly, Pablos and Pérez Montes (2022) show that this measure translated into negative abnormal returns for some credit institutions after its initial announcement, but not in subsequent revisions. Of course, these outcomes do not mean that this policy action cannot trigger positive effects. For example, it has been proven that these policies increase bank lending capacity (Dautović et al., 2023; Martínez-Miera and Vegas, 2021) and could alleviate incentives to capital depletion (Acharya et al., 2011 and Acharya et al., 2017).

2 Institutional setting

The outbreak of the Covid-19 pandemic in early 2020 brought an unprecedented health crisis that caused a severe economic contraction and disruptions in intermediaries and funding conditions. One of the main concerns at that time was the possibility of the interruption of the credit flow to households and businesses. European banks were in good health after recovering from the Great Financial Crisis, especially in terms of solvency, due, at least in part, to the introduction of more stringent capital requirements.[21] However, expectations of asset deterioration at the onset of the Covid-19 pandemic motivated the adoption of a number of support measures.[22]

Among the measures implemented to support lending and ensure that credit institutions could strengthen their loss-absorbing capacity, supervisors in some jurisdictions induced restrictions on capital distributions. Policies across jurisdictions differed in terms of scope, severity and duration (Svoronos and Vrbaski, 2020). In the euro area, the ECB recommended to suspend the distribution of capital for the financial years 2019 and 2020, both through dividend payments and share buy-backs (ECB, 2020a).[23] With this policy, the ECB assumed a clear stance on capital conservation.

[21] By the end of 2019, banks in the EU held CET1 capital comfortably above regulatory requirements. The fully loaded weighted average CET1 ratio equaled 14.8%. For more information, see https://www.eba.europa.eu/eba-releases-bank-bank-data-start-covid-19-crisis.

[22] For more details on support measures and their effects see, for instance, Casanova et al. (2021).

[23] The recommendation was directed to all significant institutions of the euro area (i.e., big banks or banks that play a meaningful role in the banking system), which are under the ECB supervision. National supervisors extended the

The measure was initially planned to be in force until October 2020, having a meaningful impact on bank distributions: in 2020, significant credit institutions in this region, originally planned to pay EUR 35.6 bn in dividends for the 2019 year, of which only 6% was effectively distributed following the policy entry into force.[24]

The recommendation was extended in July 2020 until January 2021, while in December 2020 the ECB announced the intention of lifting restrictions on shareholder remuneration from September 2021 onwards. Macroeconomic conditions were improving by that time, and although it was stated that credit institutions should determine distributions considering their own forward-looking capital generation capacity, the ECB introduced some provisions to ensure prudent distribution policies.[25] Finally, in July 2021 the ECB notified that the recommendation would not be further extended. Although extreme judiciousness in distribution policies was still advised, the supervisory process by which individual institutions' capital and distribution plans were assessed in normal times was reinstated.[26]

3 Data and variables

A. Data sources

We analyze funds´ holdings of bank securities with Lipper for Investment Management. Lipper covers data for active and inactive mutual funds based in many countries worldwide and has been used before as a means to study the determinants of funds trading decisions. See, for instance, the works of Cremers et al. (2016) or Ferreira et al. (2018).

measure to less significant banks or institutions.

[24]Calculated from ECB (2020b).

[25]More specifically, dividend payments or share buy-backs of more than the lowest value between 15% of the accumulated profit in 2019 and 2020 and 20 basis points of CET1 would not be considered prudent. This third recommendation would be applicable until 30 September 2021.

[26]See also Recommendation ESRB/2020/7 on restriction of distributions during the COVID-19 pandemic in ESRB (2020a)

We restrict the sample of funds to vehicles based in the euro area and primarily investing in equity and/or bonds (the asset types Equity, Bond and Mixed Assets in Lipper).[27] The resulting sample of funds is large: there were over 12,000 funds of this type that reported holdings in Lipper as at the end of 2019, managing assets worth near 4.5 trillion euros by then,[28] or 40% of the total assets of these funds categories in the euro area (according to ECB statistics). Annex A1 presents evidence that our sample of funds is representative. Specifically, the Annex shows that total assets reported by Lipper funds have historically moved in tandem with those of the industry, and investment decisions in bank stocks and CoCos were also similar during the period of study.

We leverage on the granularity of Lipper data, which allows to examine mutual funds´ portfolios at the security level. For instance, we can see the holdings of the common share of bank "Y" held by fund "X", and see whether this fund increases, maintains or decreases its exposure to this particular security over time (via changes in the number of shares held). On the other hand, Lipper provides information on funds´ characteristics (e.g., total assets, flows), detailed in section 3.C. It also offers information on whether funds´ shares are income-oriented or not, that is, whether the fund issues shares that distribute dividends or not (Lipper has a specific indicator-variable for this purpose). Approximately 25% of funds´ assets in our sample belong to funds whose primary share is of this type.

We cover exposures to two instruments: euro-denominated common stocks and AT1 CoCos issued by banks based in the euro area. To identify these exposures, we first obtain the ISIN codes and other security-level characteristics such as instrument prices by exploiting Refinitiv Eikon and the Centralised Securities Database (CSDB) of the ECB. We then match this information with holdings data in Lipper by using the ISIN code of funds' holdings. In total, our dataset contains

[27] According to the Statistical Data Warehouse of the ECB, funds with this investment policy represented close to 80% of total assets of the industry as of the end of Q2 2022. Types of funds not covered in our work are real estate funds, hedge funds and the category of "Other funds" with miscellaneous investment policies. We also exclude funds with assets below one million euros (which is standard in the literature). Funds with limited scope to strategically respond to dividend restrictions, such as Exchange traded funds (ETFs) or index tracker funds, are not included in the sample either.

[28] This figure would increase to over 6 trillion if we also included funds that do not report their holdings.

the monthly exposures of Lipper funds to 72 common stocks and 95 AT1 CoCos (denominated in euros). These instruments represent, according to Refinitiv Eikon, 93% of the market capitalization of banks in the euro area stock market, and 92% of the amount outstanding of AT1 CoCos in the same region.[29]

B. Holdings data

Figure 3 presents the evolution of the market value of funds´ exposures to bank stocks, normalized to 100 as of September 2019. The chart differentiates between holdings of income and non-income funds. As illustrated in the graph, both of them increase these holdings until dividend restrictions came into force in March 2020, when a wedge between the two groups of investors opens, as exposures of income funds diminish more strongly than those of other funds. This result is consistent with the hypothesis that income funds react more adversely to the supervisory distribution limits (since they "need" to invest in dividend-paying stocks). This still holds true when dividing exposures variation to total funds´ assets (see Figure 4).[30] The wedge persists all over 2020, albeit exposures return to pre-pandemic levels in both fund types at the end of the year, coinciding with the announcement of the end of dividend limitations by the ECB.[31]

Figure 5 shows the monthly change (in %) in the share of exposures to bank stocks (Figure 5.A) and CoCos (Figure 5.B) in relation to funds´ assets during March and April 2020, differentiating again between income and non-income funds. The sample is restricted to funds that simultaneously operate in the markets of bank stocks and of CoCos. Holdings of stocks drop to a higher extent in

[29]The "iBoxx Contingent Convertible Liquid Developed Europe AT1 (EUR Unhedged)", a reference index that groups liquid AT1 CoCos, covers 137 liquid bonds, more than those in our selection (95). However, this index includes issuances of institutions located in the United Kingdom and Switzerland, while our focus is on the euro area. Therefore, we believe that our list of CoCos is representative.

[30]Exposures to bank stocks stood at 2.8% of the total assets of income funds and at 3.1% of the total assets of non-income funds (of those funds with exposures to bank stocks) as of the end of 2019. This increases to 4.1% and 3.6% respectively in equity funds. These shares are not large but we note that banks represented just 10% of the total market capitalization of the corporate sector in Europe on that date. In addition, we note that funds sometimes gain exposure to the stock market by investing in passive vehicles (index trackers) rather than by directly purchasing individual shares.

[31]Dividend limitations were not lifted immediately but from September 2021 onwards. See section 2 for details.

income funds than in other funds (in line with our previous results), but holdings of CoCos fare better in the former group of investors.

The figures display thus that income-sensitive funds are more responsive to the supervisory distribution limits (they disinvest more from bank stocks, and invest more in the alternative income security -bank CoCos-, than other funds), indicating that dividend restrictions have asset allocation implications. Nevertheless, we need to carry out a more formal econometric analysis to validate these preliminary findings. Funds' characteristics cannot be controlled for with the aggregate data represented in the chart, so we cannot conclude that they do not drive portfolio decisions. We also need to consider the individual situation of banks during this episode and investors' perception of them in the formal regression framework.

C. Summary statistics

Table 1 includes some statistics of Lipper funds.[32] The sample period of our analysis is March-April 2020 (dividend restrictions were activated in late March, so we expect funds to react in these two months). As before, we distinguish between income funds (Panel A) and non-income funds (Panel B).

C.1. Dependent variable

The dependent variable is $exit$, a dummy variable that takes the value 1 when the fund reduces its exposure to zero in a given instrument and month, and 0 otherwise (Hartzmark and Solomon, 2019, use this variable in their work). $exit$ indicates therefore how often funds remove stocks (or CoCos) from the portfolio of any fund in a given month (in robustness tests, we consider alternative trading variables). Table 1 shows that income funds dealt with bank securities very differently

[32] In the empirical part, we focus on funds whose shares are euro-denominated (the vast majority), which should not consider exchange rate fluctuations when trading euro area stocks or CoCos. All our results are nevertheless robust when considering the whole sample of funds.

than other funds during the sample period. In particular, the unconditional probability of dumping bank stocks in income funds is more than two times higher than that of other funds (0.14 versus 0.06). In turn, the probability of dumping bank CoCos is higher in non-income funds (0.05 versus 0.07). Unconditionally, thus, income funds were more likely to dump bank stocks, and somewhat less likely to remove bank CoCos, which were not subject to distribution constraints during the supervisory distribution limits.

C.2. Independent variables

Table 1 also presents some funds´ characteristics, whose definitions are gathered in the note to the table. This includes funds´ net assets, the annual return of the fund, net flows or the classification of funds into the category of income-oriented, among others. All variables are retrieved or calculated from Lipper,[33] but we also obtain the share of funds in the hands of retail investors (variable $retail$ in the table) using the Securities Holdings Statistic by Sector (SHSS) of the ECB, a large repository of aggregate holdings for euro area investors.[34]

A simple inspection of funds´ attributes suggests that income funds were not very different from their non-income peers in the period of interest. We formally test this hypothesis by computing the Imbens and Wooldridge (2009) statistic, which avoids the sample-size dependence of tests for the equality of means. This statistic is the normalized difference of the mean values of covariates in the two groups of interest (income and non-income funds).[35] A statistic below 0.25 is indicative of the presence of overlap in the distributions of the covariates (Imbens and Wooldridge, 2009), even if the non-normalized or raw mean values differ between groups. Table A1 shows that normalized differences are all below the critical value, except for retail ownership, higher in income funds. This

[33] We aggregate funds characteristics across all share classes of funds, with the exception of $income$ and $retail$, for which we consider ownership data in each fund´s primary share class.

[34] In particular, we download the ISIN code of stocks issued by funds in Lipper and look for their ownership in the SHSS as of March 2020.

[35] Specifically, the normalized difference in means is computed as $(X_1 - X_0)/\sqrt{(S_1^2 + S_0^2)}$. The numerator of this expression is the difference in means of the covariate of interest in the two groups of funds, while the denominator considers the sample variances in these same groups.

is consistent with the view that search for dividends could be important for individuals (Hartzmark and Solomon, 2019), since investing in income funds´ shares contributes to earn a regular income stream. A higher share of dividend-seekers in income funds is what could motivate greater sales of bank stocks by these vehicles during the dividend restrictions episode (when these stocks became non-payers).

The bottom part of the two panels in Table 1 presents statistics for the monthly change in the price of stocks and CoCos and their market value. The market value is the market capitalization for stocks and the outstanding amount for CoCos (we draw this data from Refinitiv Eikon and from the CSDB of the ECB).[36] For the sake of completeness, we also present the raw difference in means and the Imbens and Wooldridge (2009) statistic for these covariates in Table A1, which show no evidence of significant differences.

4 Identification strategy

We analyze the response of mutual funds to dividend restrictions on euro area banks, an exogenous shock to distributions in these institutions. The shock is exogenous because dividend restrictions were supervisory-driven and not the result of managerial decisions, and because these restrictions were system-wide. This means that dividend restrictions were no more than $blind$ signals to investors, who could infer little from this decision about the situation of individual banks. This contrasts to other supervisory actions (e.g., stress tests) or the announcements of dividend cuts by firms, which are largely information shocks. Against this backdrop, our working hypothesis is that income funds should react more adversely than other funds to the supervisory distribution limits (by reducing their exposures to bank stocks to a higher extent), since they "need" to invest in income-paying securities to meet their dividend distribution commitments.

[36] We remove observations above the 99th percentile value and below the 1st percentile value in fund and security variables to make sure that our results are not driven by outliers.

To evaluate the preference of income and non-income mutual funds for banks after the activation of dividend restrictions, we first study trading decisions with bank stocks (the financial instrument of interest) by means of this specification:

$$exit_{ift} = \alpha + \beta income_f + \rho F_{ft} + \omega_{it} + \epsilon_{ift} \tag{1}$$

, where $exit$ is an indicator variable taking the value of 1 when the bank stock *i* held by fund f is removed from its portfolio during month *t*, being the same measure used in the work of Hartzmark and Solomon (2019). $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). F_{ft} is a vector of fund-level variables which incorporates the size of the fund, its return, fees (expense ratio), and flows in the fund as in Golez and Marin (2015). Besides, we control for the ownership of individuals in the fund, further adding fund family-month and fund asset type-month fixed effects in saturated specifications.[37] ω_{it} are bank stock-month fixed effects, which allow us to study $exit$ in stocks of the $same$ bank. With bank-month fixed effects, we implicitly control for institution-specific shocks. The *within-bank* analysis further allows us to isolate search for income from any information shock that motivates portfolio decisions (since dividend restrictions were uninformative regarding the $individual$ circumstances of banks). When we omit these controls (to study the effects for the cross-section of banks), we introduce the lagged return of the stock in a given month (in %). The sample period in Equation (1) covers March-April 2020. Standard errors are clustered at the fund level.

We expect income funds to be more likely to dump stocks when dividend restrictions are in force, which means that we expect a positive value for β. This effect should only be present around the activation of the policy and not at other moments. We test this hypothesis in the empirical section estimating Equation (1) on a monthly basis with different time windows, as well as with a difference-in-difference setting. On the other hand, we note that income funds could be more prone to sell bank stocks if somehow they reassessed the risk-return trade-off of bank stocks differently

[37] Fund family-month fixed effects absorb time-varying shocks to funds that belong to the same asset management company. Fund asset type-month fixed effects capture time-varying attributes of equity, bond and mixed asset funds.

than other funds during the policy period. To further make sure that demand for income is the driver of our results, we run a battery of placebo tests to show that the adverse reaction of income funds is only present in euro area banks and not in unaffected sectors or banks outside this region. These exercises also take Equation (1) as reference.

We next study the preferences of income funds and other funds between holding bank stocks and bank CoCos, with the latter not being subject to supervisory distribution limits during the pandemic. CoCos represent an interesting case study as these securities are, like stocks, risky (e.g. CoCos can absorb losses in bail-in exercises). However, CoCos continued paying coupons to their holders during the period of dividend constraints. Since these coupons are substantial (see Figure 2), CoCos could represent an alternative income-generating security to stocks. Hence, the reaction of search for income investors to the policy would also be uncovered provided that income funds tilted (more) their portfolios towards CoCos (in detriment of bank stocks). The advantage of considering CoCos over other income instruments (for example, high dividend-yielding stocks of non-financial corporates) is that banks also issue the former. This enables us to compare investor preferences between assets with and without payout restrictions *within* the same bank, that is, controlling for any institution-specific shock in our study period.

To evaluate preferences between holding stocks and CoCos in income and non-income funds, we first propose a simple extension of Equation (1):

$$exit_{ibft} = \alpha + \theta income_f + \beta income_f \times stock_i + \delta stock_i + \pi \Delta price_{i,t-1} + \rho F_{ft} + \omega_{bt} + \epsilon_{ibft} \quad (2)$$

, where in $exit$ we have added the subscript *b*, representing the bank that issued the security *i* (held by fund f in month *t*), which can be a stock or a CoCo. In Equation (2), *stock* is a dummy that identifies bank stocks (equal to 1 for these instruments, and 0 for bank CoCos). $\Delta price_{i,t-1}$ is the lagged price return of the security (stock or CoCo). ω_{bt} are bank-month fixed effects, implying that we keep studying $exit$ within the same bank, albeit no longer within the same security. The other variables where already included in Equation (1). The new θ coefficient studies whether *exit*

is higher or lower in CoCos for income funds (when compared with non-income funds). The β coefficient evaluates whether this sensitivity changes for stocks. θ should be negative if income funds are less likely to sell CoCos. In turn, we expect β to be positive, and to be higher in absolute value than the θ coefficient, if these funds are more prone to sell stocks.

We also examine substitution of stocks with CoCos by means of this expression:

$$exit_{ibft} = \alpha + \beta income_f \times stock_i + \delta stock_i + \pi \Delta price_{i,t-1} + \rho_{ft} + \omega_{bt} + \epsilon_{ibft} \quad (3)$$

, where we add fund-month fixed effects (ρ_{ft}). With fund-month fixed effects we assess *exit* between stocks and CoCos within the same mutual fund,[38] which provides more precise information about substitution between these two instruments.[39] We note that fund-month fixed effects control for any time-invariant and time-varying attribute of funds, alleviating concerns regarding unobservable variables at the fund-level. This could be important since dividend restrictions coincided with turmoil in the market, and in the funds industry, which might have impacted funds trading decisions in ways not captured by our fund-level covariates.

Finally, we look at the exposure-to-income-fund price implications for banks, given that income funds are expected to be more prone to sell off bank stocks after the announcement of the policy, and that this could have a price impact on these stocks. More specifically, we analyze the daily cumulative abnormal returns of stocks since the day before the announcement of the ECB measure (the press release was issued on the 27$^{\text{th}}$ of March 2020), calculated with the 5-factor Fama and French model (Fama and French, 2015). We then regress these returns on a dummy variable that

[38] In Equation (3), the coefficient associated with $stock$ captures preferences between stocks and CoCos within the same vehicle in the group of non-income funds. The interaction $income\text{-}stock$ measures whether these preferences change for income funds.

[39] We will also analyze substitution from different angles, considering, among others, fund-bank-month fixed effects (which allows for investigating $exit$ between stocks and CoCos of the same bank and held by the same fund, in the same month). Also by exploring changes in the share of these securities in funds´ portfolios (new dependent variable), in Annex A2.4.

identifies the stocks more exposed to income funds:

$$CAR_i = \alpha + \beta highly\_exposed_i + \epsilon_i \tag{4}$$

The unit of observation in Equation (4) is bank stock-day. CAR indicates cumulative abnormal returns in the price of stock *i* since the pre-announcement date, i.e. the difference between the observed return in stocks and the return predicted by the 5-factor Fama and French model.[40] $highly\_exposed$ is a dummy that takes the value 1 when the share of stock *i* in the hands of income funds is above the 75th percentile value in December 2019, and 0 otherwise.[41] We study returns five days around the day the ECB announced dividend restrictions. We hypothesize that banks in which the ownership of income-funds is higher ($highly\_exposed = 1$) should underperform their peers after the policy announcement, so we expect a negative value for β. Standard errors in Equation (4) are heteroskedasticity-robust.

5 Results

A. Dividend restrictions and investment decisions of mutual funds

Table 2 studies $exit$ in stocks during March-April 2020, coinciding with the period the policy was initiated (Equation (1)). Annex A2.1 considers alternative dependent variables, what does not change the main results.

We find that the probability of getting rid of bank stocks is higher in income funds than in

[40] $$R_{it} - rf_t = \alpha + \beta_1(RM_t - rf_t) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \epsilon_{it}$$
, where R_{it} is the return of the stock *i* on day *t*, rf_t the risk-free asset return on day *t*, RM is the return of the market, SMB is the size effect, HML the value effect, RMW the profitability effect, and CMA the spread return of conservative stocks minus those that follow an aggressive investment strategy.

[41] In particular, we aggregate the market value of holdings of income funds in each stock, and divide it by the market capitalization of the bank. $highly\_exposed$ is equal to 1 if this ratio is in the top quartile of the distribution (zero otherwise).

non-income funds in this period (positive coefficient associated with $income$). This happens for the cross-section of banks (Column 1, in which we do not consider past stock returns, and Column 2, where we add this control) and with bank-month fixed effects or when we examine the probability of mutual funds' disposing stocks of the $same$ bank (Column 3). These fixed effects account for bank-specific shocks during the period under study, as well as for any information shock arising from dividend restrictions. This is our benchmark specification. The fact that income funds react more to the policy shock is expected given, for instance, the relationship between the exposure to dividend-paying stocks and flows into funds documented in Harris et al. (2015). Column 4 saturates the model with bank-fund family fixed effects, which absorb the potential impact of trading decisions motivated by the preferences of mutual funds in the same family (i.e., asset management company) towards stocks issued by specific banks.[42] Our estimates of interest remain the same, meaning that the activity of these funds is not biasing our results.[43]

To take the previous outcome as indicative evidence of negative reaction of investor demand for income, we also evaluate the preferences between the two fund types before and not only during the policy period. One would expect that the negative reaction of income funds is concentrated in this period, and not before. To that end, we re-run our estimations on a monthly basis between September 2019 and August 2020, covering six months before and six months during the supervisory distribution limits. Table A2 (in the Annex) collects the results. The coefficient of interest ($income$) is not positive (in statistical terms) before the policy, including in February 2020, when market turmoil was already significant (the price of bank stocks in the EuroStoxx 600 had already fallen by 13.1% in the period January-February 2020). However, in March 2020, when the policy is activated, income funds became more prone to sell bank stocks. This effect faded away until May 2020, when the coefficient associated with income turns positive; this could be due to expectations of an

[42]This may be actually a concern for bank-affiliated funds that are shown to offer price support to stocks of their bank sponsor (Golez and Marin, 2015).

[43]Regarding the control variables, we note that in this latter specification size and flows are negatively correlated with $exit$ (lower size and flows, i.e., outflows, increase $exit$). $retail$ is, on the contrary, positively correlated. We evaluate potential endogeneity issues with respect to the selection of our control variables in Annex A2.1. Later on we will also study why greater ownership in funds by individuals could have triggered more sales of bank stocks.

extension of the ECB recommendation, which finally took place later on. Overall, the swift reaction of mutual funds to the policy should not come as a surprise as these sophisticated agents should rapidly incorporate the impact of the policy in their portfolios. We confirm this result running a difference-in-difference specification in Table A3, in which we consider the interaction between $income$ and a time dummy ($policy$) that turns positive during the policy period.[44]

The bottom line is thus that income funds were more likely to drop their exposures to bank stocks only immediately after the announcement of dividend restrictions, and not at other moments. This higher propensity to sell is not only statistically relevant but also economically: taking the output of Column 4 in Table 2, the estimated probability of selling bank stocks is close to 12% in income funds just after the policy intervention (i.e., during March-April), being the estimated probability near 6% for non-income funds in this same period.[45] That is, the probability of selling doubles for income investors. This is, together with our other exercises, a strong indication of negative reaction of investor demand for income to this policy.[46] Section B provides more evidence that it is search for income and not other confounding factors what drives this first result.

Finally, and for the sake of completeness, we also analyze bank stock holdings well after the activation of the policy, and not just in the immediate months. Specifically, we run monthly regressions studying the probability of disinvesting from bank stocks held by funds in February 2020 (one month before the activation of the ECB measure) in the period March 2020-March 2021, which covers the announcement of the end of dividend restrictions (in December 2020). This analysis involves evaluating the cumulative probability of selling bank stocks in each month, since February 2020. For instance, if fund "X" sells bank stock "A" in March 2020, $exit$ takes the value 1

[44]The sample period in Table A3 runs from January to April 2020 in Column 1, and from February to March 2020 in Columns 2-4. Since the time dimension in this sample is richer than in our main exercise (we count on a pre-treatment period and a post-treatment period), we can saturate our main specification with fund fixed effects in Column 3, and with bank-fund fixed effects in Column 4, which does not alter our results.

[45]To obtain these probabilities, we predict $exit$ for each fund taking the coefficients estimated in the column, and compute its average value for income and non-income funds.

[46]Income funds are not the only investors that are sensitive to dividend payments. In Annex A2.2, we show that mutual funds whose name refer to "income" or "dividend" were also more likely to drop bank stocks when compared to other funds during the policy intervention. In our work, however, we focus on the reaction of income funds because search for income motivations are more clearly defined in this set of vehicles.

for that particular month. If bank stock "A" is then repurchased by fund "X" in June 2020, then $exit$ will shift to zero that month, indicating that the fund no longer divested from the stock. $exit$ will be equal to zero the following months provided that fund "X" maintains bank stock "A" in its portfolio. The note to the figure provides more details on these specifications.

Figure 6.A summarizes the result of this exercise. The chart shows the coefficient associated with $income$ for each monthly regression. It captures whether the probability of selling bank stocks by income funds is different from that of non-income funds at any given month. As before, the estimate of the coefficient is positive immediately after the activation of the policy (the propensity to sell bank stocks is higher in income funds in March-April 2020). But this coefficient diminishes significantly and loses statistical significance, especially towards the end of the year, coinciding with the announcement of the termination of dividend restrictions by the ECB.

This result suggests that while the ECB policy first prompted sales of bank stocks by income funds, over time some of these investors re-entered the market, as it was evident that dividend restrictions would not last forever. Figure 6.B provides additional insights, showing that the cumulative probability of income funds of incorporating new bank stocks to their portfolios (new dependent variable, see notes to the figure) is lower just after the kick-off of the policy, but turns positive (although not statistically significant) from mid-2020.

B. Placebo tests

One concern about the previous results is that income funds could have somehow perceived bank stocks as riskier around the implementation of the supervisory distribution limits, which could have triggered more sales of these securities. This hypothesis would conflict with our conclusion that demand for income drives our previous outcome. To make sure that our results are policy-driven, in this section we consider some placebo tests and collect the results in Table 3.

First, we test whether income funds reduced more their exposures to stocks of Swiss banks,

which were not subject to dividend restrictions when this measure was activated in the euro area.[47] To that end, we add stocks issued by Swiss credit institutions to our sample of shares, and estimate specifications that build on Equation (1) in Columns 1-2 of Table 3. In particular, in Column 1 we estimate the same model as in Column 3 of Table 2 (our benchmark specification), but incorporating the interaction $income \times Swiss\ banks$, which is a dummy that identifies stocks issued by these institutions. With this interaction we evaluate whether the propensity to sell by income funds changes for shares issued by these banks. In Column 2, we enrich this specification with bank-fund family fixed effects ("issuer-fund family" fixed effects in the table). The estimate of the coefficient associated with $income$ is positive in both columns, meaning that income funds were more prone to sell stocks of euro area banks (as before). The coefficient of the interaction $income \times Swiss\ banks$ is in turn negative and balances out the positive coefficient of $income$, especially in Column 2, meaning that the probability of selling stocks of Swiss banks was roughly the same for income and non-income funds.[48] This result is consistent with price evidence collected by Hardy (2021), who finds that the price of euro area bank stocks underperformed that of Swiss credit institutions after the ECB announced dividend restrictions.

Columns 3-4 in Table 3 further analyze $exit$ in holdings of stocks issued by the non-financial corporate (NFC) sector of the euro area when the policy was activated. NFCs in this region were not subject to dividend restrictions during the pandemic. Therefore, income funds should not be more prone than other funds to remove these shares from their portfolios. Columns 3-4 use a similar specification as in Columns 1-2, but adding an interaction between $income$ and NFC, being the latter a dummy for NFC. As with Swiss banks, the coefficient of this interaction is negative and similar in magnitude to that of $income$. Therefore, the conditional likelihood of removing stocks of NFC was the same for the two groups of mutual funds.

[47] Switzerland can be considered a "counterfactual" jurisdiction to the euro area because authorities in this region adopted similar support measures, but did not formally restrict distributions to bank shareholders. See for instance this policy tracker of the response of the authorities to the Covid-19: https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19#S.

[48] As in Table 2, the period considered in the new exercises is March-April 2020, but none of our results is different if we restrict the sample period to March 2020.

Overall, these tests provide more evidence in favour of our hypothesis that the reduction in exposures to euro area bank stocks by income funds is driven by the supervisory distribution limits. These investors sold off more stocks only in the sector targeted by the policy (banks in the euro area), and only when the policy is initiated, as we previously evidenced.

In Annex A2.3 we propose some additional exercises to explore the heterogeneous effects of the supervisory distribution limits on income funds more and less sensitive to this policy shock (we do this by taking into account who own the shares of these vehicles). We also analyze groups of banks that were presumably less affected by dividend restrictions. This group of banks comprises non-payers (banks that do not pay out dividends) and banks that made distributions to their shareholders even though the policy was already in place. In contrast to their peers, planned distributions of dividends in these institutions coincided with actual payouts during the policy period. Therefore, income funds should be less responsive with these shares. All these exercises are consistent with our hypothesis that search for income drove the response of income funds when dividend constraints were implemented.

C. Asset allocation implications of dividend restrictions

We next study what income funds do with their portfolios after selling bank stocks. In particular, we examine whether these funds substitute bank stocks with bank CoCos in their portfolios, which were not subject to distribution constraints during the pandemic. With this exercise, we shed light on the asset allocation implications of the supervisory distribution limits, linked to search for income motivations.

Table 4 presents the results of estimating Equation (2) (Panel A), with fund-level controls, and Equation (3) (Panel B), more saturated with fund-month fixed effects. Our estimates support the hypothesis of substitution of stocks with CoCos by income funds.

In Panel A of Table 4, we first restrict the sample to non-income funds (Column 1) and income

funds (Column 2) to analyze separately the preferences of the two groups of funds for stocks versus CoCos. The coefficient associated with $stock$ is positive and significant in income funds but not in non-income investors. This means that income funds were more prone to sell stocks when compared to CoCos, while this did not happen in the set of non-income funds. When considering the whole sample of funds (Columns 3-5), we find that income investors were less likely to remove CoCos from their portfolios when compared with their non-income peers (negative sign of the coefficient associated with $income$). These funds sold off, however, more bank stocks in this same period (positive coefficient associated with $income$-$stock$, and higher than the one associated with $income$). Therefore, income funds changed their preferences between holding the security constrained by the supervisor (stocks) and the unconstrained one (CoCos) during dividend restrictions, and were not merely reducing their exposure to bank risk (as one could conclude by just looking at results with stocks). All our regressions incorporate bank-month fixed effects, which implies that we are examining preferences (of income and non-income funds) between holding stocks and CoCos issued by the same bank. Our estimates are similar when adding security fixed effects (see Column 5 of Panel A) and bank-fund family fixed effects (see Columns 4-5 of Panel A).

Panel B, which estimates Equation (3), confirms the previous findings. Columns 1-3 consider fund-month fixed effects, controlling thus for time invariant and time-varying characteristics of funds, observable or not. The negative drift in stocks versus CoCos for income funds is evidenced by the positive estimate of the coefficient of $stock$ in Column 2 (where, as before, we study preferences between stocks and CoCos in these vehicles) and that of the interaction $income$-$stock$ in Colums 3-5 (joint sample of income and non-income funds). Our results broadly hold when we saturate the model with fund-bank-month fixed effects (Column 4). With these fixed effects we effectively restrict the sample to those funds that in the same month invest in securities (stocks and CoCos) of the same bank. While we lose observations since there are not many funds of this type, we improve the identification since we cover trades of the same fund with securities of the same bank. Adding security fixed effects does not alter our narrative (Column 5).

Overall, the results of this section imply that there was substitution of stocks with CoCos in income funds (when compared with other funds).[49] Since dividend restrictions represent an exogenous shock to bank distributions, this reaction confirms the important role that demand for income can have in the portfolio of certain investors. It also reveals the far-reaching effects of the policy, which impacted other securities in addition to bank stocks. Our results are consistent with Daniel et al. (2021), who also document asset allocation implications of changes in the income stream of securities.

D. Price implications of search for income

In previous sections we demonstrated that demand for income affects fund trading decisions and that this led to a change in preferences for bank securities during the dividend restrictions period. Now, our aim is to evaluate whether this outcome had any implications on bank stock prices. To this end, we study the impact of the ECB decision on the price of these stocks and whether the impact is different for banks more or less exposed to income funds, which sold more of these securities after the activation of the supervisory distribution limits.

Figure 7.A gathers the results of estimating Equation (4) on a daily basis, showing the coefficient and confidence bands associated with $highly\_exposed$, or the additional effect on the daily cumulative abnormal returns of the banks in which income funds ownership is greater.[50] Before the announcement date, bank stocks more exposed to income funds presented similar returns than stocks less exposed. However, one day after the announcement, stocks exposed to income funds experienced a cumulative abnormal return decline near 5% greater than stocks less exposed, which suggests that the event had a negative effect on bank stock prices subject to demand for income.[51]

[49] Annex A2.4 further analyzes substitution between stocks and CoCos with alternative specifications.

[50] We use a short time window because we are interested in isolating the dividend restriction policy from other regulatory interventions, that were quite frequent at the onset of the Covid-19 crisis.

[51] Likely, income funds were not the only investors sensitive to dividends that dumped bank stocks in this period. Thus, we think it is better to interpret our results as an evidence that demand for dividends can have price consequences for stocks.

Actually, and although the policy decision was published after the markets closed, on the announcement date abnormal returns decline by 2%, which suggests that there were some anticipation effects to the policy. Returns recover somewhat a few days after the policy announcement, albeit do not get back to positive significant levels. These results are consistent with, for instance, evidence collected by Hartzmark and Solomon (2013), who show that dividend-seeking investors could generate temporary price pressure on stocks.

Following the work of Andreeva et al. (2023), who analyze returns in liquid bank stocks around the implementation of dividend restrictions,[52] we take on board liquidity considerations by running Equation (4) and weighting each stock by its free-float market capitalization (as of December 2019).[53] As illustrated in Figure 7.B, we reach similar conclusions as before, being negative returns somewhat more persistent during our narrow time window.[54]

In a nutshell, the results in this section uncover price pressure on bank stocks arising from the supervisory distribution limits and, in particular, from the response of income funds to this policy.[55] Annex A2.5 further complements our exercise by displaying the full estimates of abnormal return regressions. Specifically, in that section we show that banks less exposed to income funds did not present negative abnormal returns during or immediately after the implementation of the policy. This is consistent with the hypothesis that the information content of the supervisory distribution limits was rather limited (given the system-wide nature of the measure). Otherwise, we would have seen price declines not only in more affected stocks or stocks more exposed to income funds, but also in the other bank stocks. Thus, rather than a negative reaction to news, as in dividend

[52] These authors show that, in the two-week period following the announcement, stock prices fell by around 7%. This paper however does not consider the role of search for income investors in price declines, and work with raw returns rather than with abnormal returns.

[53] The free-float market capitalization differs from the market capitalization in the number of shares considered. The latter includes all stocks while the former includes just the ones available to the general public, i.e. the shares that can actually be traded.

[54] Pablos and Pérez Montes (2022) show that negative abnormal returns, estimated with a one-factor model, are only present in certain subsets of banks around this announcement.

[55] Although not analyzed here, a simultaneous shock on the stock prices of a group of banks (in our case, on those banks exposed to income-sensitive investors) could put pressure on the affected banks, and perhaps force them to make decisions that might even affect their provision of funding to the real economy. Therefore, our results have implications for financial stability.

cuts announced by managers (Baker et al., 2016), dividend constraints induced by the ECB can be viewed as an uninformative shock to dividend payments, which is ideal to uncover search for income motivations in portfolio decisions.

Since income funds self-select into high-dividend yielding bank equities (on average, the dividend yield of bank stocks in the hands of income funds was 5.0% as of December 2019, versus 3.7% for non-income funds), one could argue that our results are driven by this particular characteristic of the stocks, and not by the negative reaction of search for income investors to the policy. To confront this argument, Annex A2.6 shows that we reach the same conclusions as in our main exercise when we control for the dividend yield of stocks (as of December 2019) by introducing it as an additional independent variable in the regression. This result supports the idea that it was demand for dividends what actually reduced the abnormal returns, more than this characteristic of the stocks.[56]

E. Extensions and robustness

Annex A2 of the paper presents the outcome of some additional exercises that extend the main findings of the paper or provide robustness, which we summarize below.

Specifically, Annex A2.1 displays the outcome of exercises that employ alternative continuous trading variables to measure changes in funds´ exposures to bank stocks, and that complement the results that we get with $exit$ in the main body of the paper. Annex A2.1 also collects the outcome of alternative specifications that omit and that successively add fund-level controls to re-estimate Equation (1). These exercises show very similar results to those described in the main text, alleviating thus concerns that sales of bank stocks by funds cause variation in fund-level covariates such as returns and flows, or concerns of simultaneous relationships between these

[56]Indeed, in unreported results we find that our results remain the same with bank fixed effects, which absorbs the dividend yield and any other invariant characteristics of stocks in our timeframe. To introduce these fixed effects, we run regressions covering some days before and after the policy announcement, and look at how abnormal returns change after the policy announcement, conditioned on exposure to income funds.

regressors and $exit$.

On the other hand, annex A2.2 further evaluates the behavior during dividend restrictions of a small subset of mutual funds whose names comprise words like "dividend" or "income". Search for income is likely to be a driver of portfolio decisions in these funds, which serves as an alternative to the "treatment" we consider in the main body of the paper. These funds exhibit a higher propensity to sell bank stocks during the policy implementation period, compared with other funds, reinforcing the view of a negative reaction of search for income investors to the ECB Recommendation.

Annex A2.3 exploits the heterogeneous effects of the supervisory distribution limits by analyzing income funds more and less sensitive to this policy shock, and by considering stocks of banks more and less exposed to this policy intervention. In particular, we first leverage the findings of Harris et al. (2015), who display that funds owned by individual investors may be particularly concerned about dividend payments in stocks, relative to other funds. We then study estimates that build on Equation (1) adding interactions between $income$ and $retail$, which measures individuals ownership in mutual funds. We demonstrate that income funds held by these investors were much more likely to sell bank stocks after the ECB decision, which is again consistent with search for income motivations in portfolio decisions.

In this same Annex we address bank-level heterogeneity by considering subsets of banks that should be less affected by dividend restrictions. Specifically, we study funds trading decisions with banks that were not making distributions to their shareholders before the policy intervention (non-payers), and with credit institutions that maintained these distributions after the activation of the ECB measure. We show that income funds were less likely to sell this particular set of stocks. Especially in the case of non-payers, for which the propensity to sell (bank stocks) by income and non-income funds is the same when supervisory distribution limits were triggered.

Annex A2.4 additionally explores substitution effects between bank stocks and CoCos, the alternative income bank security that we consider in the paper. Our results are fully consistent with

our main analysis.

Finally, Annex A2.5 and Annex A2.6 provide more details on our results for abnormal returns in stocks. In Annex A2.5 we first discuss abnormal returns in banks less exposed to income mutual funds, which we omitted when describing our main results. We display that these other credit institutions did not experience negative abnormal returns after the announcement of supervisory distribution limits, in contrast to the negative reaction that we documented before for banks in which income funds´ ownership is greater. This result is interesting as it indicates that dividend restrictions by themselves were not perceived as a negative (information) shock for all banks. Otherwise, one would expect negative price performance in all credit institutions, and not just in those exposed to income investors. Broadly speaking, this outcome is indicative of the different nature of dividend restrictions and managerial dividend cuts or omissions, which have been widely documented in the literature (Baker et al., 2016), and that have been found to be negative information shocks (in the sense of conveying bad news about the situation of companies that engage in payout cuts). This reinforces our view that the policy framework of dividend restrictions is ideal to understand the role of search for income in portfolio decisions, as well as its price consequences, because this policy shock provides little information about the situation of individual banks (contrary to managerial dividend cuts).

We end with one additional exercise in Annex A2.6 which adds the dividend yield as an additional explanatory variable to Equation (4). We do this because income funds present greater exposures to high dividend-yielding banks, and our results could be simply driven by this characteristic of the stocks, rather than by the exposure of income funds to banks. Our conclusions remain however the same after running this new estimation.

6 Conclusions

This paper takes advantage of the exogenous shock that the ECB policy of dividend constraints represents to document the importance of demand for income securities in mutual funds´ portfolios. We show that these investors are not indifferent to negative news about firm payouts, and we also remark the impact it has on prices.

Our work contributes to identifying demand for income-paying securities, for which only indirect proxies are available in the literature. Following the supervisory distribution limits, we find that income-oriented funds or funds more sensitive to the income stream of securities were more likely to remove stocks from their portfolios than other funds. This effect is temporary as these funds gradually re-purchased some of the stocks they disposed of, especially near the period when the ECB announced the end of dividend restrictions. We also demonstrate that at the same time income funds were dumping bank stocks, they also tilted their portfolios towards other bank securities not subject to payout restrictions (bank CoCos). This points to the broad effects of search for income, not limited to the stock market. Finally, we document negative price pressure on bank stocks with greater exposure to income-sensitive funds after the ECB announcement of dividend constraints. Hence, we show that search for income impacts on stock returns. The latter outcome is of particular interest as it offers a means to reconsider the role of dividends, and specially time-varying search for income by investors, in asset pricing models.

Finally, this study also provides interesting insights for policy makers. Dividend restrictions increase the cushion of banks against losses and can have positive implications for the provision of credit (Dautović et al., 2023; Martínez-Miera and Vegas, 2021). But these measures come along with side effects, as canceling payouts in stocks changes the relative preferences between holding these and other bank securities, and is detrimental to the price of stocks for which demand for dividends is more material. The price effects that we document in this paper are not of second order as these policies are implemented in crisis times, when stock prices are already under pressure. That

said, the policy assessment should be made jointly with the other policy measures implemented during the Covid-19 shock, that aimed to improve the loss absorption capacity of banks and their ability to provide credit. In this vein, dividend restrictions were not the only capital relief measure contributing to that objective. For instance, the release of micro and macroprudential buffers was undoubtedly very relevant in this regard (Casanova et al., 2021).

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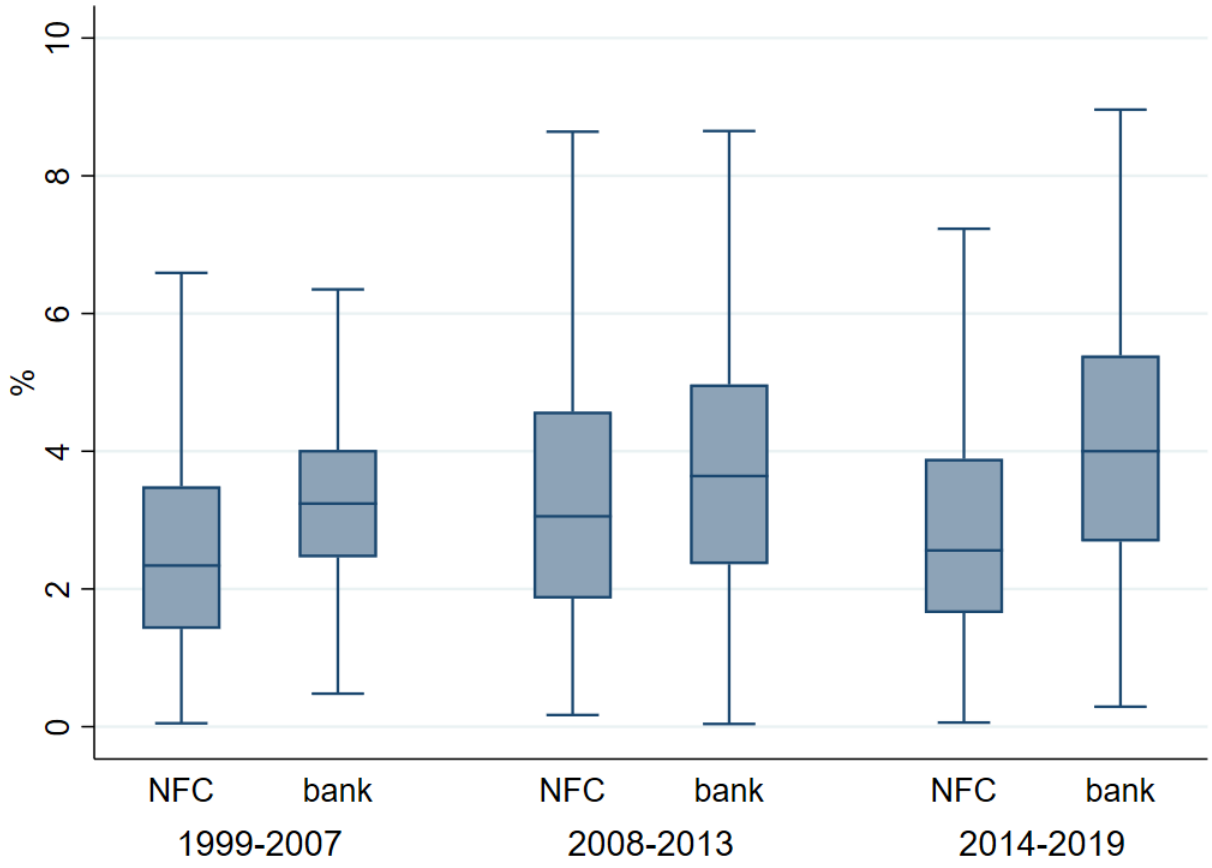
Figures

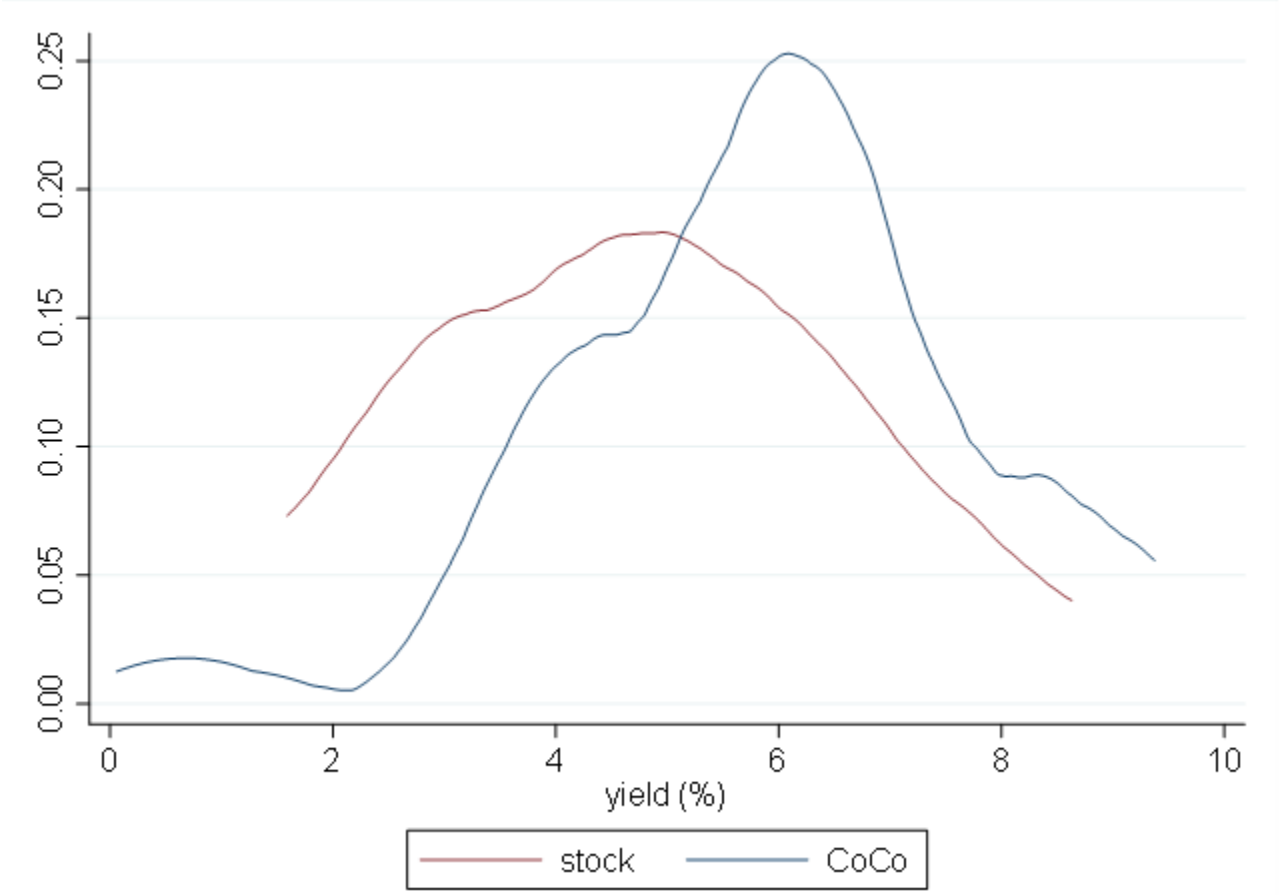
Figure 1: Dividend yield of non-financial firms and banks in the EuroStoxx 600



Source. Own elaboration and Refinitiv (Datastream)

Note. The figure shows the distribution of the dividend yield for non-financial firms ("NFC") and banks ("bank") in the EuroStoxx 600 index. The dividend yield is the (annual) dividend per share as a percentage of the share price. The boxes for each group (NFC and bank) and period (the sample period goes from 1999 to 2019, and it is split in three sub-periods) represent the interquartile range of the distribution, being the horizontal line in each box the median value of the dividend yield. The adjacent vertical lines extend two-thirds the width of boxes. We exclude from the sample non-dividend payers.

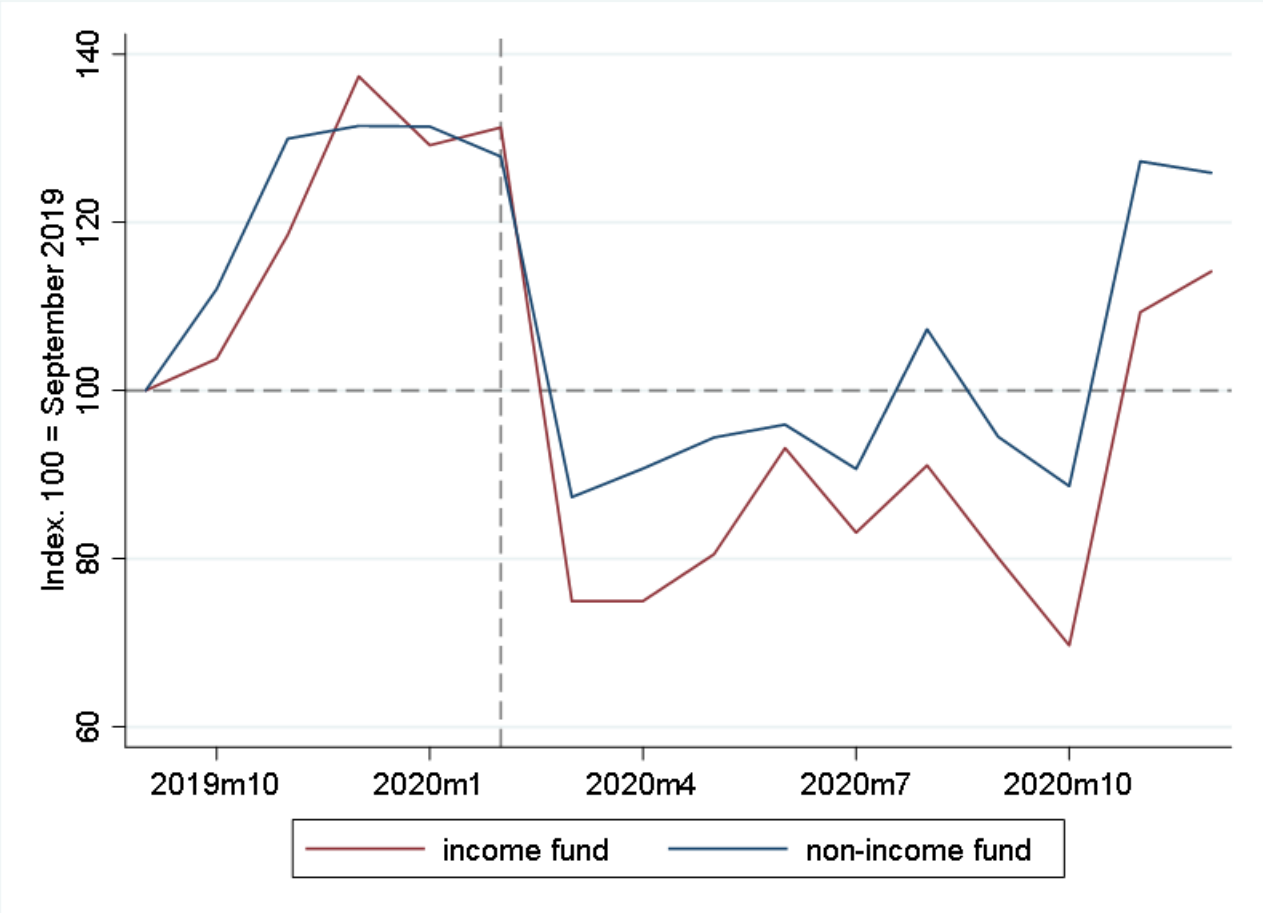
Figure 2: Dividend yield of bank stocks and coupon rate of bank CoCos. Distributions



Source. Own elaboration and Lipper for Investment Management

Note. The figure shows the distribution of the dividend yield of bank stocks in the EuroStoxx 600 index and the coupon rate of AT1 CoCos issued by euro area banks, as of the end of 2019. The dividend yield is the ratio of dividends per share to the stock price. The coupon rate is the (annual) coupon payment in CoCos divided by the par value of the security. The distribution of the dividend yield excludes non-dividend payers. Both distributions are density functions estimated using a kernel estimator, which enables non-parametric estimations and provides a continuous, smoothed graphic representation of these functions.

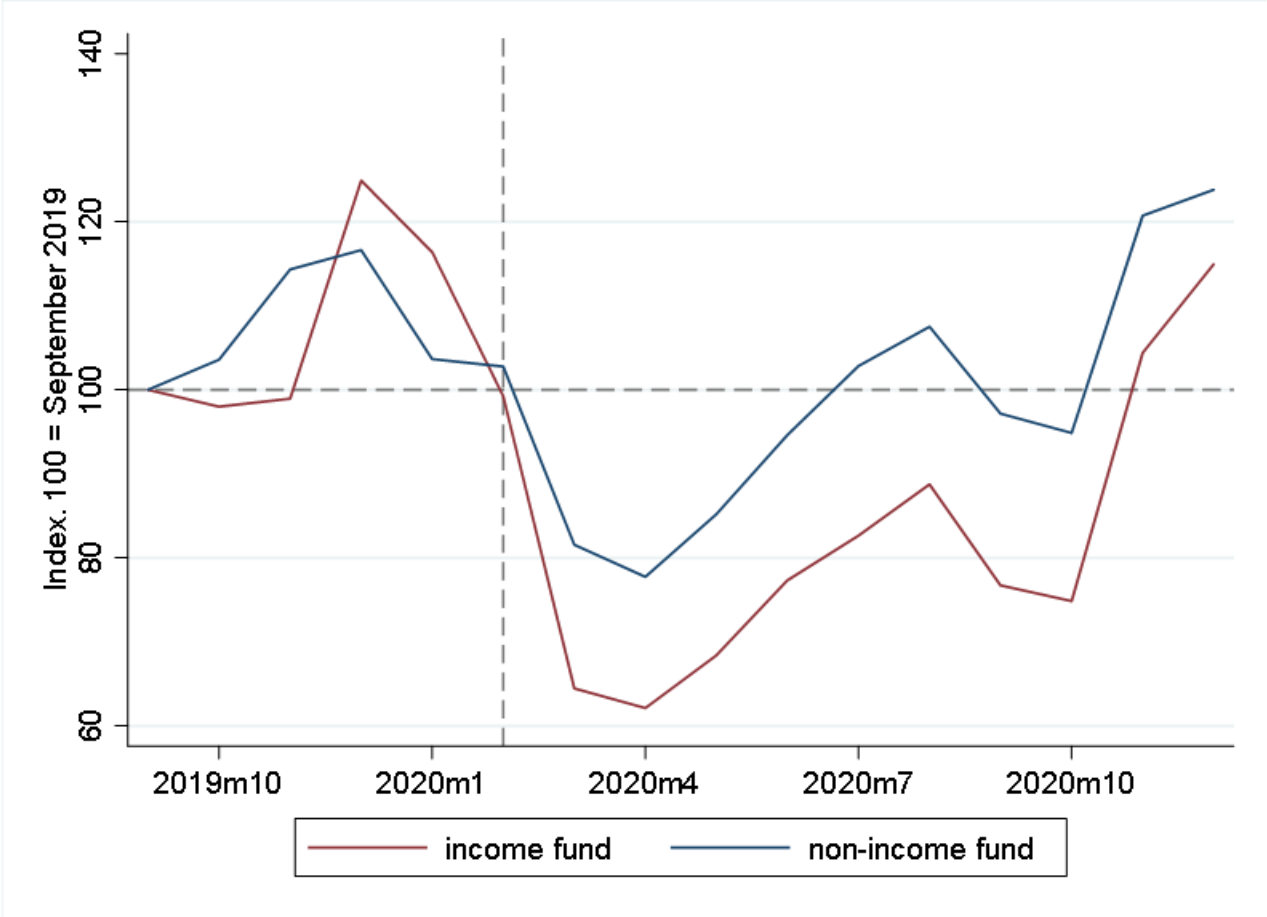
Figure 3: Market value of exposures to bank stocks in income funds and non-income funds.



Source. Own elaboration and Lipper for Investment Management

Note. The figure displays two indices that represent the evolution of the market value of holdings of bank stocks by income funds (red line) and non-income funds (blue line) since September 2019. In this month, indices are set at 100. The vertical grey dashed line corresponds to February 2020, one month before the activation of the supervisory distribution limits. The horizontal grey dashed line is set at 100. We restrict the sample of funds to those that report holdings for at least 50% of the months within the selected timeframe. This helps to attenuate volatility in the time series caused by funds entering and/or exiting the sample.

Figure 4: Share of exposures to bank stocks in income and non-income funds' portfolios



Source. Own elaboration and Lipper for Investment Management

Note. The figure displays two indices that represent the evolution of the (market value) share of holdings of bank stocks in the total assets of income funds (red line) and non-income funds (blue line) since September 2019. In this month, indices are set at 100. The vertical grey dashed line corresponds to February 2020, one month before the activation of the supervisory distribution limits. The horizontal grey dashed line is set at 100. We restrict the sample of funds to those that report holdings for at least 50% of the months within the selected timeframe. This helps to attenuate volatility in the time series caused by funds entering and/or exiting the sample.

Figure 5: Monthly change in the share of exposures to bank stocks and bank CoCos. Income funds and non-income funds

Figure 5.A: Bank stocks

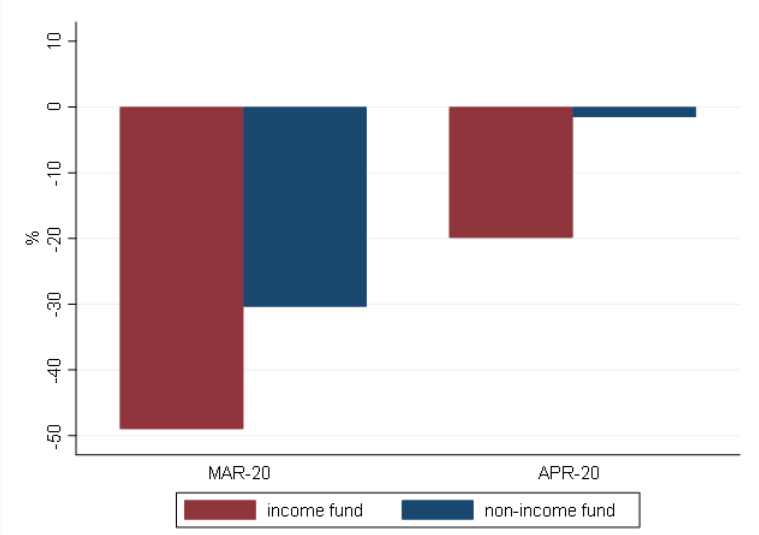
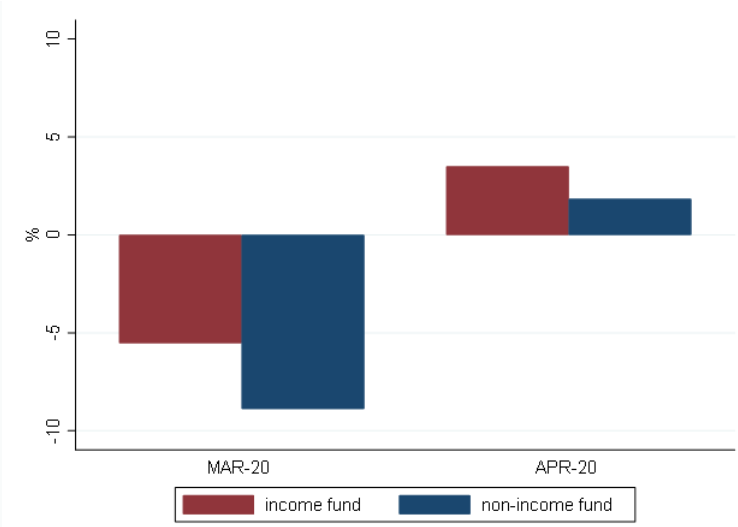


Figure 5.B: Bank CoCos



Source. Own elaboration and Lipper for Investment Management

Note. Figure 5.A shows the monthly change in the (market value) share of holdings of bank stocks in the total assets of income funds (red bar) and non-income funds (blue bar) in March and April 2020, in %. We restrict the sample to funds that operate in the market of bank stocks and in the market of bank CoCos at the same time, and to those funds that report holdings for at least 50% of the months within the selected timeframe. This helps to attenuate volatility in the time series caused by funds entering and/or exiting the sample. Figure 5.B represents the same metric and uses the same sample period as Figure 5.A, but the instruments are bank CoCos.

Figure 6: Investment decisions after March-April 2020

Figure 6.A: Probability of selling bank stocks over time

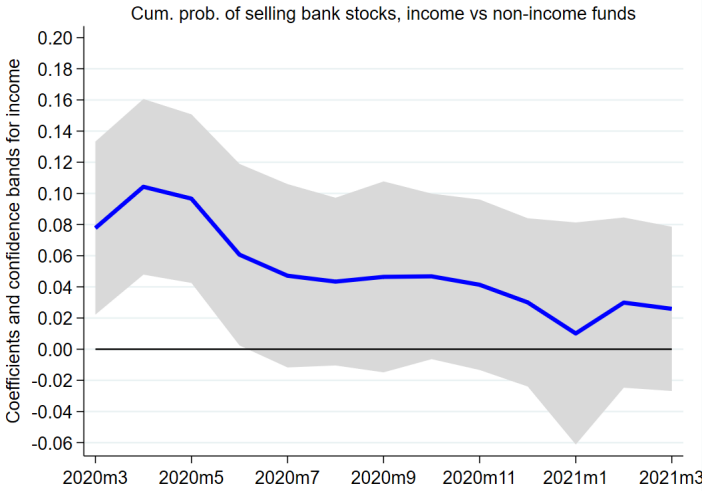
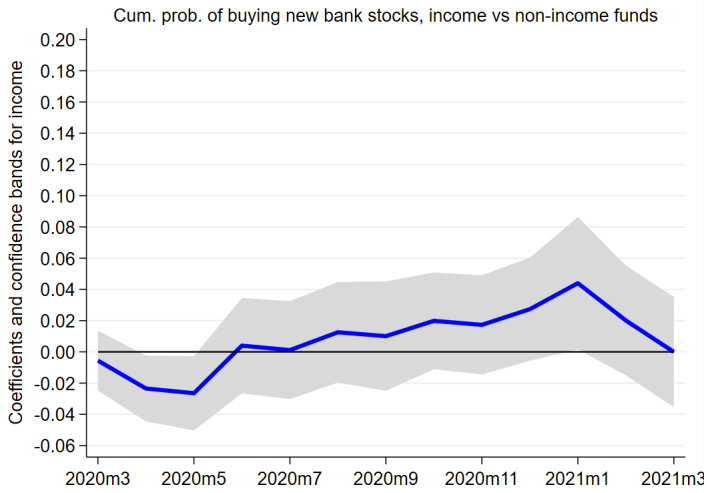


Figure 6.B: Probability of buying bank stocks over time



Source. Own elaboration.

Note. Figure 6.A (Figure 6.B) displays the outcome of monthly regressions in which the dependent variable is a dummy equal to one if the fund f sells (purchases) bank stock i held (not held) in the portfolio of the fund in February 2020, while explanatory variables are $income$ and fund family, fund asset type and bank fixed effects. In particular, the figures represent the estimated coefficients and the estimated 95% confidence intervals associated with $income$, when the dependent variable is whether there has been a sale (Figure 6.A) or a new purchase (Figure 6.B) of a bank stock. For instance, if the point estimate of $income$ is 0.10 in Figure 6.A (Figure 6.B), this means that the probability of selling (buying) is 10pp higher in income funds when compared with non-income funds.

Figure 7: Price implications of search for income

Figure 7.A: Unweighted regressions

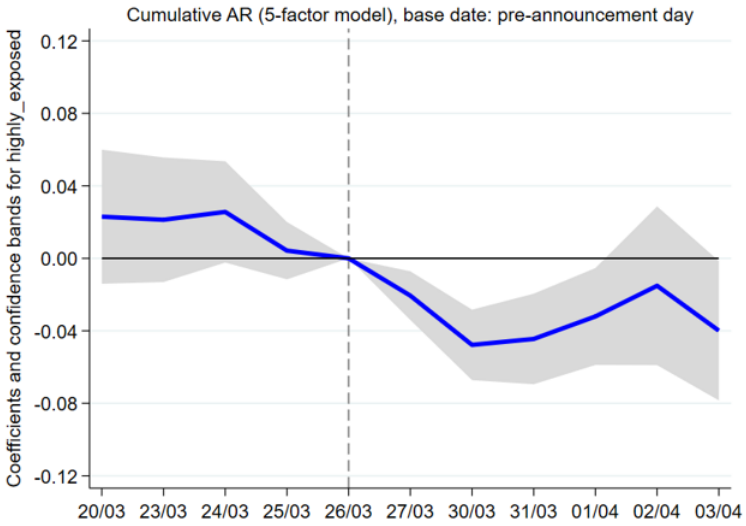
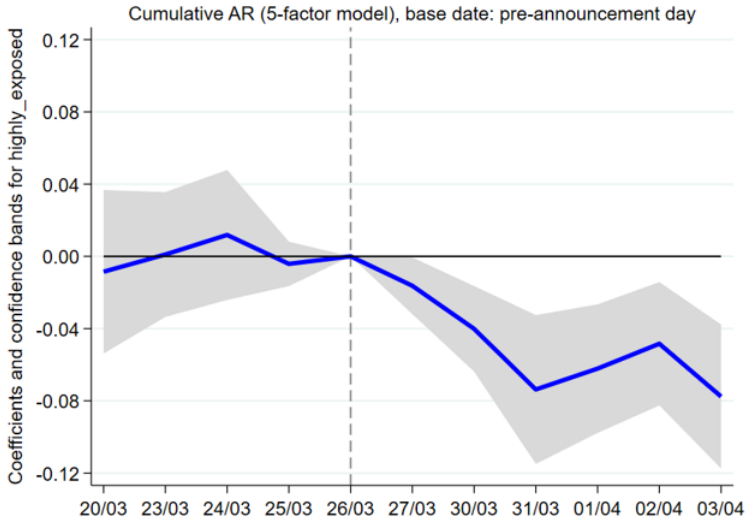


Figure 7.B: Weighted regressions



Source. Own elaboration.

Note. Figure 7.A. displays the coefficients and the 95% confidence intervals associated with the dummy that identifies the stocks highly exposed to income funds in Equation (4), being the dependent variable the daily cumulative abnormal return, normalized to zero at the day before the announcement of the dividend restrictions (26 March 2020). The vertical grey dashed line in the figure corresponds to this date. We run daily regressions to obtain the coefficients and confidence bands. In Figure 7.B, observations in these daily regressions are weighted by the free-float market capitalization of bank stocks as of December 2019.

Tables

Table 1: Summary statistics

Panel A. Income funds

Var. / Statistics	Number Obs.	Mean	Std Deviation	P10	P25	P50	P75	P90
Dependent variable								
$exit\ (in\ stocks)$	1,955	0.14	0.34	0.00	0.00	0.00	0.00	1.00
$exit\ (in\ CoCos)$	546	0.05	0.22	0.00	0.00	0.00	0.00	0.00
Fund characteristics								
$size$	2,501	726.19	3094.39	24.15	53.00	115.00	203.97	686.03
$return\ (t-1)$	2,501	-0.02	0.07	-0.13	-0.07	0.00	0.03	0.06
$fees$	2,501	1.2	0.52	0.55	0.98	1.15	1.54	1.90
$netflow$	2,501	-0.26	4.44	-2.75	-1.25	-0.27	0.40	2.09
$retail$	2,501	0.56	0.37	0.00	0.21	0.58	0.96	0.98
Security characteristics								
$\Delta\ price\ (t-1)$	2,501	-17.71	14.02	-38.11	-32.3	-12.38	-6.39	-2.29
market value (EUR bn)	2,501	14.60	12.20	0.75	1.85	13.10	20.80	34.40

Panel B. Non-income funds

Var. / Statistics	Number Obs.	Mean	Std Deviation	P10	P25	P50	P75	P90
Dependent variable								
$exit\ (in\ stocks)$	7,376	0.06	0.23	0.00	0.00	0.00	0.00	0.00
$exit\ (in\ CoCos)$	2,809	0.07	0.25	0.00	0.00	0.00	0.00	0.00
Fund characteristics								
$size$	10,178	469.19	941.06	20.09	50.04	161.45	463.88	1094.56
$return\ (t-1)$	10,185	-0.03	0.08	-0.15	-0.08	0.00	0.03	0.05
$fees$	10,185	1.28	0.64	0.37	0.81	1.31	1.73	2.11
$netflow$	10,185	-0.02	7.32	-5.18	-2.34	-0.32	1.03	3.87
$retail$	10,185	0.39	0.35	0.00	0.04	0.31	0.73	0.90
Security characteristics								
$\Delta\ price\ (t-1)$	10,185	-17.85	14.37	-38.11	-32.30	-12.44	-4.89	-2.09
market value (EUR bn)	10,161	11.60	11.60	0.51	1.00	7.03	19.50	33.90

Note. The table shows descriptive statistics for holdings of stocks of income funds (Panel A) and non-income funds (Panel B) based in the Eurozone. The dependent variable in the paper is $exit$ or a dummy variable that takes the value 1 when the fund removes the security from its portfolio in a given month, and 0 otherwise (we show $exit$ for stocks [$exit\ (in\ stocks)$] and CoCos [$exit\ (in\ CoCos)$], in each panel). $size$ refers to the fund market value of assets (net of liabilities), in EUR million, $return\ (t-1)$ is the year over year change in the net asset value (NAV) of the fund (lagged one period and in %), $fees$ or the expense ratio consists of management fees and additional expenses, such as trading fees, legal fees, auditor fees, and other operational expenses, and is expressed in % of the fund assets, $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). We use assets and performance to derive inflows/outflows: $[netflow = (size_t - size_{t-1} * (1 + return_t))/size_{t-1}]$; being $size$ known while $return$ is the monthly change in the NAV, which is standard in the literature (see, for instance, Golez and Marin (2015)); a positive sign indicates inflows and a negative sign indicates outflows. $retail$ measures individuals ownership in funds (in %), or the share of individuals in the market capitalization of funds (as of December 2019). We aggregate fund characteristics across all share classes of funds, with the exception of $retail$, for which we consider ownership data in the primary share class in each fund. $\Delta\ price(t-1)$ is the lagged return of the bank security (stock or CoCo) in a given month (in %). $market\ value\ (EUR\ bn)$ is the market capitalization of stocks or the outstanding amount of CoCos, and is expressed in EUR bn.

Table 2: Sales of bank stocks by income and non-income funds

	Dependent Variable: $exit$			
	(1)	(2)	(3)	(4)
$income$	0.063***	0.063***	0.062***	0.062**
	(0.022)	(0.022)	(0.022)	(0.025)
$size$	-0.000**	-0.000**	-0.000**	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
$return\ (t-1)$	0.042	0.048	0.042	0.072
	(0.090)	(0.090)	(0.092)	(0.097)
$fees$	-0.004	-0.004	-0.003	0.000
	(0.013)	(0.013)	(0.013)	(0.016)
$netflow$	-0.001*	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
$retail$	0.055***	0.055***	0.052***	0.043**
	(0.016)	(0.016)	(0.016)	(0.018)
$\Delta\ price\ (t-1)$		-0.002***		
		(0.000)		
$R-squared$	0.129	0.131	0.179	0.403
N	9,325	9,325	9,325	9,325
$Fund\ family-Month\ FE$	Y	Y	Y	Y
$Fund\ asset\ type-Month\ FE$	Y	Y	Y	Y
$Bank-Month\ FE$	N	N	Y	Y
$Bank-Fund\ family\ FE$	N	N	N	Y

Note. The table studies the probability of removing bank stocks ($exit$) when dividend restrictions were activated by studying funds characteristics. The unit of observation in these specifications is security-fund-month. The sample period runs from March 2020 to April 2020. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). $size$ refers to the fund market value of assets (net of liabilities), $return$ is the year over year change (lagged one period) in the net asset value (NAV) of the fund (in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets. $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). $retail$ measures individuals ownership in funds. $\Delta\ price\ (t-1)$ is the lagged return of the bank stock in a given month (in %). All specifications include fund family-month and fund asset type-month fixed effects, while we also add bank-month fixed effects in Columns 3-4, and bank-fund family fixed effects in Column 4. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}\ p<0.1$; $^{**}\ p<0.05$; $^{***}\ p<0.01$

Table 3: Placebo tests

	Dependent Variable: $exit$			
	Swiss banks		NFC of the euro area	
	(1)	(2)	(3)	(4)
$income$	0.063***	0.063**	0.059***	0.070***
	(0.022)	(0.025)	(0.019)	(0.024)
$income \times Swiss\ banks$	-0.117***	-0.066*		
	(0.025)	(0.035)		
$income \times NFC$			-0.049***	-0.060***
			(0.012)	(0.015)
$size$	-0.000*	-0.000	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$return\ (t-1)$	0.038	0.061	0.027	0.038
	(0.087)	(0.094)	(0.041)	(0.045)
$fees$	-0.003	0.002	0.013*	0.013
	(0.013)	(0.017)	(0.007)	(0.009)
$netflow$	-0.001	-0.001	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$retail$	0.044***	0.042**	0.008	0.006
	(0.015)	(0.018)	(0.007)	(0.009)
$R-squared$	0.197	0.417	0.152	0.408
N	10,090	10,090	88,949	88,949
$Fund\ family-Month\ FE$	Y	Y	Y	Y
$Fund\ asset\ type-Month\ FE$	Y	Y	Y	Y
$Issuer-Month\ FE$	Y	Y	Y	Y
$Issuer-Fund\ family\ FE$	N	Y	N	Y

Note. The table studies the probability of removing stocks ($exit$) when dividend restrictions were activated by studying funds characteristics. The unit of observation in these specifications is security-fund-month. The sample in Columns 1-2 comprises stocks of euro area banks and Swiss banks. In Columns 3-4 we consider stocks of euro area banks and of euro area NFC. The sample period runs from March 2020 to April 2020. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). $Swiss\ banks$ is a dummy that identifies banks based in this jurisdiction, while NFC is a dummy that does the same for non-financial corporations located in the euro area. $size$ refers to the fund market value of assets (net of liabilities), $return$ is the year over year change (lagged one period) in the net asset value (NAV) of the fund (in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets, $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). $retail$ measures individuals ownership in funds. All specifications include fund family-month and fund asset type-month fixed effects. We consider issuer-month fixed effects in all columns and issuer-fund family fixed effects in Column 2 and Column 4. Issuer refers to banks in Columns 1-2 and to banks and firms in Columns 3-4. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}\ p < 0.1$; $^{**}\ p < 0.05$; $^{***}\ p < 0.01$

Table 4: Asset allocation implications of dividend restrictions

Panel A. Regressions with fund-level controls

	Dependent Variable: $exit$				
variables / fund type	Non-income	Income	All funds		
	(1)	(2)	(3)	(4)	(5)
$stock$	-0.023	0.161***	-0.022	-0.016	
	(0.018)	(0.041)	(0.018)	(0.022)	
$income$			-0.051**	-0.071**	-0.043*
			(0.021)	(0.029)	(0.026)
$stock \times income$			0.119***	0.141***	0.113***
			(0.020)	(0.028)	(0.022)
$size$	-0.000	-0.000***	-0.000**	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$return\ (t-1)$	0.108	-0.184	0.018	0.028	0.033
	(0.083)	(0.238)	(0.085)	(0.089)	(0.088)
$fees$	0.000	-0.038	0.004	0.006	0.006
	(0.009)	(0.023)	(0.013)	(0.015)	(0.015)
$netflow$	-0.000	0.001	-0.000	-0.001	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
$retail$	0.028*	0.069**	0.033**	0.026	0.026
	(0.016)	(0.034)	(0.016)	(0.017)	(0.018)
$R-squared$	0.136	0.379	0.158	0.334	0.350
N	10,339	2,536	12,910	12,721	12,721
$Fund\ family-Month\ FE$	Y	Y	Y	Y	Y
$Fund\ asset\ type-Month\ FE$	Y	Y	Y	Y	Y
$Bank-Month\ FE$	Y	Y	Y	Y	Y
$Security\ FE$	N	N	N	N	Y
$Bank-Fund\ family\ FE$	N	N	N	Y	Y

(this table continues in next page)

(Table 4 –continued-)

Panel B. Regressions with fund-month fixed effects

	Dependent Variable: $exit$				
variables / fund type	Non-income	Income	All funds		
	(1)	(2)	(3)	(4)	(5)
$stock$	-0.020	0.231***	-0.012	0.019	
	(0.023)	(0.050)	(0.023)	(0.026)	
$stock \times income$			0.161***	0.189***	0.183***
			(0.038)	(0.059)	(0.050)
$\Delta\ price\ (t-1)$	-0.002***	0.003	-0.002***	0.002	0.003
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
$R-squared$	0.408	0.546	0.430	0.548	0.632
N	9,953	2,416	12,387	2,593	2,593
$Fund-Month\ FE$	Y	Y	Y	.	.
$Bank-Month\ FE$	Y	Y	Y	.	.
$Fund-Bank-Month\ FE$	N	N	N	Y	Y
$Security\ FE$	N	N	N	N	Y

Note. The table studies the probability of removing bank stocks and bank CoCos ($exit$) when dividend restrictions were activated by studying funds characteristics. The unit of observation in these specifications is security-bank-fund-month. Specifications in Panel A build on Equation (2), which uses fund-level controls. Panel B estimates build on Equation (3), which replaces fund-level controls with fund-month fixed effects. The sample period runs from March 2020 to April 2020. $stock$ is a dummy equal to 1 when the security is a bank stock, and to 0 when the security is a bank CoCo. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). $return$ is the year over year change (lagged one period) in the net asset value (NAV) of the fund (in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets, $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). $retail$ measures individuals ownership in funds. size refers to the fund market value of assets (net of liabilities). $\Delta\ price\ (t-1)$ is the lagged return of the bank stock/CoCo in a given month (in %). In Panel A, all specifications include fund family-month, fund asset type-month, and bank-month fixed effects. We add security fixed effects in Column 5, and further add bank-fund family fixed effects in Columns 4-5. In Panel B, Columns 1-3 consider fund-month and bank-month fixed effects. Column 4 incorporates fund-bank-month fixed effects, and Column 5 further adds security fixed effects. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}\ p<0.1$; $^{**}\ p<0.05$; $^{***}\ p<0.01$

A1 Representativeness of Lipper funds

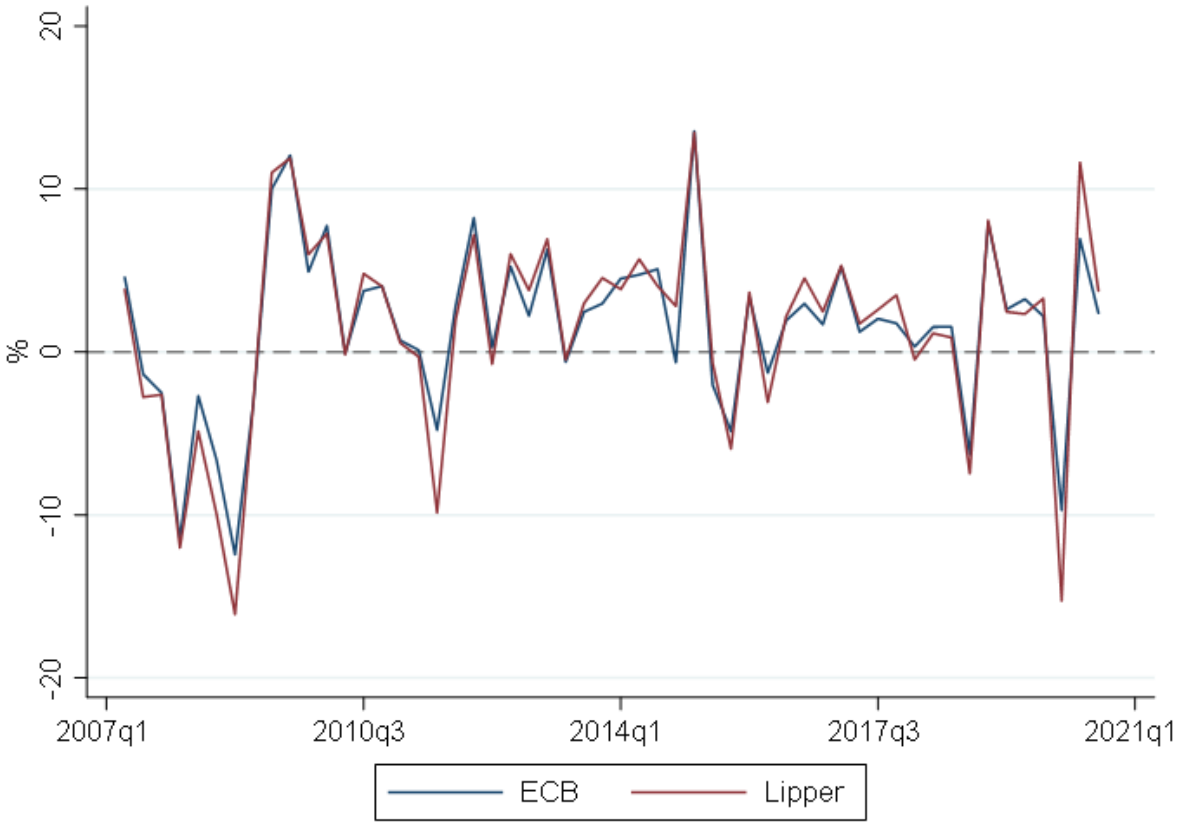
In the main body of the paper, we restrict the sample of funds to those based in the euro area and that primarily invest in equity and/or bonds. Vehicles that report holdings in Lipper made up 40% of the assets of this same type of funds in the industry as of the end of 2019. While this set of funds is large, being the net market value of their assets close to 4.5 trillion euros at the previous date, one concern is that Lipper funds present biases regarding their portfolio composition and/or their characteristics.

We alleviate the previous concern in two ways. First, in Figure A1.1 we display the evolution of total assets held by funds in Lipper ("Lipper funds") and in the industry, being the latter downloaded from the Statistical Data Warehouse of the ECB. The definition of total assets is different in the two databases, but rather comparable.[57] The time series are normalized to 100 as of Q1 2007. Total assets of funds in the industry and in Lipper move in tandem, suggesting that the composition of portfolios and possibly the structure of assets and liabilities are quite similar in the two groups of funds.

Figure A1.2, on the other hand, evaluates the representativeness of the holdings of our securities of interest, stocks (Figure A1.2.i) and AT1 CoCos (Figure A1.2.ii) issued by euro area banks, held by Lipper funds. In particular, the chart illustrates quarterly changes (in percentage) in the market value of holdings of these two securities. Data for the industry of funds comes from the Securities Holdings Statistics by Sector (SHSS) run by the ECB and other central banks of the Eurozone. The SHSS collects holdings of securities at the institutional sector level (not at the fund level, like in Lipper). The chart shows that exposures to both securities change similarly over time in the two datasets. Therefore, Lipper funds do not appear to change their holdings of stocks and CoCos differently than the average fund in the industry.

[57] Lipper reports the market value of assets net of liabilities, while ECB data presents total assets. Since leverage in mutual funds is low, both measures are comparable.

Figure A1.1: Representativeness of Lipper funds. Quarter over quarter change in total assets



Source.Own elaboration, Lipper for Investment Management and Statistical Data Warehouse (European Central Bank)

Note. The figure represents the quarter over quarter change in total assets of mutual funds. ECB stands for assets of mutual funds based in the euro area according to the European Central Bank. Lipper stands for Lipper funds. Funds include equity, bond and mixed assets funds.

Figures A1.2. Representativeness of Lipper funds

Figure A1.2.i: Holdings of bank stocks in Lipper and in official statistics (SHSS). Quarter over quarter change, market value of holdings

Figure A1.2.ii: Holdings of bank CoCos in Lipper and in official statistics (SHSS). Quarter over quarter change, market value of holdings

Source. Own elaboration, Lipper for Investment Management and the Securities Holdings Statistics by Sector (SHSS) of the European Central Bank

Note. Figure A1.2.i shows the quarter over quarter change in the market value of holdings of stocks. The SHSS stands for holdings of mutual funds based in the euro area according to the ECB ("official statistics"). For Lipper funds, we restrict the sample to vehicles that report in all quarters before calculating the change in holdings. Figure A1.2.ii shows the same outcome for holdings of bank CoCos.

A2 Other results

A2.1 Results with other trading variables and set of controls

Table A4 reports results for the benchmark specification in Equation (1) but considering a set of alternative dependent variables. Column 1 considers $netbuy$ or the percentage monthly change in holdings calculated for each pair of security-fund observations, the same measure used by, for instance, Jiang and Verardo (2018). To get rid of valuation effects, this monthly change is calculated on the number of common stocks held in each period.[58] In Column 2 we also use $netbuy$, but exclude observations in which $exit$=1, to evaluate whether our results are driven by these observations. Column 3 employs the change in the natural logarithm of holdings (not defined when $exit$=1) as the dependent variable. Column 4 explains changes in holdings against total fund assets, but we relativize this variation considering the share of these securities in the portfolio of the fund. Finally, Column 5 performs a similar calculation but considering changes in the share of each fund´s exposure in the market value of the stock of interest. The note to the table provides details on the construction of all these variables.

The main finding of Table A4 is that our results hold for alternative metrics of the trading of bank stocks. Specifically, there are more sales of bank stocks by income funds as evidenced by the negative coefficient associated with $income$, especially when we include observations in which $exit$=1 (Column 1, 4 and 5). This suggests that the finding that income funds were more prone to sell bank stocks is essentially driven by these observations, which advocate for the use of $exit$ as the main dependent variable in the paper.

We next propose some changes to our set of controls. While our study reproduces the same control variables used in Golez and Marin (2015), there could still be doubts that $exit$ may trigger changes in certain funds´ attributes, such as the fund´s return or even flows, being the dependent variable and regressors jointly determined. To address this concern, we re-run our estimations in Table A5 using specifications with and without the Golez and Marin (2015) variables (size, return,

[58] In this period analyzed, there are no corporate actions such as splits, so changes in the number of shares are equivalent to changes in the nominal value of these exposures.

fees, flows), and consider estimations in which we use the current value of these controls or their first lag.[59] We find that the coefficient associated with $income$ is rather stable in these exercises, which limits, in our view, potential endogeneity issues arising from the use of our set of fund-level covariates.

A2.2 Alternative identification of dividend-seekers

This section proposes an alternative treatment to test search for income. Rather than considering the behavior of income funds, here we identify dividend-sensitive funds as those whose name include words like "dividend" or "income" (as well as the abbreviations "div" and "inc"). We refer to this subset of funds, that represents 7% of our observations, as $dividend\ fund$ (dummy variable equal to 1 for these funds). The approach of using fund names to identify investor sensitiveness to the income stream of securities has been used by, for instance, Daniel et al. (2021).

Table A6 presents the results of specifications that build on Equation (1) and that consider the new treatment variable. Columns 1-2 consider the full sample of funds, while Columns 3-4 exclude income funds from the sample.[60] We find that dividend-seekers (funds identified with the $dividend\ fund$ dummy) are more likely to get rid of bank stocks during dividend restrictions. This holds true when excluding income funds from the sample, which implies that our results are not driven by income funds that we label as $dividend\ fund$ in the new regressions. Overall, these tests reaffirm the role of demand for dividends in the response of investors to the policy shock, not limited to income funds.

A2.3 Fund-level and bank-level heterogeneity

Income funds naturally invest in income-paying securities to pass through an income stream to their shareholders. Yet, investors in these vehicles may have different sensitivities to dividend payments.

[59] In all these regressions, we keep $retail$, which presents less variation over time than the Golez and Marin (2015) controls.

[60] Income funds are more likely to have names that explicitly mention "income" or "dividend". In particular, the additional probability of having a name that refers to these words, or to abbreviations of these words, is 1.8pp larger in these funds, being this difference statistically significant at the 1% level.

In particular, when compared with institutional investors, individuals may place a greater value on gaining exposure to these funds because some of them may be living off this income stream (Daniel et al., 2021), or because they could be more prone to suffer from certain biases like the "free dividend fallacy" (Hartzmark and Solomon, 2019).[61] For other dividend-seekers, dividends could be important, but perhaps not as crucial.

Table A7 presents the outcome of some additional models (Columns 1-2) that test whether individuals ownership in income funds resulted in more sales of banks stocks when dividend restrictions were activated. In particular, these models consider again $income$ as in Equation (1), and add the interaction between this dummy variable and $retail$, which captures the share of the market capitalization of the fund in the hands of individuals, and that we previously used as a control variable. As in our other exercises, we find that income funds are more likely to dump bank stocks in the policy period, but we also find that this is especially the case in income funds that are held by individuals. In particular, the output of Column 2 indicates that for income funds in which retail ownership is at its mean value,[62] the additional probability of selling bank stocks (versus non-income funds) is 5.2pp larger, being this likelihood much greater when individuals ownership increases (for an income fund completely owned by these investors, the additional likelihood of selling bank stocks would be 12.0pp (5.2 + 6.8)). The result that income funds owned by individuals react more to the policy shock is consistent with Harris et al. (2015), who demonstrate that flows into these funds fluctuate depending on their exposure to dividend-paying stocks, especially when these vehicles are owned by less sophisticated investors.

We further explore the response of demand for dividends by exploiting heterogeneities at the bank level. In this regard, we take advantage of the fact that while the ECB asked all euro area banks to cancel dividend payments (and share repurchases), some banks in the sample already planned not to distribute dividends in 2020 (non-payers), while others made these distributions in spite of the ECB decision (non-compliant banks). Both non-payers and non-compliant banks are institutions in which actual distributions of dividends coincide with expected distributions, and were therefore not affected or less affected by the ECB recommendation.[63] As a result, we expect income funds to

[61] We already showed, in Table 1, that individuals or retail investors own more shares of income funds on average, when compared with their non-income peers.

[62] We have centered the variable $retail$ in these regressions.

[63] We consider that non-payer banks are those for which the 12 month forward dividend per share as of December

be less responsive to the policy shock with the shares of these banks than with the shares of credit institutions that suspended all payouts.

Columns 3-6 of Table A7 presents the outcome of models that build upon our previous specifications. In particular, we estimate models based on this specification but adding interactions between $income$, $retail$ and a dummy variable that we label $less\ affected\ bank$. This variable takes the value 1 for non-payers in Columns 3-4 and for non-compliant banks in Columns 5-6 (and 0 otherwise). The table shows that income funds sold fewer bank shares of non-payers when compared with other bank shares following the activation of dividend restrictions (negative coefficient of $income$-$less\ affected\ bank$ in Columns 3-4). Indeed, the probability of selling the former stocks is similar to that of non-income funds (the negative coefficient of $income$-$less\ affected\ bank$ roughly balances out the positive coefficient of $income$).

On the other hand, results for non-compliant institutions are less clear-cut. In the most completed specification (Column 6), only income funds in which retail ownership is more relevant are found to be less responsive with these stocks (negative and significant coefficient of the interaction $income$-$less\ affected\ bank$-$retail$). One interpretation of this outcome is that while the ECB Recommendation was originally expected to last until October 2020, there was considerable uncertainty regarding the actual duration of the policy (indeed, the Recommendation was finally extended twice during 2020, with some modifications). It is possible that investors thought that the measure would be active for a longer period, impacting on future and not only on immediate bank payouts.

A2.4 Substitution between stocks and CoCos

The analysis in the main body of the paper concludes that there is substitution between stocks and CoCos induced by the dividend restrictions policy. Yet, one could argue that since $exit$ represents

2019 is equal to zero, according to Datastream (Refinitiv). For non-compliant banks we consider the same group as Martínez-Miera and Vegas (2021): BBVA, Banco Sabadell, Bankia and Bankinter. These institutions did not comply with the ECB measure because dividend payments were already approved at their annual shareholder meetings, whose agreements are binding. Andreeva et al. (2023) removes Bankinter from this list and adds Caixabank, which made partial distributions of dividends after the ECB decision, according to internal supervisory information. Using the list of banks of these other authors does not change our results.

the probability of removing stocks or CoCo, we are not properly capturing substitution. Also, our sample covers funds that do not regularly invest in the two markets (for instance, bond funds do not usually invest in equity, and equity funds rarely invest in instruments like CoCos). To address these concerns, we use a new dependent variable, $\Delta\ share$, which is the monthly variation in the share of each security in the fund´s asset (for instance, if the weight of stock "X" is 1.0% of total assets in month t and 2.5% in month t+1, then $\Delta\ share$ would take the value +1.5%). This better captures changes in relative exposures to the two securities. Besides, we will consider specifications with fund-month or fund-bank-month fixed effects, which naturally compare the preference for stocks or CoCos within the same fund, or within the same fund and bank, respectively.

Table A8 collects the results of some specifications using the new dependent variable and sample of funds. We still find more substitution of stocks with CoCos in income funds (negative coefficient of the interaction $income\text{-}stock$). Non-income funds were also increasing the share of CoCos in their portfolios, but to a lesser extent than their income peers (the coefficients associated with $stock$ are negative and statistically significant).

A2.5 Further discussion of the results for daily abnormal returns

For the sake of clarity, Table A9 gathers the results of Equation (4) using as dependent variable the daily abnormal returns, rather than the cumulative returns, experienced by bank stocks five days before and after the dividend restriction announcement. The results support those presented in the main body of the paper: before the announcement, stocks more exposed to income funds had similar daily returns than stocks less exposed (returns are not significantly different). After it, stocks exposed to income funds experienced an abnormal return decline near 3% greater than that of stocks less exposed (this negative return is below the 5th percentile value of the distribution of abnormal returns for euro area banks during the year before the policy announcement). Actually, and although the policy decision was published after the markets closed, on the announcement date we already see a statistically significant negative coefficient, which suggests that there could be some anticipation effects to the policy shock.

On the other hand, we note that the constant term is not statistically different from zero on the

announcement date as well as on the day after. That is, for stocks with less exposure to income-sensitive investors, abnormal returns were flat in this timeframe.[64] This is indicative, in our view, of the limited informative content of the policy measure. Otherwise, these other banks would present negative returns too. This outcome further confirms that dividend restrictions allow us to isolate search for income motivations from other reasons to trade bank stocks (in this period), which makes an excellent framework for our study. This contrasts to other situations in which firm´s payouts change, such as dividend announcements, that not only affect dividend payments in stocks, but also convey information about the firm's situation (Baker et al., 2016).

A2.6 Dividend yield and daily cumulative abnormal returns

In order to address the concern that results could be driven by the dividend yield level and not by search for income, Figure A2 shows that the conclusions described in the main body of the paper remain unchanged when controlling for this variable. More specifically, we run Equation (5), which is an extension of Equation (4).

$$CAR_i = \alpha + \beta_1 highly\_exposed_i + \beta_2 div\_yield_i + \epsilon_i \tag{5}$$

, where div_yield is a continuous variable that indicates the dividend yield of stock i as of December 2019 (in %), and the other variables are known. Standard errors in Equation (5) are heteroskedasticity-robust.

If the original results were actually due to the fact that highly exposed banks have a higher dividend yield, the initial results would dilute and β_1 would change, either in significance or in levels. However, β_1 remains negative and statistically significant with the new specification. This supports our view that underperformance of these banks is not explained by the dividend yield but by the negative reaction of search for income investors.[65]

[64] During the second day after the announcement, these stocks presented negative abnormal returns. However, we do not think that this can be explained by the policy announcement. Relevant information from the announcement should be rapidly incorporated into stock prices.

[65] Unreported results also support this conclusion, showing that the day after the announcement bank stocks more exposed to search for income experiment a decrease in abnormal returns 2% greater than bank stocks less exposed, no matter the level of dividend yield. We reach this conclusion by running Equation A.1 for daily and not cumulative abnormal returns with the interaction between both independent variables (the negative coefficient for the dividend

Figure A2: Price implications of search for income controlling for the dividend yield of bank stocks

Figure A2.i: Unweighted regressions

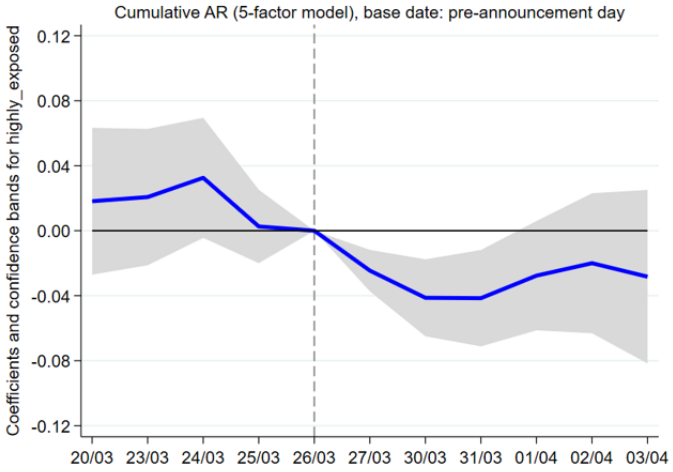
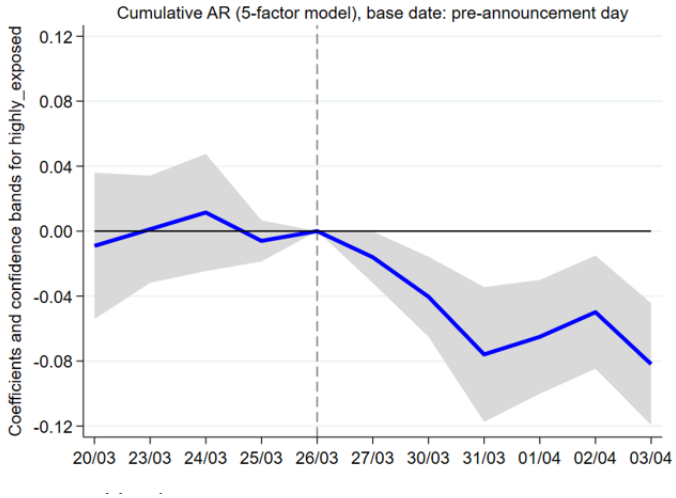


Figure A2.ii: Weighted regressions



Source. Own elaboration

Note. Figure A2.i displays the coefficients and the 95% confidence intervals for the dummy that identifies the stocks highly exposed to income funds in Equation (5), being the dependent variable the daily cumulative abnormal return, normalized to zero at the day before the announcement of the dividend restrictions (26 March 2020). The vertical grey dashed line in the figure corresponds to this date. We run daily regressions to obtain the coefficients and confidence bands. In Figure A2.ii, observations in these daily regressions are weighted by the free-float market capitalization of bank stocks as of December 2019.

yield offsets with the positive one for the interaction).

Table A1: Income funds versus non-income funds. Differences in covariates

	Income funds		Non-income funds		Imbens_stat.	Diff_in_means
	Obs.	Mean	Obs	Mean		
Fund characteristics						
$size$	2,501	726.19	10,178	469.19	0.079	257.005***
$return\ (t-1)$	2,501	-0.02	10,300	-0.03	0.095	0.010***
$fees$	2,501	1.20	10,185	1.28	0.091	-0.075***
$netflow$	2,501	-0.26	10,185	-0.02	0.028	-0.244
$retail$	2,501	0.56	10,185	0.39	0.336	0.170***
Security characteristics						
$\Delta price\ (t-1)$	2,501	-17.71	10,185	-17.85	0.007	0.140
$market\ value\ (EUR\ bn)$	2,485	14.60	10,161	11.60	0.178	3.000***

Note. The table shows descriptive statistics for fund and security-level variables, together with the normalized and the non-normalized or raw difference in means for each covariate (*Imbens_stat* and *Diff_in_means* columns respectively). The normalized difference (Imbens_stat.) is calculated as in Imbens and Wooldridge (2009), and is presented in absolute values. A statistic below 0.25 is indicative of the presence of overlap in the distributions of the covariates (see Imbens and Wooldridge, 2009). $size$ refers to the fund market value of assets (net of liabilities), $return\ (t-1)$ is the year over year change (lagged one period) in the net asset value (NAV) of the fund (lagged one period and in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets, $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). $retail$ measures individuals ownership in funds (in %). $\Delta price\ (t-1)$ is the lagged return of the bank security (stock or CoCo) in a given month (in %). $market\ value\ (EUR\ bn)$ is the market capitalization of stocks or the amount outstanding in CoCos and is expressed in EUR bn. $^{*}\ p < 0.1$; $^{**}\ p < 0.05$; $^{***}\ p < 0.01$

Table A2: Sales of bank stocks by income and non-income funds. Monthly regressions

	Dependent Variable: $exit$											
	SEP19 (1)	OCT19 (2)	NOV19 (3)	DEC19 (4)	JAN20 (5)	FEB20 (6)	MAR20 (7)	APR20 (8)	MAY20 (9)	JUN20 (10)	JUL20 (11)	AUG20 (12)
$income$	-0.005	0.019	-0.006	-0.002	0.014	0.011	0.085**	0.021	0.038**	0.009	0.018	0.001
	(0.007)	(0.020)	(0.007)	(0.014)	(0.009)	(0.013)	(0.039)	(0.017)	(0.017)	(0.019)	(0.016)	(0.008)
$R-squared$	0.452	0.555	0.440	0.362	0.651	0.551	0.479	0.495	0.492	0.411	0.512	0.611
N	2,952	3,437	3,898	3,996	4,127	4,210	4,211	3,952	3,765	3,469	3,189	3,548
$Controls$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$Fund\ asset\ type\ FE$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$Bank-Fund\ family\ FE$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: The table studies the probability of removing bank stocks (exit) on a monthly basis by studying funds characteristics. The unit of observation in these specifications is security-fund. The sample period runs from September 2019 to August 2020. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). All specifications include the set of fund-level controls considered in the main body of the paper. We further include fund asset type and bank-fund family fixed effects (the latter absorbing fund family fixed effects). Robust standard errors are shown in parentheses and are clustered at the fund level. $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table A3: Difference-in-difference specification

	Dependent Variable: $exit$			
	(1)	(2)	(3)	(4)
$income$	0.010	0.010		
	(0.009)	(0.014)		
$income \times policy$	0.059***	0.082**	0.091***	0.096***
	(0.022)	(0.036)	(0.035)	(0.033)
$size$	-0.000**	-0.000**	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
$return\ (t-1)$	0.052	-0.109	0.402**	0.544***
	(0.040)	(0.084)	(0.176)	(0.171)
$fees$	0.004	0.006	-0.071	-0.072
	(0.008)	(0.014)	(0.062)	(0.065)
$netflow$	-0.000	-0.001	0.001	0.001
	(0.000)	(0.001)	(0.001)	(0.001)
$retail$	0.030***	0.041***		
	(0.011)	(0.015)		
$R-squared$	0.360	0.423	0.556	0.625
N	19,297	9,657	9,585	8,622
$Fund\ family-Month\ FE$	Y	Y	Y	Y
$Fund\ asset\ type-Month\ FE$	Y	Y	Y	Y
$Bank-Month\ FE$	Y	Y	Y	Y
$Bank-Fund\ family\ FE$	Y	Y	Y	.
$Fund\ FE$	N	N	Y	.
$Bank-Fund\ FE$	N	N	N	Y

Note. The table studies the probability of removing bank stocks ($exit$) before and when dividend restrictions were activated by studying funds characteristics. The unit of observation in these specifications is security-fund-month. The sample period runs from January to April 2020 in Column 1, and from February to March 2020 in Columns 2-4. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). $size$ refers to the fund market value of assets (net of liabilities), $return$ is the year over year change (lagged one period) in the net asset value (NAV) of the fund (in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets. $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). $retail$ measures individuals ownership in funds. All specifications include fund family-month, fund asset type-month, bank-month fixed effects. We add bank-fund family fixed effects in Columns 1-3. Fund fixed effects are incorporated in Column 3. Bank-fund fixed effects are considered in Column 4. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}\ p < 0.1$; $^{**}\ p < 0.05$; $^{***}\ p < 0.01$

Table A4: Alternative metrics of bank stock trading

	Dependent Variables				
	netbuy	**netbuy if** $exit \neq 1$	**log(netbuy)**	**dshareF**	**dshareM**
	(1)	(2)	(3)	(4)	(5)
$income$	-6.774***	-0.852	-1.128	-6.304***	-6.717***
	(2.219)	(1.000)	(1.001)	(1.913)	(2.215)
$size$	0.000	-0.001***	-0.001**	0.000	0.000
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
$return\ (t-1)$	7.232	13.700**	13.183**	-1.703	7.160
	(10.882)	(6.115)	(5.753)	(9.971)	(10.822)
$fees$	2.040	1.888**	2.062**	1.255	1.984
	(1.595)	(0.900)	(0.828)	(1.406)	(1.595)
$netflow$	0.859***	0.807***	0.677***	-0.054	0.861***
	(0.085)	(0.070)	(0.047)	(0.061)	(0.085)
$retail$	-6.689***	-1.405	-0.485	-6.204***	-6.616***
	(2.218)	(1.648)	(1.734)	(1.777)	(2.221)
$R-squared$	0.188	0.188	0.200	0.340	0.189
N	8,941	8,263	8,199	8,309	8,922
$Fund\ family-Month\ FE$	Y	Y	Y	Y	Y
$Fund\ asset\ type-Month\ FE$	Y	Y	Y	Y	Y
$Bank-Month\ FE$	Y	Y	Y	Y	Y

Note. The table analyzes sales of bank stocks when dividend restrictions were activated by studying funds characteristics. The unit of observation in these specifications is security-fund-month. In Column 1, the dependent variable is $netbuy$ or the month over month change in the number of bank stocks held (in %). In Column 2 we show results for $netbuy$ when $exit \neq 1$. In Column 3, the dependent variable is $log(netbuy)$ or the difference between the natural logarithm of the number of shares held between t and t-1. This variable is not defined (by construction) when exit is equal to one or when funds remove stocks from their portfolios in any given month. Column 4 considers the change in the share of stocks in the portfolio of funds as the dependent variable ($dshareF$). We divide this change by the share of these securities in the portfolio of the fund in t-1 to take into account the importance of each security for mutual funds. Finally, Column 5 ($dshareM$) evaluates the change in the share of stocks over the market value of the stock (its market capitalization). As in the dependent variable in Column 4, we divide this change by the share of these securities in the market value of the stock in t-1 to take into account the importance of these exposures. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). $size$ refers to the fund market value of assets (net of liabilities), $return$ is the year over year change (lagged one period) in the net asset value (NAV) of the fund (in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets, $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). $retail$ measures individuals ownership in funds (in %). All specifications include fund family-month, fund asset type-month and bank-month fixed effects. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}\ p < 0.1$; $^{**}\ p < 0.05$; $^{***}\ p < 0.01$

Table A5: Alternative set of controls

	Dependent Variable: $exit$					
	(1)	(2)	(3)	(4)	(5)	(6)
$income$	0.062**	0.059**	0.062**	0.062**	0.063**	0.063**
	(0.025)	(0.023)	(0.025)	(0.025)	(0.025)	(0.024)
$size$	-0.000*		-0.000*	-0.000*		-0.000*
	(0.000)		(0.000)	(0.000)		(0.000)
$return\ (t-1)$	0.072		0.074	0.072	0.076	
	(0.097)		(0.097)	(0.097)	(0.097)	
$fees$	0.000		0.001	0.000		0.000
	(0.016)		(0.016)	(0.016)		(0.016)
$netflow$	-0.001			-0.001		-0.001
	(0.000)			(0.000)		(0.000)
$retail$	0.043**	0.042**	0.045**	0.043**	0.041**	0.043**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
$size\ (t-1)$					-0.000*	
					(0.000)	
$fees\ (t-1)$					0.001	
					(0.016)	
$netflow\ (t-1)$					-0.001**	
					(0.001)	
$return$						0.066
						(0.104)
$R-squared$	0.403	0.401	0.403	0.403	0.404	0.403
N	9,325	9,325	9,325	9,325	9,325	9,325
$Fund\ family-Month\ FE$	Y	Y	Y	Y	Y	Y
$Fund\ asset\ type-Month\ FE$	Y	Y	Y	Y	Y	Y
$Bank-Month$	Y	Y	Y	Y	Y	Y
$Bank-Fund\ family\ FE$	Y	Y	Y	Y	Y	Y

Note. The table studies the probability of removing bank stocks ($exit$) when dividend restrictions were activated by studying funds characteristics. The unit of observation in these specifications is security-fund-month. The sample period runs from March 2020 to April 2020. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). $size$ refers to the fund market value of assets (net of liabilities), $return$ is the year over year change in the net asset value (NAV) of the fund (in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets. $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). When we lag these controls, we add $(t-1)$ at the end of the variable name. $retail$ measures individuals ownership in funds. All specifications include fund family-month, fund asset type-month, bank-month and bank-fund family fixed effects. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}\ p<0.1$; $^{**}\ p<0.05$; $^{***}\ p<0.01$

Table A6: Funds whose name includes the words "dividend", "income"

	Dependent Variable: $exit$			
	all funds		excl. income funds	
	(1)	(2)	(3)	(4)
$dividend\ fund$	0.082***	0.083**	0.064**	0.065**
	(0.031)	(0.033)	(0.025)	(0.028)
$size$	-0.000**	-0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$return\ (t-1)$	0.042	0.070	0.133	0.128
	(0.091)	(0.097)	(0.091)	(0.098)
$fees$	-0.009	-0.004	-0.006	-0.003
	(0.012)	(0.016)	(0.009)	(0.011)
$netflow$	-0.001	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
$retail$	0.060***	0.052***	0.030*	0.023
	(0.016)	(0.018)	(0.017)	(0.018)
$R-squared$	0.179	0.403	0.144	0.374
N	9,325	9,325	7,362	7,337
$Fund\ family-Month\ FE$	Y	Y	Y	Y
$Fund\ asset\ type-Month\ FE$	Y	Y	Y	Y
$Bank-Month\ FE$	Y	Y	Y	Y
$Bank-Fund\ family\ FE$	N	Y	N	Y

Note. The table studies the probability of removing stocks ($exit$) when dividend restrictions were activated by studying funds characteristics. The unit of observation in these specifications is security-fund-month. The sample period runs from March 2020 to April 2020. $dividend\ fund$ is a dummy that identifies funds whose names include the words dividend, income or abbreviations ("div" and "inc"). In Columns 1-2, we include all funds in the sample. In Columns 3-4, we exclude income funds to further test whether non-income funds whose name refer to "dividends" or "income" are more likely to remove bank stocks from their portfolios than other non-income funds. $size$ refers to the fund market value of assets (net of liabilities), $return$ is the year over year change (lagged one period) in the net asset value (NAV) of the fund (in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets, $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). $retail$ measures individuals ownership in funds. All specifications include fund family-month, fund asset type-month fixed effects and bank-month fixed effects. Columns 2 and 4 further add bank-fund family fixed effects. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}\ p<0.1$; $^{**}\ p<0.05$; $^{***}\ p<0.01$

Table A7: Fund-level and bank-level heterogeneity

	Dependent Variable: $exit$					
	retail ownership		non-payer		non-compliant	
	(1)	(2)	(3)	(4)	(5)	(6)
$income$	0.062***	0.052**	0.064***	0.055**	0.062***	0.050**
	(0.022)	(0.024)	(0.022)	(0.025)	(0.021)	(0.024)
$income \times retail$		0.068**		0.068**		0.083***
		(0.032)		(0.033)		(0.032)
$income \times less\ affected\ bank$			-0.061**	-0.076**	-0.014	0.032
			(0.026)	(0.036)	(0.028)	(0.042)
$income \times less\ affected\ bank \times retail$				-0.043		-0.208***
				(0.057)		(0.076)
$size$	-0.000**	-0.000*	-0.000**	-0.000*	-0.000**	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$return\ (t-1)$	0.042	0.072	0.046	0.074	0.041	0.073
	(0.092)	(0.097)	(0.091)	(0.097)	(0.093)	(0.098)
$fees$	-0.003	0.002	-0.003	0.001	-0.002	0.003
	(0.013)	(0.016)	(0.013)	(0.017)	(0.013)	(0.016)
$netflow$	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$retail$	0.052***	0.024	0.052***	0.029	0.051***	0.017
	(0.016)	(0.018)	(0.016)	(0.019)	(0.016)	(0.019)
$retail \times less\ affected\ bank$				-0.098**		0.093***
				(0.044)		(0.036)
$R-squared$	0.179	0.404	0.178	0.403	0.180	0.404
N	9,325	9,325	9,256	9,256	9,214	9,214
$Fund\ family-Month\ FE$	Y	Y	Y	Y	Y	Y
$Fund\ asset\ type-Month\ FE$	Y	Y	Y	Y	Y	Y
$Bank-Month\ FE$	Y	Y	Y	Y	Y	Y
$Bank-Fund\ family\ FE$	N	Y	N	Y	N	Y

Note. The table studies the probability of removing bank stocks (exit) when dividend restrictions were activated by studying funds characteristics. The unit of observation in these specifications is security-fund-month. The sample period runs from March 2020 to April 2020. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). $retail$ measures individuals ownership in funds. $less\ affected\ banks$ is a dummy that identifies banks that did not plan to distribute dividends in 2020 (non-payers, Columns 3-4) or banks that did not comply with the ECB Recommendation and made payouts after this policy action (non-compliant banks, Columns 5-6). $size$ refers to the fund market value of assets (net of liabilities), $return\ (t-1)$ is the year over year change (lagged one period) in the net asset value (NAV) of the fund (in %), $fees$ (expense ratio) consists of management fees and additional expenses, expressed in % of the fund assets. $netflow$ is the fund estimated inflow or outflow of money for a given month divided by assets in the previous month (in %). All specifications include fund family-month, fund asset type-month and bank-month fixed effects, while we also consider bank-fund family fixed effects in Columns 2,4 and 6. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}\ p<0.1$; $^{**}\ p<0.05$; $^{***}\ p<0.01$

Table A8: Substitution between stocks and CoCos

	Dep. var.: Δ $share$	
	(1)	(2)
$stock$	-0.051***	-0.050***
	(0.013)	(0.017)
$stock \times income$	-0.034**	-0.055**
	(0.017)	(0.027)
Δ $price$ $(t-1)$	-0.001**	-0.002**
	(0.001)	(0.001)
$R-squared$	0.506	0.549
N	11,354	1,177
$Fund-Month\ FE$	Y	.
$Bank-Month\ FE$	Y	.
$Fund-Bank-Month\ FE$	N	Y

Note. The table studies substitution between stocks and CoCos after dividend restrictions were activated by studying funds characteristics. We use a new dependent variable, Δ $share$, which is the monthly variation in the share of each security in the fund´s asset. The unit of observation in these specifications is security-bank-fund-month. The sample period runs from March 2020 to April 2020. $stock$ is a dummy equal to 1 when the security is a bank stock, and it is 0 when the security is a bank CoCo. $income$ is a dummy that identifies income-oriented funds (the dummy takes the value 1 for these observations, and 0 otherwise). Δ $price$ $(t-1)$ is the lagged return of the bank stock/CoCo in a given month (in %). In Column 1, the specification includes fund-month and bank-month fixed effects.Column 2 considers fund-bank-month fixed effects, which restricts the sample to funds that in the same month invest in securities of the same bank. Robust standard errors are shown in parentheses and are clustered at the fund level: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table A9: Implications for daily abnormal returns

	Dependent Variable: *Abnormal Returns*										
	t-5	t-4	t-3	t-2	t-1	policy date (t)	t+1	t+2	t+3	t+4	t+5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
highly_exposed	0.0167	-0.00184	0.00426	-0.0197	-0.00512	-0.0206***	-0.0273***	0.00275	0.0131*	0.0144	-0.0101
	(0.0143)	(0.0110)	(0.00883)	(0.0127)	(0.00845)	(0.00685)	(0.00761)	(0.00747)	(0.00775)	(0.0179)	(0.00767)
constant	0.00392	0.00559	-0.0211***	-0.00345	0.00632	0.00490	0.00408	-0.0131***	-0.00131	-0.0157	-0.00228
	(0.00746)	(0.00598)	(0.00479)	(0.00449)	(0.00538)	(0.00378)	(0.00425)	(0.00303)	(0.00373)	(0.0169)	(0.00467)
$R-squared$	0.016	0.000	0.003	0.048	0.003	0.092	0.125	0.002	0.038	0.003	0.017
N	72	72	72	72	72	72	72	72	72	72	71

Note: The table shows the difference in the daily abnormal return experienced by bank stocks before and after the dividend restriction announcement. More specifically, it shows the abnormal return in each day of those indicated in Columns 1 to 11 of stocks exposed to income funds in relation to those of stocks less exposed (*policy date(t)* indicates the day of the announcement of the policy). The dependent variable is the daily abnormal return calculated with the 5-factor Fama and French model. The unit of observation in these specifications is stock-day. The sample period is just one day in each of the columns. $highly\_exposed$ is a dummy that takes the value 1 when the stock is highly exposed to income funds, and 0 otherwise. Robust standard errors are shown in parentheses: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$