Risk Mitigating *versus* Risk Shifting: Evidence from Banks Security Trading in Crises

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Abstract

We show that risk mitigating incentives dominate risk shifting incentives in fragile banks. Risk shifting could be particularly severe in banking since it is the most opaque industry and banks are one of the most leveraged corporations with very low skin in the game. To analyze this question, we exploit security trading by banks during financial crises, as banks can easily and quickly change their risk exposure within their security portfolio. However, in contrast with the risk shifting hypothesis, we find that less capitalized banks take relatively *less* risk after financial market stress shocks. We show this using the supervisory *ISIN-bank-month* level dataset from Italy with all securities for each bank. Our results are over and above capital regulation as we show lower reach-for-yield effects by less capitalized banks within government bonds (with zero risk weights) or within securities with the same rating and maturity in the same month (which determines regulatory capital). Effects are robust to controlling for the covariance with the existence portfolio, and less capitalized banks, if anything, reduce concentration risk. Further, effects are stronger when uncertainty is higher, despite that risk shifting motives may be then higher. Moreover, three separate tests – based on different accounting portfolios (trading book *versus* held to maturity), the distribution of capital and franchise value – suggest that bank own incentives, instead of supervision, are the main drivers. Results are confirmed if we consider other sources of balance sheet fragility and different measures of risk-taking. Finally, evidence from the recent COVID-19 shock corroborates findings from the Global Financial Crisis and the Euro Area Sovereign Crisis.

Keywords: risk shifting, financial crises, securities, bank capital, interbank funding, concentration risk, uncertainty, risk weights, available for sale, held to maturity, trading book, COVID-19.

JEL Codes: G01, G21, G28.

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1. Introduction

A central result in corporate finance is that, due to limited liability, the payoffs of shareholders in leveraged corporations are convex, hence shareholders have incentives to increase risk at the expense of other stakeholders when the firm is close to distress (Jensen and Meckling, 1976). This is particularly relevant in the banking industry since banks are among the most leveraged corporations with very low skin in the game (Admati and Hellwig, 2013), banking is the most opaque industry (Morgan, 2002) and some of their liabilities are government (explicitly and implicitly) guaranteed (Freixas and Rochet, 2008). However other forces, such as regulation and supervision (Dewatripont and Tirole, 1994) or the preservation of franchise value (Keeley, 1990; Hellmann, Murdock and Stiglitz, 2000), may push shareholders of distressed banks to reduce risk instead of increasing it. As a result, the theoretical literature offers ambiguous predictions.[1]

We analyse banks' risk-taking when they are close to distress. We study banks' security trading during crises for several reasons. First, for banks it is particularly easy to quickly change the risk exposure by buying and selling securities (Boot and and Ratnovsky, 2016; Brunnermeier, Dong and Palia, 2020). The fact that trading exposure can be quickly scaled up and down makes the trading activity more prone to excessive risk-taking. Securities, as compared to loans, are highly liquid, and, as shown by Myers and Rajan (1998), holding more liquid assets reduce management's ability to commit credibly to a (long-term) investment strategy that protects investors from moral hazard problems (the "paradox of liquidity"). Second, the amount of securities held by banks as a percentage of total assets is large, more than 20 percent both in Europe and the U.S. (Mayer et al., 2018). Third, banks are probably the only corporations for which detailed data on the riskiness of individual assets are available. In particular, we rely on an administrative data for all the securities each bank hold in Italy every month at the *ISIN-bank-month* level during several crisis periods: the Global Financial crisis, the Euro

[1] Deposit insurance encourages risk shifting by banks (see, e.g., Merton, 1977), which can be controlled by requiring sufficient bank capital, and hence the effect of capital adequacy requirements is usually to decrease risk taking (Freixas and Rochet, 2008). However, the reverse is also possible: see, e.g., Kim and Santomero (1988), Furlong and Keeley (1989), Gennotte and Pyle (1991), Rochet (1992), Besanko and Kanatas (1996), Gale and Özgür (2005), Gale (2010). Keeley (1990) focus on a different mechanism. He shows that the perverse incentives created by the deposit insurance system are countervailed by the potential loss of charter (franchise) value that induces banks to limit their own risk taking. Hellman, Murdock and Stiglitz (2000) analyse the effect of both a higher charter value and capital adequacy requirements on risk-taking incentives. They find that both are necessary to constraint bank risk-taking.

Area Sovereign Debt crisis and the COVID-19 Crisis. In addition, analysing security trading provides a unique setting where, due to the high granularity of our proprietary dataset, we can control for the role of regulation, by analysing trading in different securities within the same regulatory risk weights (Becker and Ivashina, 2015). Additional tests will also help to disentangle the role of supervision from the role of bank own incentives, including franchise value (Keeley, 1990).

Since the Global Financial Crisis and Euro Area Sovereign Debt Crisis, academics and regulators around the world have been concerned that fragile banks may use their portfolio of securities to gamble for resurrection. Regulators intervened in constraining security trading in the US and there have been related policy proposals in Europe. In the US the Volcker Rule, contained in the Dodd–Frank Wall Street Reform and Consumer Protection Act, specifically prohibits banks from engaging in proprietary trading (although a number of exceptions to this ban are included). In the UK the Vickers' report and in the European Union (EU) the Likaanen Report suggest that market-based activities should be segregated in firewalled subsidiaries and European banking regulators have also been considering introducing limits on some security trading by banks, specifically in the area of the purchases of sovereign bonds (ESRB, 2015). However, none of these proposals has been implemented in the European Union. Analysing the European sovereign crisis, several papers (Acharya and Steffen, 2015; Drechsler, Drechsel, Marquez-Ibanez and Schnabl, 2016; Altavilla, Pagano and Simonelli, 2017) gave substance to this concern arguing that in distressed countries there was risk shifting in security trading since they show that more fragile banks purchased larger quantity of sovereign debt.

The interpretation of the evidence in this paper provides the opposite conclusion. We argue that *comprehensive* micro data at the *security level* by each *bank* is crucial for identification and for a more complete analysis. Thanks to the granularity of our data, we find that in response to financial market stress shocks, less capitalized banks take less risk. Tests based on different accounting portfolios, the distribution of capital and franchise value suggest that bank own incentives, instead of supervision, are the main drivers. Moreover, results are strong within rating*maturity*month fixed effects (that determine regulatory capital) and within government bonds (with zero capital risk weights), and hence capital regulation does not drive the results. Further, results are confirmed if we consider other sources of balance sheet fragility and different measures

of risk-taking and are stronger in times of high economic policy uncertainty. Finally, all crisis shocks suggest similar results.

We exploit security (ISIN) level data of *all* securities investments (not just government bonds, or just securities that banks pledge as collateral to borrow ECB liquidity) of *all* Italian banks at a *monthly* frequency (*security-bank-time*) since 2005:M1. We exploit the Global Financial Crisis and the Euro Area Sovereign Debt Crisis, until 2013:M12 and also analyze the recent COVID-19 Crisis. We consider only bonds (81% of holdings) to have a similar measure of risk, and, for each security, we obtain yields, prices, issuer, and rating from Datastream, the Eurosystem and Factset.

In our main results we use the yield as a measure of security risk (following Becker and Ivashina, 2015; Di Maggio and Kacperczyk, 2017). The literature which analyses the European sovereign crisis does not distinguish between securities with high versus low yields (the unit of observation in this crisis literature has never been at the ISIN level). Without very disaggregated data at the security level, data may show that two banks have similar amount of securities in their portfolio, but the composition of securities may still be very different (e.g., on yields or rating, even within the same issuer). When we look at alternative measures of risk-taking, as the concentration risk at bank level, since we do not need security level information, we use *all* the securities. Since the portfolio of securities can be adjusted quickly, it is important to analyse data at a high frequency level to capture the reactions of the banks to negative shocks.

For identification, we analyse the data at the *security-bank-month* level. This is crucial for analysing security heterogeneity (and hence reach-for-yield) as well as for controlling for unobservables in the regressions, via security*month fixed effects. The inclusion of security*month fixed effects also helps us to control, in each month, for how much of each security is issued and outstanding and, therefore, isolate the demand of securities by banks. For crisis shocks, we proxy for the turmoil in the financial markets by using the changes in the 3 months Euribor-OIS spread as this variable captures well the different 2007-13 crisis shocks (alternatively we use several other different crisis variables). This Euribor-OIS spread is the difference between the rate at which European banks lend to each other (EURIBOR) and the (riskless) overnight indexed swap (OIS) rate on the overnight rate (EONIA) for a 3 month period. The Euribor-OIS spread, similar to its counterpart, Libor-OIS in the U.S. market, is a leading indicator of market stress among practitioners and has been used as a proxy for

market stress, among others, by Gorton and Metrick (2012) for the US and by Aggarwal, Bai and Laeven (2020) for the Euro Area. The Euribor-OIS spread was close to zero before the Global Financial Crisis, but then it massively increased and was much more volatile for several years. The time series show three peaks which correspond to the three worse periods of financial market stress: the initial freeze-out of the European interbank market, the failure of Lehman Brothers and the European sovereign crisis (Figure 1a). In addition, we use 2019-20 data and analyze the recent COVID-19 shock (Figure 1b). Moreover, exploiting the crisis shocks and the granular security data, we analyse risk-taking based on ex-ante bank level measures of fragility. We match the security register with supervisory bank-level balance sheet information and exploit ex-ante bank capital (capital in excess of the regulatory requirement) as the main dimension of bank heterogeneity. We also use other measures of capital and a measure of uninsured wholesale (interbank) liabilities. Importantly we control for several other bank observable characteristics and also include bank fixed effects.

FIGURE 1 HERE

In contrast to the risk shifting hypothesis, we find that, in response to (higher) financial market stress, less ex-ante capitalized banks buy securities with lower yield.[2] Regarding economic effects, the increase in purchases of securities with lower yield (one standard deviation) by banks with low capital (10^{th}-percentile) with respect to banks with high capital (90^{th}-percentile), in response to a one standard deviation increase in financial market stress, is larger than 17 per cent of the average net purchases over the period.

This result survives to a very large battery of robustness checks. First, another threat to identification is that large banks could benefit from a too-big-to-fail status. To address this, we exclude the three largest banks and our results are similar. Second, results are also similar if we control for several macroeconomic, bank and security

[2] Risk shifting by less (compared to more) capitalized banks requires that these banks (apart from taking on negative net present value projects) increase more their risk (e.g. reaching for higher yield). Our paper is silent on negative net present value but shows that more fragile banks take on lower (not higher) risk in reaction to financial market stress. See also below our results when we control for the correlation with the ex-ante portfolio of securities.

portfolio variables (e.g., if we control explicitly for monetary policy by the ECB).[3] Third, results are robust if we fix bank capital to its pre-crisis level or if we use several alternative definitions (leverage ratio, net worth—leverage ratio plus ROA—, Tier 1 ratio). Fourth, results also hold if we adopt an alternative definition of the dependent variable or an alternative definition of risk (rating instead of yield) or if we change the estimation method and instead of using OLS estimates we use Weighted Least Squares (WLS) estimates where the weight is the amount of the holdings of each security at the beginning of the month by each bank to give more weight to the largest holdings. Fifth, results are also robust to the inclusion of additional fixed effects, as bank*time fixed effects or security*bank fixed effects to control for unobserved time-varying bank heterogeneity or time-invariant security-bank matching heterogeneity. Finally, results are very similar after controlling for the correlation of securities traded with the existing entire bank portfolio, which therefore suggest changes in bank risk-taking.

The identification of the crisis shocks is crucial for our analysis. We try several alternative specifications and find consistent results. Different definitions of the market stress variable give the same results, e.g. changes in the European CDS index, changes in several versions of Euro Area indexes of systemic stress (e.g. ECB's CISS), a dummy for the largest spikes in the Euribor-OIS spread instead of a continuous variable, a dummy for the European sovereign crisis months—between June 2011 and December 2012. Moreover, results are confirmed if instead of using all the sample we limit the analysis to a short time window around the failure of Lehman Brothers (September, 15th 2008), which was the strongest shock in the data. We show that banks with low capital react to the failure of Lehman by reducing their exposure to securities with high yields. Moreover, we show that the risk mitigating behaviour associated with episodes of financial market stress is stronger in times of high economic policy uncertainty (based on the measure by Baker, Bloom and Davis, 2016). This is interesting as in these cases, the incentives for risk shifting in crisis times for less capitalized banks could be the strongest.

Furthermore, we also look to an alternative source of bank balance sheet fragility: we analyse not only the level of bank capital but also the fragility of the debt structure, proxied by the level of interbank exposure (Brunnermeier, 2009; Gorton and Metrick,

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[3] See Peydro, Polo and Sette (2020) for evidence on the impact on monetary policy on trading and lending in normal vs. crisis times.

2012).[4] If, in addition to bank capital, we include also the percentage of interbank funding, we find that bank capital is still significant while interbank funding is not statistically significant. However, when we split the sample between Italian government bonds and the rest of the securities we find that while bank capital has a similar effect in both subsamples, interbank funding exposure only matters in the subsample of Italian government bonds. Banks with an ex-ante more fragile liability structure based on interbank funding, throughout the analysed period, buy Italian government bonds with lower yield. Moreover, this effect is even stronger in response to financial market stress shocks.[5] This is consistent with a matching between liabilities and asset risk (Hanson, Shleifer, Stein and Vishny, 2015; Ippolito, Peydro, Polo and Sette, 2016).

Regulation and supervision could limit risk shifting incentives. By looking at security trading and, thanks to the high granularity of our proprietary dataset, we are able to explicitly exclude the role of capital regulation in explaining our findings. We do so by applying the methodology introduced by Becker and Ivashina (2015) which consists in analysing reach-for-yield behaviour within regulatory risk classes. We show that more fragile banks react to financial market stress shocks by purchasing securities with lower yield even within the same regulatory risk weight class. The results hold when we include rating*maturity*month fixed effects (that determines regulatory capital) or when we analyse only Italian Government bonds (which have zero risk weights). In fact, results are stronger in the portfolio of Italian government bonds (in comparison to the portfolio of the other securities), so results are the strongest where capital regulation is the least important.

Two remaining drivers can explain our results: supervision or bank own incentives. Three separate tests suggest the mechanism of bank own incentives rather than of supervision. The first test is based on evidence from different accounting portfolios. If a security is in the *held to maturity* portfolio, unrealized changes in price do not have any impact on the financial statements. On the other hand, if a security is held in the other portfolios, the unrealized changes in prices are recognized in the income statement (*trading* portfolio) or in the comprehensive income (*available for sale* portfolio). If the

[4] A fragile liability is crucial in some key models in banking as e.g. in Calomiris and Kahn (1991) and Diamond and Rajan (2001). In those models, depositors are not insured. Interbank depositors as compared to retail depositors are not insured, and hence they tend to be more fragile.

[5] The fact that the effect of interbank exposure is confined only to the Italian government bond subsample may be due to the fact that Italian banks tend to use these securities as collateral when they borrow from other banks in the private interbank market or when they borrow from the ECB.

results were driven by supervision, we would expect a similar behaviour in the two portfolios: if fragile banks are acting under the guidance of the supervisors, the supervisors would push banks to reduce risk across all portfolios. On the contrary, we find that our results are strongly statistically (and economically) significant only in the *available for sale* and *trading* portfolios. In the *held to maturity* portfolio our coefficient of interest even changes sign, suggesting opposite behaviour (higher risk-taking) in this section of the security portfolio. The coefficient has a different sign but it is not significant at conventional levels due to high standard errors. It is highly unlikely that this behaviour is prescribed by bank supervisors. As there are more securities (number and volume) in the trading and available for sale portfolios than in the held to maturity portfolio, the former effects dominate the latter ones, i.e. risk mitigating dominates.

The second test is based on evidence from the distribution of capital. Our main results survive if we only look at the subsample of observations where capital is larger than the median level. This is a subsample of relatively strong banks where the scrutiny and attention by bank supervisors should be much less relevant. Moreover, if instead of using a continuous variable for bank capital we use dummy variables which correspond to the quintiles of the distribution we show that results are not monotonic. The first (very bottom) quintile and the fourth quintile are the ones taking less risk with respect to the strongest banks (fifth quintile). If the results were driven by supervision we would have expected monotonic effects: again, scrutiny and attention should be monotonically stronger the more we move down along the distribution of capital. These effects are robust to controlling for other bank level measures of size, risk and liquidity.

The third test is based on evidence from the franchise value: the present value of the stream of profits that a firm is expected to earn as a going concern. More fragile banks take less risk in response to a shock only when they have enough franchise value. Our results are strong only in the subsample of banks where the Lerner Index is larger than the median.[6] This is consistent with Keeley (1990) and Demsetz et al. (1996) which suggest that franchise value is the main economic force which constrains bank risk-taking. Moreover, if the results were driven by supervision we would have expected a stronger effect in the low franchise value subsample (as these banks not only

[6] We proxy the franchise value with the Lerner Index. This is a commonly used measure of market power in banking (Beck et al. 2015, Vives, 2016; Delis et al. 2016, Tan et al. 2020) and it is defined as the difference between output prices and marginal costs (relative to prices).

have low bank capital but also lower future expected profits and hence capital). Instead, the coefficient of interest even changes sign in this subsample (although coefficient is economically small and not statistically significant). Therefore, based on this last finding, our results suggest banking supervision does not substitute weak bank own incentives (e.g. banks with low capital that also have low franchise value due to low monopoly power). Of course, our results do not imply that regulation and supervision are, in general, not important in constraining bank risk-taking but only that there are also other risk mitigating drivers at play that we identify in this setting. In fact, in the next draft of this paper, we want to analyze interactions between these several effects.

We show that more fragile banks reduce their exposure toward securities with high yield in response to financial market stress but it could still be the case that more fragile banks increase their overall risk exposure by increasing the concentration of their holdings to one specific issuer (i.e., the Italian government) or to one specific country (i.e., Italy). We address this concern by looking at the concentration risks in terms of type of issuer and instrument at bank level using the portfolio of all securities, following the methodology of Di Maggio and Kacperczyk (2017). Here, we find some evidence that more fragile banks, if anything, react to negative shocks by reducing the concentration risk. For robustness, we also adopt the main regression specification at security-bank-month level but using a dummy variable for Italian government bonds (or, in general for Italian issued securities). Again, we can strongly rule out the concern that more fragile banks increase concentration risk. This result also suggests that moral suasion by government is not a key driver of security trading by more fragile banks during crises.

We conclude the paper by analysing bank behaviour around the recent COVID-19 shock. The spread of the coronavirus and the worldwide pandemic is a shock which, in comparison to the previous analysed ones, has a very different nature since it is not originated in the financial markets but has had crucial effects on financial markets and in particular on banks. We analyse the time window which includes the six months before and after March 2020, the month in which the Italian government imposed the national lockdown. Consistently with rest of the results in the paper, we also find that after this shock more fragile banks take less risk relatively to better capitalized ones. All in all, our results show that, when faced with crisis shocks, for ex-ante fragile banks, risk mitigating concerns dominate risk shifting motives.

Contribution to the literature. Results are particularly relevant since the empirical literature on risk shifting in banks is largely in favour of the risk shifting hypothesis.[7] Saunders, Strock, and Travlos (1990) and Laeven and Levine (2009) show that stockholder-controlled banks take more risk than managerially controlled banks. Gan (2004) find evidence of risk shifting in the behaviour of Texas thrifts during the real estate crisis of the 1980s. Case study evidence seem to support the risk shifting hypothesis (Esty, 1997; and Landier, Sraer, and Thesmar, 2015). Similar conclusions are reached also by the recent literature on banks' trading. Several papers study the increase in holdings of sovereign debt during the Euro area sovereign crisis. Acharya and Steffen (2015), Altavilla, Pagano and Simonelli, (2017) use EBA stress test or bank-level data while Drechsler, Drechsel, Marquez-Ibanez and Schnabl (2016) use data on the collateral pledged by banks to borrow from the ECB. These works, using Euro area data, show that in distressed countries banks with less capital purchased larger quantity of sovereign debt and, in light of this evidence, argue that risk shifting was a key driver of the securities purchases.[8]

Differently from these papers, we have a comprehensive dataset with granular information on individual securities with monthly observations for each bank. This allows for a stronger identification and a more complete analysis which leads us to a different conclusion. In response to financial market stress, more fragile institutions buy securities with lower—not higher—yield which is not consistent with risk shifting. Our results are complementary with Ben-David, Palvia & Stulz (2019) who show with *bank-level* data that U.S. distressed banks deleverage instead of increasing bank-level risk-taking. However, without granular information, it is difficult to explicitly exclude the role of banking regulation and supervision in mitigating bank risks. Also Rampini, Viswanathan, Vuillemy (2020), who study the hedging behaviour of U. S. banks, report one test in their paper which is inconsistent with the risk shifting hypothesis. Interestingly, in our sample the profits from trading in securities and the profits from

[7] The risk shifting hypothesis has also been investigated in other sectors of the financial industry. While substantial agreement exists in favour of the risk shifting hypothesis in the mutual fund industry (see, for instance, Huang, Clemens, and Hanjiang (2011) and literature cited within), results are mixed in the insurance sector (Becker and Ivashina, 2015; Foley-Fisher, Narajabad, and Verani, 2016; Kirti, 2017).

[8] Also Horvath, Huizinga and Ioannidou (2015) using similar data suggest that the risk shifting motive is a driver of the investment in domestic government bonds but they do not base their analysis on measures of bank balance sheet fragility. They also analyzed whether the purchases of domestic government bonds is driven by moral suasion. On this, see also Ongena, Popov, and Van Horen (2019); De Marco and Macchiavelli (2016); Becker and Ivashina (2017).

derivatives are not correlated, thereby suggesting that banks do not use derivatives to hedge the higher risk they get in trading in securities.

Moreover, by analyzing bank behavior around the COVID-19 shock we contribute also to the emerging literature on the economic and financial consequences of the COVID-19 crisis. For example, while Chodorow-Reich et al. (2020) and Li et al. (2020) study the lending behavior of banks in response to the pandemic shock, we analyze securities trading.

Given that our results suggest that regulation and supervision are not driving the risk mitigating effects we find, our findings have also a broader message for the corporate finance literature. The evidence from the literature on industrial firms is somewhat mixed. A few papers provide evidence supporting the risk shifting hypothesis. Using a real options framework, Eisdorfer (2008) show that volatility has a positive effect on distressed firms' investment and that the investments by distressed firms during times of high uncertainty generate less value. Becker and Stromberg (2012) show that managers are less likely to invest in riskier projects when their fiduciary duties require them to consider the interests of debtholders. In a related paper, Favara, Morellec, Scroth and Valta, (2017) find that higher shareholders' expected recovery in default, due to imperfect enforcement of debt contracts, reduces shareholder-debtholder conflicts and induces more leveraged firms to take less risk when they approach distress. Recently, Aretz, Banerjee and Pryshchepa (2019), exploiting hurricane strikes, show that moderately, but not highly, distressed firms skew their asset mixes toward riskier segments after negative shocks.

On the other hand, a large literature finds that risk mitigating incentives outweigh risk shifting incentives when companies are close to distress. When financial conditions deteriorate, firms take more cautious investments in their pension funds (Rauh, 2009), undertake diversifying acquisitions (Gormley and Matsa, 2011), and, in the case of oil and gas firms, take less exploratory projects, which are more risky in comparison to development projects (Gilje, 2016). These results are also confirmed in a laboratory experiment with high-level managers (Hernandez, Povel, and Sertsios, 2016). Our results contribute to this debate. We find that, even for institutions characterized by very high leverage and opportunities to quickly change risk exposure, risk mitigating dominate risk shifting incentives.

The rest of the paper is organized as follows. Section 2 describes the main datasets and explains the empirical strategy. Section 3 presents and discusses the results. Section 4 concludes.

2. Data and Empirical Strategy

In this section we describe the proprietary datasets that we exploit in this paper and the empirical strategy, including the main variables and the econometric specifications.

2.1 Data

We have access to the security register, which is a supervisory centralized dataset managed by the Bank of Italy in its role of bank supervisor. The security register includes microdata on *all* securities investments – at the *security-level* (ISIN code) – for *each* bank in Italy (bonds, ABS, equities, derivatives and shares of mutual funds) in *each* month. Our main sample is from January 2005 to December 2013. In the last part of the paper we extend the database to analyze the recent COVID-19 shock (August 2019 - August 2020).

For each security, banks have to report the notional amount they hold at the end of each period (stock of individual securities). We use the unique International Security Identification Number (ISIN) associated with every security to merge the data on holdings with Datastream to obtain the monthly time series of prices and yields and FactSet to get additional information regarding the issuer, residual maturity and the time series of ratings (Moody's). We compute the quantity of securities in banks' portfolio by dividing the notional amount by the market price at the corresponding date (banks are required by regulation to report the market value of the securities they hold using the closing market price of the last working day of the month). This is crucial to control for changes in values which may be caused by changes in prices. We merge the security register with the bank balance sheet data taken from the Italian supervisory reports.

The composition of securities is the following: 81 per cent are bonds, out of which 58 per cent are issued by government, 34 per cent by financial firms, 2 per cent by non-financial firms and 6 per cent by other entities (e.g. international organizations or municipalities); 9 per cent are Asset Backed Securities (ABS); 3 per cent are shares; and

7 per cent are other securities (e.g. shares of mutual funds, derivatives, covered and structured bonds).

We apply the following filters to the securities data. We consider only bonds as they represent the large majority of securities and we can compare differential risk-taking by different banks in a class of very similar securities.[9] We exclude the holdings of bonds issued by the same bank or by a bank belonging to the same group. To reduce the influence of securities of small value, we drop those for which the total holdings for the entire banking sector are below EUR 10 million and the securities for which the average holding across all periods of each bank is below EUR 10 thousands. The resulting set of securities comprises over 95% of the total holdings for which price data are available. We also exclude from the analysis banks with total assets below EUR 1 billion and mutual banks, the latter being subject to specific capital regulation. The final sample consists of 1684 securities and 115 banks. All major banks operating in the country are included in our sample. When in the last part of the paper, we look at alternative measures of risk-taking, as the concentration risk at bank level, since we do not need security level information we use all the securities.

2.2 Empirical Strategy

We analyze how banks vary their portfolio depending on financial markets stress, bank, and security characteristics. The risk shifting hypothesis predicts that more fragile banks when faced with financial market stress would buy riskier securities. We test this hypothesis using the following econometric specification

$$\text{Net Buys}_{s,b,t}=\beta_1 \text{Capital}_{b,t-1}{*}\text{Risk}_{s,t-1}{*}\text{Market Stress}_{t-1}+\beta_2 \text{Capital}_{b,t-1}{*}\text{Risk}_{s,t-1}+$$
$$+\ \beta_3 \text{Capital}_{b,t-1}{*}\text{Market Stress}_{t-1}+\gamma \text{Controls}_{b,t-1}+\alpha_{s,t}+\alpha_b+\varepsilon_{s,b,t} \qquad (1)$$

We analyze *Net Buys* of security *s* by bank *b* in month *t* on the left-hand side and on the right-hand side we are interested in the coefficient of the triple interaction between a

[9] We exclude derivatives and assets backed securities because these are mostly traded over the counter (OTC), hence we do not observe the market price and thus we cannot calculate a measure of net buys. However: a) the profits from trading in securities and the profits from derivatives are not correlated, thereby suggesting that banks do not use derivatives to hedge the higher risk they get in trading in securities; b) Italian banks have never been significantly exposed to ABS issued by countries with a real estate bubble (US, Spain, Ireland) (for the exposure to asset backed securities, see Bonaccorsi di Patti and Sette (2016) and BIS data, www.bis.org/statistics); d) our results are confirmed when we take out the largest banks which have a higher derivatives exposure.

lagged measure of financial market stress, a lagged measure of bank capital and a lagged measure of security risk. We include the lower level of interactions (the two double interactions *Capital*Risk* and *Capital*Market Stress*). We include bank controls (*Size, Liquidity, Interbank, Bad Loans/Total Assets*) and security*time fixed effects (α_{st}) and bank fixed effects (α_b).[10] We triple-cluster the standard errors at security, bank and month level.

We analyze the data at the *security-bank-month* level, instead of the bank level. This is very important for studying heterogeneity, as different securities (even within the same issuer and even in the same time period) have different ex-ante yields, as well as rating. Moreover, and crucially for identification, our micro-level data allow us to control for key unobservables, via security*time fixed effects. Security*time fixed effects are a multiplication of a dummy for each security and a dummy for each month of each year (substantially stronger than adding just security and time fixed effects). They help us to control – in each month – for how much of each security is issued and outstanding, thus isolating the demand of securities by banks (they also fully control for ratings, price or other unobserved time-varying risk at the security level). For example, we can analyze the risk-taking of different banks controlling fully for time-varying ratings and maturity, the main determinants of capital regulation. In addition, as explained below in the results sections, we include other fixed effects and we provide a battery of robustness checks.

Our main dependent variable is the net buys of security *s* by bank *b* at time *t* (month). We use the Davis-Haltiwanger definition (Davis and Haltiwanger, 1992) to include both the extensive and intensive margin. We define the following:

$$\text{Net Buys}_{s,b,t}=\frac{\text{Holdings}_{s,b,t}\text{-Holdings}_{s,b,t-1}}{\frac{1}{2}*(\text{Holdings}_{s,b,t}+\text{Holdings}_{s,b,t-1})} \tag{2}$$

Net Buys$_{s,b,t}$ is the increase in holdings of security *s*, by bank *b* during the month *t*. This variable is symmetric around 0 and it lays in the closed interval [-200, 200] with final sales (initial purchases) corresponding to the left (right) endpoint. This measure facilitates the integrated treatment of initial purchases (passing from 0 to a positive

[10] The third double interaction *Market Stress*Risk* is absorbed by the security*time fixed effects. When we do not include these fixed effects we include the *Market Stress*Risk* and also macro controls *(∆ CPI and* ∆ *Unemployment*).

number), final sales (passing from a positive number to 0) and continuing trading in the empirical analysis (see the Appendix for an exact definition on all the variables used). In Table 1 (which reports the descriptive statistics of the main variables used in the paper), we report that the average monthly net buys in the crisis period is 5.0. The median change is around zero but there is a large standard deviation (82.2) which implies a very large heterogeneity in banks securities trading.[11] For robustness, we use the change of log holdings as an alternative measure of banks' securities trading.

TABLE 1 HERE

We proxy financial markets stress by using the lagged changes in the 3 months Euribor- OIS spread. This is the difference between the rate at which European banks lend to each other (EURIBOR) and the overnight indexed swap (OIS) rate on the overnight rate (EONIA) among the same banks for a 3 month period. Euribor is the rate at which banks indicate they are willing to lend to other banks for a specified term of the loan. The term OIS rate is a measure of the market's expectation of the overnight funds rate over the term of the contract. The Euribor-OIS spread has been close to zero before the summer of 2007, but then it massively increased and has been much more volatile since then. The time series show three peaks which correspond to the three worse periods of financial market stress: the initial freeze-out of the European interbank market, the failure of Lehman Brothers and the European sovereign crisis. The Euribor-OIS spread is considered the principal market indicator of health of the banking system, reflecting both credit and liquidity risk premia. As detailed in the results section, we check whether results hold if we use several alternative measures of financial markets stress (dummy for the largest spikes in the Euribor-Ois spread instead of a continuous variable, dummy for the European sovereign crisis months—between June 2011 and December 2012, changes in the European CDS index or changes in several versions of ECB's Euro Area indexes of systemic stress-CISS or if we just take a small time window around the failure of Lehman Brothers).

[11] In this case we take care of initial purchases and final sales by setting the logarithm of the holdings equal to 0 when the holdings are 0.

We focus on bank capital heterogeneity since bank capital is a good proxy for the intensity of the agency conflict between bank shareholders and their financiers (including depositors, debtholders and tax payers) and a key measure for the strength of bank balance sheets (Holmstrom and Tirole, 1997; Bernanke, 2007; Freixas and Rochet, 2008). Admati and Hellwig (2013) identify bank capital as a key driver of banks' behavior during the crisis. As the main measure of bank capital we use capital (shares subscribed, book value of equity plus retained earnings) in excess of the regulatory minimum divided by total assets (Gambacorta and Mistrulli, 2004). For robustness we fixed the capital at the precrisis level or we use several alternative proxies of bank capital such as leverage ratio, net worth (leverage ratio plus ROA), Tier 1 ratio. We also exploit variations in another aspect of the bank balance sheets which is the fragility of the debt structure, proxied by the level of interbank exposure—the ratio of total borrowing from other banks to total assets (Brunnermeier, 2009; Gorton and Metrick, 2012).

The average value of *Capital* is 2.5 per cent and the average value of *Interbank* is 9.3 per cent. There is a large variability among banks: the interquartile range goes from 1.5 to 3.0 per cent for *Capital* and from 3.4 to 12.0 per cent for *Interbank*. We also control for other bank variables, such as time invariant heterogeneity via bank fixed effects, and time-varying bank controls: *Size,* the logarithm of the total assets; *Liquidity*, the sum of cash and sovereign bonds divided by total assets; and *Bad Loans/Total Assets.* In robustness tests we also include security*bank and bank*time fixed effects.

We analyze risk-taking by using the yield as a measure of risk of securities (Becker and Ivashina, 2015; Di Maggio and Kacperczyk, 2017).[12] The yield is calculated as the Yield-to-Redemption minus the overnight interest rate for the Euro area. The average yield is 2.1 per cent with an interquartile range between 0.7 per cent and 3.2 per cent. The average yield within the sub-sample of Italian government bonds (1.7 per cent) is much smaller than the average yield in the rest of the sample (2.5 per cent). In a robustness check we also use *rating* as an additional measure of security heterogeneity. The interquartile range for the rating is between BBB and AA (Moody's).

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[12] The size of the yield is a superior measure of risk in comparison with rating since, as shown in Becker and Ivashina (2015), financial institutions may select securities with an ex-ante higher yield, within the same rating category, to increase risk and obtain a higher return. Moreover, since results are very similar after controlling for the correlation of securities traded with the existing entire bank portfolio, we identify changes in bank risk-taking.

Moreover, we also exploit time series variations in uncertainty in economic policy to check whether our result differ in times of high versus low economic policy uncertainty.

Furthermore, as we explain in detail in the results section, we analyze different subsamples of securities, portfolios and banks (e.g. government bonds that have regulatory capital weights equal to zero, or held to maturity versus the trading book and available for sale portfolios, which have different accounting and regulatory treatment, or subsamples of banks with different level of capital or franchise value) to analyze the possibility that regulation or supervision might be the key drivers of the observed behavior.

We explore alternative measures of risk-taking, namely the concentration risks. We start by substituting the yield with a dummy *Italian* (a dummy equal to 1 if the issuer of the security is the Italian government or any Italian issuer) in equation 1. Then, we collapse the data from *security-bank-month* to *bank-month* level and we run bank level regressions with the concentration risk of the portfolio as the main dependent variable as in Di Maggio and Kacperczyk (2017). We adopt the following econometric specification:

$$\text{Concentration Risk}_{b,t}=\beta \text{Capital}_{b,t-1}*\text{Market Stress}_{t-1}+\gamma \text{Controls}_{b,t-1}+\alpha_t+\alpha_b+\varepsilon_{b,t} \quad (3)$$

We use three different definitions of *Concentration Risk*: a) the share of Italian government bonds, b) the HHI index of holdings by issuers, c) the HHI index of holdings by type of instruments.[13] Higher values of these measures imply higher risk-taking. We include several bank controls, time and bank fixed effects. In this case we double-cluster the standard errors at bank and month level.

Finally in the last part of the paper, we extend the database and analyze bank behaviour around the recent COVID-19 shock. We analyze the time window which includes the six months before and after March 2020. Using a very similar specification as the one described in equation 1. The main difference is that the variable *Market Stress* is in this case a dummy variable equal to 1 for the six months after the shock

[13] In the portfolio of Italian banks we have the following instruments: mutual funds, ABS, shares of Italian financial companies, shares of foreign financial companies, shares of Italian non-financial companies, shares of foreign non-financial companies, bonds of foreign financial companies, bonds of Italian financial companies, bonds of foreign non-financial companies, bonds of Italian non-financial companies, Italian government bonds, foreign government bonds.

(March 2020- August 2020) and 0 in the six months before (August 2019- February 2020).

3. Results

In this section we discuss the main results, provide a large set of robustness checks, explore alternative identification of the shocks, discuss the alternative channels of regulation and supervision, analyze alternative measures of risk-taking and conclude by analyzing the recent COVID-19 shock.

3.1 Main Results

Table 2 reports the main results of the paper. We estimate equation 1 using Ordinary Least Squares and triple-clustering the standard errors at bank, security and month level. In column 1 we include only macro and bank controls. In column 2 we include security fixed effects and in column 3 we add also time fixed effects. We continue by gradually saturating the model with fixed effects: in column 4 we add rating*maturity*time (which are the main determinants of regulatory capital weights) fixed effects, in column 5 we add security*time fixed effects to isolate the demand of securities by banks and also to fully control for ratings, price or maturity and other unobserved time-varying risk at the security level. Finally, in the last column we also include bank fixed effects to control for time invariant bank heterogeneity.

In all specifications, the coefficient of the triple interaction *Capital*Risk*Market Stress* is positive and highly statistically significant. The coefficients in column 1 and in column 9 are very similar.[14] Results are also economically significant. The increase in purchases of securities with lower yield (one standard deviation) by banks with low capital (10th-percentile) with respect to banks with higher capital (90th-percentile), in response to a standard deviation increase in the lagged changes of the Euribor-Ois spread, is larger than 17% per cent of the average net purchases over the period. More

[14] Only in column 4 it differs (actually it becomes larger) but notice that in this column the sample is smaller since we require information on maturity and rating which is not available for all the securities in the sample.

fragile banks react to financial market Stress by rebalancing their portfolio toward securities with lower yield.

The three double interactions *Capital*Risk*, *Market Stress*Risk*, *Capital*Market Stress* and the variable *Market Stress* are almost never significant.

TABLE 2 HERE

3.2 Robustness

We provide a large battery of robustness checks analyzing different samples, using different estimation methods, adopting different definitions of the main variables, adding further controls, and adding more fixed effects.

In Table 3, specifically, we check whether results hold if we exclude the largest banks, if we fix bank capital at a pre-crisis level, if we change estimation method or if we use rating instead of yield as a measure of the riskiness of a security. In column 1 we show that results are similar if we exclude from the analysis the largest three banks in our sample in terms of total assets. This is important to confirm that our results are not just driven by a handful of large banks which could be considered too-big-to-fail. The top three banks are the biggest banks in the country with the largest international presence, they have a large portfolio of securities, and rely more on derivatives. In column 2 we fix the capital to the pre-crisis level by taking the average of excess capital between January 2005 and June 2007 before the first signs of tension in the interbank market in the summer of 2007. The pre-crisis capital level can be interpreted as an instrument for whether a bank has risk-taking incentives during the financial crisis. The identifying assumption is that the pre-crisis capital affects the trading behavior in response to market Stress through its incentive to take risk. Again, results remain significant although the point estimates are slightly smaller.

TABLE 3 HERE

Results hold also if we change the estimation method and instead of using OLS estimates we report Weighted Least Squares (WLS) estimates where the weight is the level of the holdings of each security at the beginning of the month by each bank to give more weight to the largest holdings (column 3). In the last column of Table 3, we use *Rating* instead of yield as a measure of security risk. As we explain above this is a poorer measure in comparison to yield since this is less granular: one could buy securities with higher yield within the same rating category (Becker and Ivashina, 2015). However, the triple interaction *Capital*Rating*Market Stress* is also statistically significant with a negative sign: banks with high capital expand the holdings of securities with lower rating (higher risk) in response to financial market stress.

In the Appendix we provide additional robustness tables. In Table A2 we keep adding further interaction terms. First, we address a potential concern that the results may be driven by diversification motives. We control for the existing portfolio of each bank at the beginning of each month, by including the shares of the bank portfolios invested in different type of securities according to the issuer: Italian government, foreign governments, Italian banks, foreign banks, Italian non-financial corporations, foreign non-financial corporations. Results do not change (column 1). Second, to make sure that our variable *Capital* is really capturing what we want to measure and is not proxying for something else, we include the triple (and double) interactions with bank *Size*, *Market Stress* and *Risk*. Our coefficient of interest remains largely significant (column 2). In columns 3 and 4 we control for unconventional and conventional monetary policy changes which occurred in the sample period: we include the triple (and double) interactions between *Capital*, *Risk* and the *LTRO dummy* (a dummy equal to 1 in the months of the announcement and allotments of the LTRO) and also triple (and double) interactions between *Capital*, *Risk* and the *EONIA* rate (overnight reference rate for European interbank lending). With the Long Term Refinancing Operations (LTRO), the ECB provided more than one trillion of (euro) lending with a 3-year maturity to European banks. The LTRO was announced in December 8, 2011 and the funds were distributed in two allotment dates: December 21, 2011 and February 29, 2012. Also after controlling for these additional variables, our coefficient of interest remains strongly significant.

In Table A3 we use a different definition of the dependent variable and in Table A4 we use different definitions of *Capital*. First, we show that our results do not depend

from the definition of our dependent variable. Instead of the Davis-Haltiwanger definition of *Net Buys*, in Table A3 we use the difference between the logarithm of (holdings of security s, by bank b at time t) and the logarithm of (holdings of security s, by bank b at time t-1). When the holdings are zero we set the logarithm of the holdings equal to zero. Results are similar. In Table A4 we show that results hold also if we use several alternative definitions of bank capital: *Leverage ratio*, *Net worth* or *Tier1 ratio.*

Finally, while the main results include already bank and security*time fixed effects, in Table A5 we show that results are also robust to the inclusion of additional fixed effects, as bank*time fixed effects or security*bank fixed effects to control for unobserved time-varying bank heterogeneity such as, for example, bank risk (bank*time fixed effects) or time-invariant security-bank matching heterogeneity proxying for example for different specialization of banks in some securities (security*bank fixed effects).

3.3 Identifications of the shocks

The objective of this study is to analyze how more fragile banks react to negative shocks. The way we identify shocks is then crucial. The turbulence in the financial markets experienced in Europe after 2007 offers a large laboratory. In the main results we study how fragile banks respond to the one month lagged changes in the Euribor-Ois spread. We choose this variable since the Euribor-Ois spread is a leading indicator of market stress (Gorton and Metrick, 2012; Aggarwal, Bai and Laeven, 2020). In this section we want: a) to make sure that changing the way we identify shocks does not affect our conclusions and b) to see whether our results are stronger when episodes of financial market stress happen in times when there is also high economic policy uncertainty.

Alternative Identifications of Financial Market Stress Episodes

First, we look at continuous measures of market stress different from the Euribor-Ois spread. We try variables which are not specific to the banking sector and are not specific to Italy. We use the monthly changes in the Markit iTraxx European Credit Default Swap Index (which comprises 125 equally-weighted European corporations) which is one of the most widely traded indexes of CDS in Europe. We also look at the monthly changes in several versions of the ECB's Euro Area indexes of systemic stress

(CISS). CISS is a composited indicator of systemic risk introduced by the ECB which should measure “the current level of frictions, stresses and strains (or the absence thereof) in the financial system and summarizes it in a single continuous statistic” (Hollo, Kremer, Lo Duca, 2012). We use the composited indicator and also the sub-indices of the bond market and the money market. Independently of the proxy for financial market stress we use, we find consistent results. The coefficient of the triple interaction *Capital*Risk*Market Stress* is always positive and statistically significant.

Second, since we are particularly interested in the negative shocks, we use dummy variables instead of continuous variables. The first is a Dummy for high Δ Euribor-Ois spread. It takes the value of one if the monthly change is among the largest monthly increases in the spread. Here we really want to capture how banks behave in the months following the biggest shocks (top 10 per cent). Alternatively we focus on a dummy which is equal to one in the months of the European sovereign crisis (Dummy for Sovereign crisis). This dummy takes the value one in the months between July 2011 and December 2012 which are the worse months of the crisis. The spread between 10-year Italian BTP and German Bund started increasing abruptly, reaching historically high levels, from July 2011 (Bofondi, Carpinelli and Sette, 2017). In column 5 of Table 4 we use the Dummy for high Δ Euribor-Ois spread and in column 6 of Table 4 we use the Dummy for Sovereign crisis. In both cases, we find that more fragile banks react to these negative shocks by reducing the risk in their portfolio relatively to better capitalized banks. Finally, instead of using the all sample from 2005 to 2013, we focus only on the six months around the failure of Lehman Brothers (September, 15th 2008). We do so since this is associated with the largest spike in our main measure of financial market stress (see Figure 1). Also in this sample, we show that banks with low capital react to the financial market stress shock (the failure of Lehman) by reducing their exposure to securities with high yields (column 7).[15]

TABLE 4 HERE

[15] In this last specification, given the short-time window, we double-cluster the standard errors at bank and security level. However results do not change if we triple-cluster at bank, security and time level.

Financial Market Stress Episodes and Economic Policy Uncertainty

Episodes of financial market stress can happen in times when there is also high uncertainty in economic policy. Does our key result of risk mitigating behavior by fragile banks in the face of financial market shocks differ in times of high versus low economic policy uncertainty?

Economic policy uncertainty is high when economic agents are unable to foresee the outcomes of fiscal, regulatory, monetary and trade policies. We proxy for European policy-related economic uncertainty by using the index constructed by Baker, Bloom and Davis (2016). The index is based on newspaper articles regarding policy uncertainty. The three authors construct the European-level index in the same manner as their Economic Policy Uncertainty (EPU) index based on American newspapers. For the European index, they draw on two newspapers per country: Le Monde and Le Figaro for France, Handelsblatt and Frankfurter Allgemeine Zeitung for Germany, Corriere Della Sera and La Stampa for Italy, El Mundo and El Pais for Spain, and The Times of London and Financial Times for the United Kingdom.[16]

The correlation between the monthly series of the European-based EPU index and the Euribor-Ois spread in the analyzed period is, as expected, positive but not very high (0.28). We calculate the median of the EPU index period in the period and, in Table 5, we split the sample between months when the EPU Index is larger than the median (columns 1-4) and months when the EPU Index is below the median (columns 5-8). We run our main regressions in the two different subsamples. As before, we are interested in the coefficient of the triple interaction *Capital*Risk*Market Stress.* The variable *Market Stress* is: a) the monthly change in the Euribor-Ois spread in columns 1, 2, 5 and 6, b) a dummy equal to 1 if the monthly change in the Euribor-Ois spread is larger or equal to the 90th percentile and 0 otherwise in columns 3, 4, 7 and 8. We find that our results are concentrated in the subsample when economic policy uncertainty is also high. The risk-taking behaviors of fragile and strong banks in the face of an episode of

[16] They count the number of newspaper articles containing the terms uncertain or uncertainty, economic or economy, and one or more policy-relevant terms. Then, they scale the raw count by a measure of the number of articles in the same newspaper and month. Finally, they standardize each newspaper-level monthly series to unit standard deviation prior to 2011 and average across newspapers by month to obtain the European EPU index. The monthly series we use is labelled "European_News_Index" and it is downloaded from https://www.policyuncertainty.com/europe_monthly.html.

financial market stress are very different when there is also high economic policy uncertainty.

TABLE 5 HERE

3.5 Fragility, Regulation, Supervision and Economic Forces

In this section we offer additional evidence on the risk shifting hypothesis by analyzing also another source of bank balance sheet fragility, namely the exposure to the wholesale funding market. Moreover, we investigate alternative channels which could drive the investment behavior of more fragile banks in response to financial market stress: regulation, supervision or economic forces.

In Table 6, we augment equation 1 with the triple interaction between *Interbank*, *Risk* and *Market Stress* (we also include the double interaction *Interbank*Risk* and *Interbank*Market Stress*). The variable *Interbank* which is calculated as the ratio of total borrowing from other banks to total assets is a proxy for the fragility of the debt structure. We find that the coefficient of the triple interaction *Interbank*Risk*Market Stress* is never significant while the coefficient of the triple interaction *Capital*Risk*Market Stress* remains almost unchanged and significant at 1 per cent. We also notice that banks with less stable funding structure, throughout the sample, buy securities with lower yield. *Interbank*Risk* is, in fact, negative and significant (although the coefficient becomes much smaller when we consider only the within security*time variation). This is consistent with the risk management hypothesis: since their liabilities are relatively more fragile banks with more interbank exposure buy assets with lower risk (Ippolito et al., 2016). Also if we consider this alternative source of fragility we do not find evidence of risk shifting.

TABLE 6 HERE

Maybe banks do not risk-shift because they are constrained by regulation or supervision. Banks with low capital may buy less risky securities just to minimize the regulatory capital since safer securities have lower risk-weights. However, thanks to the granularity of our data we can rule out the impact of regulation. We have already shown in Table 2 that the results hold when we include rating*maturity*time fixed effects, which are the key determinants of regulatory risk weights. In this section, we confirm our result by splitting the sample between Italian government bonds which have *zero* risk weights and the rest of the securities. In Table 7 we show that the coefficient of the triple interaction *Capital*Risk*Market Stress* is positive and significant in both subsamples and the coefficient is slightly larger in the subsample of the Italian government bonds. Regulation is not driving our results.

The sample split between Italian government bonds and the rest of the securities reveals another interesting pattern in the data. We find that banks with more fragile debt structure behave differently in the two sub-samples. The triple and double interactions, *Interbank*Risk*Market Stress* and *Interbank*Risk* are negative and strongly significant in the subsample of Italian government bonds while they do not have explanatory power in the sub-sample of the rest of the securities. Banks with larger interbank exposure, throughout the analyzed period, buy Italian government bonds with lower yield and this effect is even stronger in response to financial market stress. The difference between the two sub-samples of securities could be due to the fact that Italian banks tend to use these securities as collateral when they borrow from other banks in the private interbank market or when they borrow from the ECB. Safer securities have lower haircuts when used as collateral. This is further evidence against the risk shifting hypothesis.

TABLE 7 HERE

Two remaining drivers can explain our results: supervision or economic forces. We run three separate tests to shed light on the relative importance of the two drivers. The three tests are based on evidence from different accounting portfolios, from the distribution of capital and from franchise value. All the three tests point in the direction of economic forces being the main driver of our findings.

For the first test we exploit information on the regulatory portfolio each security is held in. We split the sample into securities placed in different accounting portfolios. If a security is in the trading or available for sale portfolios, the unrealized changes in fair value are recognized in the income statement (*trading*) or in the balance sheet in the comprehensive income (*available for sale*). On the contrary, if a security is in the *held to maturity* portfolio, unrealized changes in fair value are not reported on either the income statement or the balance sheet[17] but the securities need to be owned until maturity and cannot be traded. If the results were driven by supervision we would have expected a similar behaviour in the two portfolios: if fragile banks are acting under the guidance of the supervisors, banks would reduce risk across all portfolios. On the contrary, we find that our results are strongly statistically significant only in the *available for sale* and *trading* portfolios (Table 8). In the *held to maturity* portfolio our coefficient of interest even changes sign, suggesting opposite behaviour (higher risk-taking) in this section of the security portfolio. The coefficient has a different sign but it is not significant at conventional levels.[18] It is highly unlikely that this behaviour is prescribed by bank supervisors. It is also interesting to notice the different signs of the double interaction *Capital* Market Stress* in the two sub-samples. In response to financial market stress, banks with low capital, at the margin, increase the size of the *held to maturity* portfolio which shield them from the fluctuations of bond prices that could further damage their already fragile balance sheet.[19]

TABLE 8 HERE

The second test is based on evidence from the distribution of capital. We do two exercises here (Table 9). First, we analyze a subsample of relatively strong banks where the scrutiny and attention by bank supervisors should be much less relevant. Our main results survive if we only look at the subsample of observations where capital is larger

[17] Unless there is objective evidence of impairment, i.e. after a breach of contract, such as default or delinquency in interest or principal.

[18] In column 3 (available for sale and trading portfolios) the coefficient is 1.47 with a standard error of 0.68, in column 7 (held to maturity portfolio) the coefficient is -1.29 but the standard error jumps to 2.15.

[19] Banks face a trade-off: having more securities in the *held to maturity* portfolio is good insofar as banks are shielded by potential reduction in prices but, in case of need of liquidity, these securities cannot be sold.

than the median level. Second, if instead of using a continuous variable for bank capital we use dummy variables which correspond to the quintiles of the distribution we show that results are not monotonic. The very bottom quintile and the fourth quintile are the ones taking less risk with respect to the strongest banks (fifth quintile). If the results were driven by supervision we would have expected monotonic effects: again, scrutiny and attention should be monotonically stronger for weaker banks.

TABLE 9 HERE

The third test is based on evidence from the franchise value (Table 10). We find that more fragile banks take less risk in response to a shock only when they have enough franchise value. We proxy the franchise value with the Lerner Index. This is a commonly used measure of market power in banking (Beck et al. 2015, Delis et al. 2016, Tan et al. 2020) and it is defined as the difference between output prices and marginal costs (relative to prices).[20] We calculate the Lerner index in June 2007 before the first signs of tension in the interbank market in the summer of 2007. This variable is positively correlated with the ROA (0.45) but is not correlated with *Capital* (-0.03). ROA and *Capital* are correlated among themselves with a smaller coefficient (0.21). Our results are strong only in the subsample of banks where the Lerner Index is larger than the median.[21] This is consistent with Demsetz et al. (1996) which suggest that franchise value - the present value of the stream of profits that a firm is expected to earn as a going concern – is a key economic force in constraining bank risk-taking. Moreover, if the results were driven by supervision we would have expected a stronger effect in the low franchise value subsample. Instead, the coefficient of interest even changes sign in this subsample (although coefficient is economically small and not statistically significant).

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[20] The Lerner index measures a banks' markup and is calculated as: Lerner Index= P – MC / P. The price of the banking good P is given by the ratio of total operating income to total assets. The marginal cost, MC, is obtained from a translog function which estimates the total cost a bank faces as the function of labor, physical capital and funding. The index goes from 0 to 1 with larger values implying higher market power.

[21] The sample used in this table is smaller since for some banks we do not have all the variables necessary to construct the Lerner Index.

TABLE 10 HERE

3.6 Concentration Risk

In this section we address a remaining concern. We show that more fragile banks reduce their exposure toward securities with higher yield in response to financial market stress but it could still be the case that more fragile banks increase their overall risk exposure by increasing the concentration of their holdings to one specific issuer (i.e., the Italian government) or to one specific country (i.e., Italy). We address this issue in two ways.

First, we look at the concentration risks from a different perspective. Instead of analyzing data at security-bank-month level, as we do throughout the paper, here we analyze data at the bank-month level. As we describe in Section 2.2 we use three measures of concentration risk. First we use the share of Italian government bonds out of the total portfolio, second, following Di Maggio and Kacperczyk (2017), we create two Herfindahl indexes of holdings by issuers and by instruments. Since here we do not need granular information at the security level, we can use the all portfolio of securities. Higher levels of the share of Italian government bonds or higher levels of the HHI indexes suggest reduced diversification, hence higher risk-taking.

We report estimates of specification 3 in Table 11. Here, we are interested in the coefficients of the double interactions *Capital* Market Stress* and *Interbank* Market Stress*. In the first eight columns which have as dependent variables the share of Italian government (columns 1-4) or the HHI Issuers (columns 5-8), the two double interactions are almost never significant. By analyzing the HHI of the type of instruments (columns 9-12) we find some evidence that more fragile banks (with less stable funding or less capital) reduce (instead of increasing) concentration risks (although results are less statistically significant for *Capital* Market Stress*). The standalone variables Capital and Interbank are never significant.

TABLE 11 HERE

Finally, in Table A6 we adopt the same regression specification as in equation 1 but we substitute the yield, our key measure of security risk, with a dummy variable *Italian* which is equal to 1 if the issuer of the security is the Italian government (columns 1-4) or, in general, any Italian issuer—either corporate or government (columns 5-8) and 0 otherwise. We find some evidence that better capitalized banks (not the more fragile ones) buy more Italian issued securities, throughout the period (positive and significant coefficient of the double interaction *Capital*Italian* but only in the specifications with security*time fixed effects) and, in response to financial market stress, we do not find any differential behavior between more or less fragile banks. The triple interaction *Capital*Italian*Market Stress* is, in fact, never significant.

More fragile banks do not seem to gamble in response to financial market stress by concentrating their portfolio on some specific issuer or type of security. If anything, we find some evidence that more fragile banks react to negative shocks by reducing the concentration risk. These additional results confirm that, when faced with financial market stress, risk mitigating concerns dominate risk shifting motives. This result also suggests that moral suasion by government is not a key driver of security trading by more fragile banks during crises.

3.7 Recent Evidence from the COVID-19 Shock

In the last part of the paper we analyze the trading behavior of banks in response to the recent COVID-19 shock. This shock is similar to the previous analyzed ones in so far as also during this episode there is massive increase in the Euribor-Ois Spread. On the other hand, this shock has a very different nature since it is not originated in the financial markets.

In Table 12 we analyze the time window which includes the six months before and after the shock and we use a very similar specification as the one described in equation 1. The main difference is that the variable *Market Stress,* in this case, is a dummy variable equal to 1 for the six months after the shock and 0 in the six months before it. We consider March 2020 as the beginning of the post period since on March 9th 2020 the government of Italy imposed a national lock-down, restricting the movement of the

population, in response to the growing pandemic of COVID-19 in the country. Since the end of February, the spread of the COVID-19 epidemic had a strongly negative impact on economic activity: in the first quarter of 2020 Italy's GDP fell by 5.3 per cent. In the last three columns, for robustness, we anticipate the start of the post period to February 2020 since in the north of Italy the locked down in some municipalities started already toward the end of this month and the FTSE MIB started to fall from the 19th of February 2020. All bank variables are fixed in the last available quarter before the shock (December 2019). In columns 3 and 6 we fix the yield of the security in the last month before the shock (January 2020). We double-cluster the standard errors at bank and security level but results are similar if we add the third dimension of time.

Consistently with rest of the results in the paper, we find that also after this shock, despite its different nature, more fragile banks take less risk relatively to better capitalized ones. The coefficient of the triple interaction *Capital*Risk*Post COVID-19* is positive and statistically significant across all the specifications.

TABLE 12 HERE

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4. Conclusions

In this paper we analyzed the question whether banks start to gamble when they are closer to distress or become more cautious.

Analyzing the European sovereign crisis, several papers (Acharya and Steffen, 2015; Drechsler, Drechsel, Marquez-Ibanez and Schnabl, 2016; Altavilla, Pagano and Simonelli, 2017) argue that in distressed countries there was risk shifting in security trading since they show that more fragile banks purchased larger quantity of sovereign debt. Moreover, regulators since the Global Financial Crisis have been eager to intervene. In the US the Volcker Rule, contained in the Dodd–Frank Wall Street Reform and Consumer Protection Act, specifically prohibits banks from engaging in proprietary trading (although a number of exceptions to this ban are included). In the UK the Vickers' report and in the European Union the Likaanen Report suggested that market-based activities should be segregated in firewalled subsidiaries. Moreover, European

banking regulators have been considering introducing limits on bank securities trading, specifically in the area of the purchases of sovereign bonds.

However, in the absence of comprehensive micro data at the security level on banks' trading activities it has proved difficult to bring robust evidence on these issues. Thanks to the ISIN-bank-month supervisory data, that allows a stronger identification and a more complete analysis, our evidence suggests the opposite results: in response to financial market stress, less capitalized banks take less risk in their portfolios.

Results are confirmed if we consider different sources of balance sheet fragility and different measures of risk-taking and are stronger in times of high economic policy uncertainty. One could be concerned that banks cannot risk-shift because they are subject to regulation and supervision. Again, analyzing security trading provides a unique setting where, thanks to the high granularity of our proprietary dataset, we are able to explicitly exclude the role of capital regulation. Moreover, three separate tests, based on different accounting portfolios, the distribution of capital and franchise value, suggest also that bank own incentives, instead of supervision, are the main drivers behind the observed behavior. Finally, our findings are similar if we analyse bank behavior around the recent COVID-19 shock.

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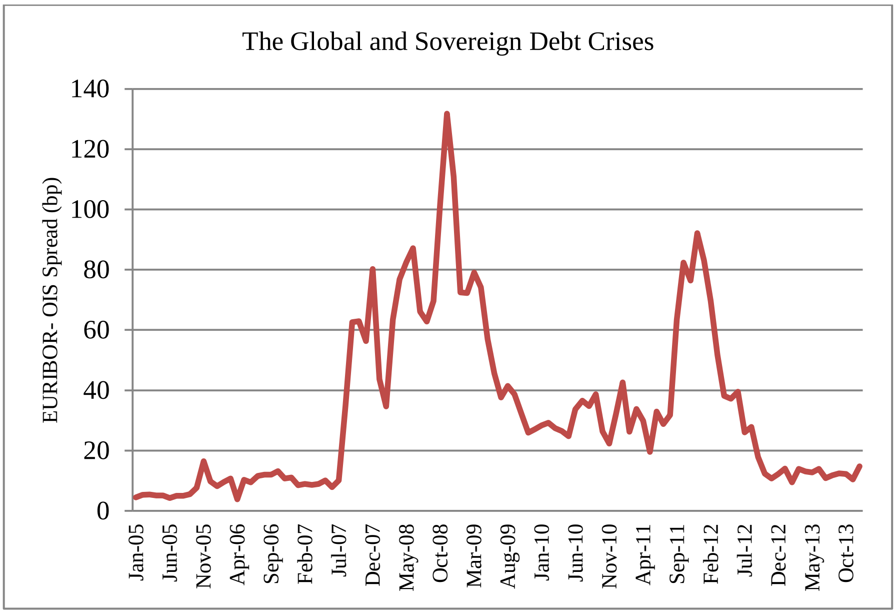
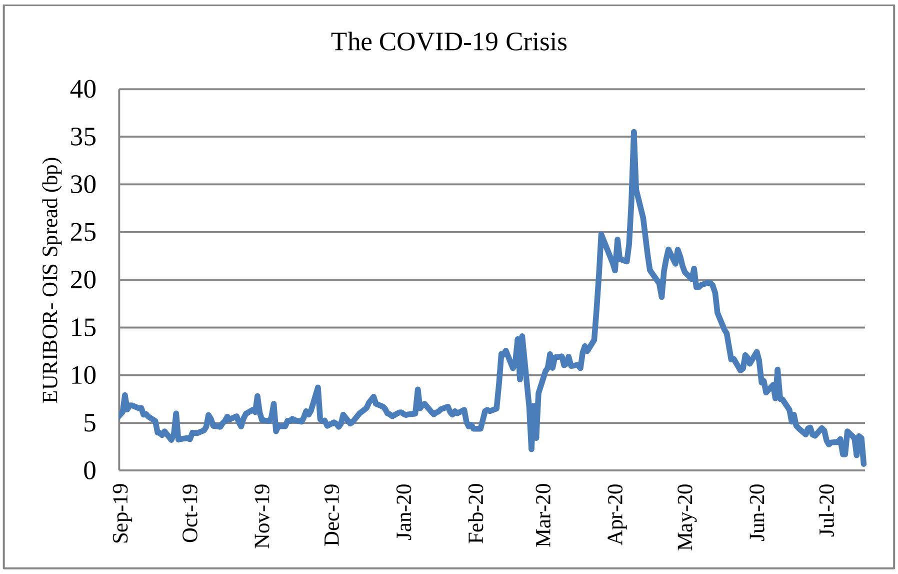
Figure 1: The Evolution of the Euribor-Ois Spread



(a)



(b)

The Figure a reports the time series of the 3 months Euribor-Ois spread from January 2005 to December 2013 at a monthly frequency. The Figure b reports the time series of the 3 months Euribor-Ois spread from September 2019 to July 2020 at a daily frequency. This is the difference between the rate at which European banks lend to each other (EURIBOR) and the overnight indexed swap (OIS) rate on the overnight rate (EONIA) among the same banks for a 3 month period.

Table 1: Descriptive Statistics

Variables	Mean	St.Dev.	Median	p25	p75	Obs.
Net Buys	5.028	82.171	0.007	-1.415	2.768	304830
Δ Log (Holdings)	21.491	284.476	0.007	-1.417	2.765	304830
Capital	2.477	1.545	2.221	1.485	2.951	304568
Leverage	7.805	1.990	7.691	6.634	8.725	304830
Net Worth	8.186	2.095	8.102	7.019	9.149	303889
Tier 1	8.997	3.045	8.150	7.174	9.875	304568
Precrisis Capital	2.662	1.985	2.056	1.786	2.541	290498
Size	10.221	1.936	10.160	8.478	11.823	304830
Interbank	9.290	9.683	6.836	3.376	11.784	304830
Liquidity	9.819	7.183	8.182	5.039	11.876	304830
Bad Loans	3.143	1.934	3.004	1.640	4.477	304830
Lerner Index	0.439	0.116	0.462	0.344	0.507	250830
Yield	2.140	1.918	1.739	0.721	3.157	304830
Yield (Italian Government)	1.668	1.706	0.975	0.302	2.768	132168
Yield (non Italian Goverment)	2.502	1.991	2.061	1.216	3.358	172662
Rating	701.599	38.922	710 (A+)	670 (BBB)	730 (AA)	232475
Rating=AAA	0.065	0.247	0	0	0	232475
Rating>A	0.706	0.455	1	0	1	232475
Concentration Risk by Issuer	4451.438	2662.879	3802.606	2253.402	6332.314	6423
Concentration Risk by Type of Instrument	5375.765	2243.051	4998.104	3563.036	6960.814	6423
Share of Italian Government Bonds	49.930	30.820	50.770	22.780	76.410	6366
Δ Euribor-Ois Spread	-0.002	0.102	-0.002	-0.045	0.023	304830
Δ European CDS Index	0.206	16.747	-1.350	-7.780	8.490	285431
Δ Euro Area Syst. Stress Index	-0.002	0.092	-0.002	-0.051	0.041	304830
Δ Euro Area Syst. Stress Index, Bond	0.000	0.018	-0.003	-0.010	0.009	304830
Δ Euro Area Syst. Stress Index, Money	0.000	0.017	-0.002	-0.008	0.011	304830
Eonia	1.198	1.292	0.593	0.344	2.067	304830
Δ Unemployment	0.058	0.214	0.000	-0.100	0.200	304830
Δ CPI	0.167	0.203	0.200	0.000	0.300	304830

The table shows descriptive statistics of the main variables employed in our analysis. The definitions of the variables are reported in Table A1 in the Appendix.

Table 2: Main Results

Dependent Variable:	Net Buys $_{s,b,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Capital*Risk*Market Stress	1.443***	1.378***	1.462***	2.097***	1.480***	1.421***
	(0.430)	(0.388)	(0.399)	(0.564)	(0.551)	(0.514)
Capital*Risk	0.090	0.077	0.073	0.038	0.053	0.069
	(0.059)	(0.059)	(0.047)	(0.069)	(0.064)	(0.066)
Market Stress*Risk	0.265	-0.078	-1.104	3.733		
	(1.326)	(1.044)	(1.130)	(2.328)		
Capital*Market Stress	0.950	1.020	0.698	-0.142	1.251	1.761*
	(0.685)	(0.754)	(0.659)	(1.012)	(0.764)	(1.024)
Market Stress	-1.846	-1.225				
	(3.276)	(3.307)				
Macro Controls	Yes	Yes	-	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Security Fixed Effects	No	Yes	No	No	-	-
Time Fixed Effects	No	No	Yes	-	-	-
Rating*Maturity*Time Fixed Effects	No	No	No	Yes	-	-
Security*Time Fixed Effects	No	No	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	No	No	Yes
Observations	304568	304568	304568	232162	304568	304568

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Robustness: TBTF, Pre-crisis Capital, WLS and Rating

Dependent Variable:	Net Buys $_{s,b,t}$			
	No top 3 banks	Capital Pre-crisis	WLS	
	(1)	(2)	(3)	(4)
Capital*Risk*Market Stress	1.198*	1.157*	0.860*	
	(0.689)	(0.621)	(0.478)	
Capital*Risk	0.099	0.018	-0.047	
	(0.073)	(94.857)	(0.101)	
Capital*Market Stress	1.872	0.427	0.837	1.341
	(1.154)	(0.764)	(0.926)	(1.389)
Capital*Rating*Market Stress				-57.400*
				(30.073)
Capital*Rating				0.563
				(1.511)
Bank Controls	Yes	Yes	Yes	Yes
Security*Time Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
Observations	235181	290074	304568	232315

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. In column 1 we exclude observations from the three largest Italian banks. In column 2 we fix capital at a pre-crisis level (we take an average of capital between 2005 and the summer of 2007). In column 3 we report Weighted Least Squares Estimates (the weight is the level of the holdings of each security at the beginning of the month by each bank). In column 4 we use rating instead of yield as a measure of riskiness of the security (higher rating means lower risk). The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes") or not included ("No"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Alternative Proxies for Market Stress

Dependent Variable:	Net Buys $_{s,b,t}$						
	Δ European CDS Index	Δ Euro Area Systemic Stress Index	Δ Euro Area Systemic Stress Index, Bond Market	Δ Euro Area Systemic Stress Index, Money Market	Dummy for high Δ Euribor-Ois Spread	Dummy for Sovereign Crisis	Post Lehman Shock–Restricted Sample
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Capital*Risk*Market Stress	0.003*	1.148*	6.211***	5.763**	0.382**	0.356**	1.136**
	(0.002)	(0.686)	(2.295)	(2.388)	(0.168)	(0.161)	(0.434)
Capital*Risk	0.057	0.089	0.087	0.087	0.012	-0.011	-0.735**
	(0.076)	(0.077)	(0.076)	(0.075)	(0.070)	(0.072)	(0.330)
Capital*Market Stress	-0.004	-1.086	-7.481	-5.880	-0.114	-0.704**	0.366
	(0.010)	(1.556)	(8.461)	(6.294)	(0.449)	(0.302)	(0.968)
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	-
Security*Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	285169	304568	304568	304568	304568	304568	8565

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. The variable Risk is the yield of the security. In column 1 the variable Market Stress is the monthly change in the European Markit iTraxx Credit Default Swap Index (5 years). In column 2 the variable Market Stress is the monthly change in the Euro Area Systemic Stress Index (ECB's CISS). In column 3 the variable Market Stress is the monthly change in the Euro Area Systemic Stress Index (ECB's CISS), subindice Bond Market. In column 4 the variable Market Stress is the monthly change in the Euro Area Systemic Stress Index (ECB's CISS), subindice Money Market. In column 5 the variable Market Stress is a dummy equal to 1 if the monthly change in the Euribor-Ois spread is larger or equal to the 90^{th} percentile and 0 otherwise. In column 6 the variable Market Stress is a dummy equal to 1 in the months between June 2011 and December 2012 and 0 otherwise. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. In column 7 we restrict the sample to the six months around the failure of Lehman Brothers (September, 15th 2008). Variable Market Stress is a dummy equal to 1 in the months after the Lehman shock. The definitions of the variables are reported in Table A1 in the Appendix. In the first 6 columns the sample period starts in January 2005 and ends in December 2013. In column 1 the sample is from September 2005 to December 2013 due to availability of the index. Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses (in the last column standard errors are double-clustered at bank and security level). *** p<0.01, ** p<0.05, * p<0.1

Table 5: High and Low Economic Policy Uncertainty

Dependent Variable:	Net Buys $_{s,b,t}$							
	High Economic Policy Uncertainty				Low Economic Policy Uncertainty			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital*Risk*Market Stress	1.557**	1.483**	0.503***	0.472**	1.254	0.860	-0.716	-0.635
	(0.660)	(0.619)	(0.158)	(0.178)	(1.441)	(1.405)	(0.627)	(0.621)
Capital*Risk	0.0986	0.150	-0.005	0.056	0.113	0.0562	0.100	0.050
	(0.0738)	(0.102)	(0.041)	(0.082)	(0.0960)	(0.0824)	(0.105)	(0.087)
Capital*Market Stress	1.258***	1.122	-0.229	-0.329	1.169	1.734	-1.688*	-1.177
	(0.427)	(0.863)	(0.453)	(0.530)	(2.298)	(2.413)	(0.915)	(0.909)
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Security*Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	153595	153595	153595	153595	148728	148728	148728	148728

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. In this table we split the sample between months when the Economic Policy Uncertainty Index is larger than the median (columns 1-4) and below the median (columns 5-8). The variable Risk is the yield of the security. The variable Market Stress is: a) the monthly change in the Euribor-Ois spread in columns 1, 2, 5 and 6, b) a dummy equal to 1 if the monthly change in the Euribor-Ois spread is larger or equal to the 90th percentile and 0 otherwise in columns 3, 4, 7 and 8. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 6: The Role of Interbank Exposure

Dependent Variable:	Net Buys $_{s,b,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Capital*Risk*Market Stress	1.444***	1.374***	1.485***	2.123***	1.474***	1.401***
	(0.431)	(0.394)	(0.382)	(0.549)	(0.554)	(0.525)
Interbank*Risk*Market Stress	-0.010	-0.009	0.015	0.028	-0.007	-0.020
	(0.122)	(0.114)	(0.111)	(0.140)	(0.109)	(0.115)
Capital*Risk	0.074	0.065	0.058	0.028	0.046	0.059
	(0.053)	(0.062)	(0.044)	(0.073)	(0.060)	(0.059)
Interbank*Risk	-0.027***	-0.022**	-0.024***	-0.023*	-0.014	-0.017
	(0.006)	(0.010)	(0.008)	(0.012)	(0.010)	(0.013)
Capital*Market Stress	0.789	0.848	0.564	-0.197	1.208	1.772
	(0.666)	(0.744)	(0.728)	(1.083)	(0.859)	(1.091)
Interbank*Market Stress	-0.217	-0.225	-0.197	-0.095	-0.068	-0.007
	(0.139)	(0.139)	(0.153)	(0.194)	(0.190)	(0.177)
Macro Controls	Yes	Yes	-	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Security Fixed Effects	No	Yes	No	No	-	-
Time Fixed Effects	No	No	Yes	Yes	-	-
Rating*Maturity*Time Fixed Effects	No	No	No	Yes	-	-
Security*Time Fixed Effects	No	No	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	No	No	Yes
Observations	304568	304568	304568	232162	304568	304568

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Regulation? Further Evidence from Subsamples of Different Securities

Dependent Variable:	Net Buys $_{s,b,t}$							
	Italian Government Bonds				Rest of the Securities			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital*Risk*Market Stress	1.908*	1.805*	2.003*	2.048*	1.037***	1.011***	0.911*	0.903*
	(1.103)	(1.003)	(1.172)	(1.189)	(0.333)	(0.343)	(0.476)	(0.485)
Interbank*Risk*Market Stress	-0.266***	-0.253***	-0.274***	-0.262***	0.161	0.197	0.193	0.167
	(0.102)	(0.084)	(0.095)	(0.093)	(0.190)	(0.195)	(0.206)	(0.214)
Capital*Risk	0.091	0.059	0.012	-0.006	0.090	0.097	0.100*	0.093
	(0.109)	(0.099)	(0.116)	(0.127)	(0.094)	(0.067)	(0.058)	(0.067)
Interbank*Risk	-0.058***	-0.054***	-0.045***	-0.068***	-0.010	-0.009	0.003	0.002
	(0.023)	(0.016)	(0.016)	(0.017)	(0.013)	(0.012)	(0.013)	(0.014)
Capital*Market Stress	0.982	0.902	1.829	2.597	1.496	1.226	1.597	1.883
	(2.174)	(2.359)	(2.278)	(2.481)	(0.921)	(0.755)	(1.539)	(1.511)
Interbank*Market Stress	-0.071	-0.013	0.027	0.140	-0.519*	-0.526*	-0.412	-0.361
	(0.266)	(0.256)	(0.280)	(0.302)	(0.314)	(0.312)	(0.382)	(0.384)
Macro Controls	Yes	-	-	-	Yes	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	Yes	-	-	No	Yes	-	-
Security*Time Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	Yes	No	No	No	Yes
Observations	131951	131951	131951	131951	172617	172617	172617	172616

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. In this table we split the sample between Italian Government bonds (columns 1-4) and rest of the securities (columns 5-8). The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8: Supervision or Economic Forces? Evidence from Different Accounting Portfolios

Dependent Variable:	Net Buys $_{s,b,t}$							
	Trading book and Available for Sale				Held To Maturity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital*Risk*Market Stress	1.317***	1.409***	1.471**	1.383**	-0.524	-0.416	-1.286	-0.411
	(0.469)	(0.441)	(0.677)	(0.691)	(1.224)	(1.333)	(2.148)	(1.820)
Interbank*Risk*Market Stress	0.108	0.131	0.088	0.061	-0.051	-0.006	-0.018	-0.013
	(0.159)	(0.173)	(0.165)	(0.173)	(0.151)	(0.153)	(0.126)	(0.132)
Capital*Risk	0.048	0.040	0.054	0.081	-0.026	0.020	-0.195	-0.312
	(0.059)	(0.056)	(0.077)	(0.065)	(0.177)	(0.122)	(0.201)	(0.198)
Interbank*Risk	-0.038***	-0.036***	-0.022**	-0.020	-0.020	-0.029**	-0.004	-0.004
	(0.005)	(0.009)	(0.010)	(0.015)	(0.014)	(0.014)	(0.019)	(0.020)
Capital*Market Stress	1.664*	1.347*	1.634*	1.953*	-5.083	-5.735	-4.653	-6.516*
	(0.920)	(0.737)	(0.828)	(1.078)	(3.457)	(4.078)	(4.091)	(3.370)
Interbank*Market Stress	-0.297	-0.271	-0.093	-0.010	-0.038	-0.164	-0.331	-0.389
	(0.289)	(0.283)	(0.304)	(0.309)	(0.132)	(0.197)	(0.465)	(0.512)
Macro Controls	Yes	-	-	-	Yes	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	Yes	-	-	No	Yes	-	-
Security*Time Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	Yes	No	No	No	Yes
Observations	208795	208795	207619	207619	14558	14558	7913	7910

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. In this table we split the sample between the Trading Book and Available for Sale portfolios (columns 1-4) and Held To Maturity portfolio (columns 5-8). The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Supervision or Economic Forces? Evidence from the Distribution of Capital

Dependent Variable:	Net Buys $_{s,b,t}$							
	Subsample of Relatively Better Capitalized Banks				Full Sample with Quintiles of Capital			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital*Risk*Market Stress	1.980**	2.221**	2.842**	2.679**				
	(0.904)	(0.951)	(1.252)	(1.257)				
Capital Quintile 1*Risk*Market Stress					-7.094***	-7.190***	-6.673***	-6.708***
					(1.751)	(2.074)	(2.395)	(2.417)
Capital Quintile 2*Risk*Market Stress					1.475	1.432	2.016	2.539
					(2.333)	(2.230)	(2.497)	(2.514)
Capital Quintile 3*Risk*Market Stress					0.258	0.335	1.407	1.353
					(2.564)	(2.418)	(2.549)	(2.516)
Capital Quintile 4*Risk*Market Stress					-4.993***	-5.173**	-5.352***	-5.243**
					(1.838)	(2.160)	(1.906)	(2.023)
Interbank*Risk*Market Stress	-0.045	-0.023	0.022	0.050	-0.009	0.013	-0.017	-0.024
	(0.171)	(0.146)	(0.173)	(0.170)	(0.131)	(0.103)	(0.093)	(0.096)
All the Double Interactions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls	Yes	-	-	-	Yes	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	Yes	-	-	No	Yes	-	-
Security*Time Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	Yes	No	No	No	Yes
Observations	152173	152173	144683	144683	304568	304568	304568	304568

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. In the first four columns we restrict the sample to observations where capital is larger than the median. In the last four columns we analyze the full sample but we substitute the continuous variable Capital with the dummies for each quintile (the omitted category is the fifth quintile which corresponds to the best capitalized banks. The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 10: Supervision or Economic Forces? Evidence from the Franchise Value

Dependent Variable:	Net Buys $_{s,b,t}$							
	Subsample with High Franchise Value				Subsample with Low Franchise Value			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital*Risk*Market Stress	2.597***	2.579***	2.818***	2.625***	-0.435	-0.339	-0.340	-0.201
	(0.449)	(0.509)	(1.008)	(0.939)	(0.971)	(0.943)	(0.954)	(1.035)
Interbank*Risk*Market Stress	0.023	0.055	0.039	0.029	0.065	0.101	0.157	0.146
	(0.170)	(0.145)	(0.145)	(0.150)	(0.208)	(0.149)	(0.133)	(0.128)
Capital*Risk	0.112	0.084	0.036	0.122	0.327***	0.311***	0.252**	0.158
	(0.084)	(0.074)	(0.098)	(0.093)	(0.117)	(0.106)	(0.121)	(0.119)
Interbank*Risk	-0.020***	-0.017***	-0.008	-0.008*	-0.015	-0.016	0.001	-0.000
	(0.005)	(0.003)	(0.006)	(0.004)	(0.033)	(0.017)	(0.018)	(0.019)
Capital*Market Stress	0.218	0.124	1.399	1.562	1.837	1.302	0.198	0.821
	(0.721)	(1.153)	(1.039)	(1.336)	(2.191)	(2.129)	(1.773)	(2.017)
Interbank*Market Stress	-0.313	-0.339*	-0.343**	-0.312*	-0.341	-0.336	-0.139	-0.125
	(0.262)	(0.175)	(0.161)	(0.175)	(0.295)	(0.283)	(0.322)	(0.359)
Macro Controls	Yes	-	-	-	Yes	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	Yes	-	-	No	Yes	-	-
Security*Time Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	Yes	No	No	No	Yes
Observations	129533	129533	122332	122332	121178	121178	110942	110942

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. In this table we split the sample between observations where the Lerner Index is larger than the median (columns 1-4) and observations where the Lerner index is smaller than the median (columns 5-8). The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 11: Concentration Risks: Bank Level Analysis

Dependent Variable:	Concentration Risk$_{b,t}$											
	Share of Italian Government				HHI Issuers				HHI Type of Instruments			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Capital* Market Stress	-1.039	-1.159	-1.097	-1.224	89.698	58.245	87.688	54.712	165.661*	130.163	153.258*	117.350
	(0.869)	(0.813)	(0.918)	(0.864)	(87.471)	(88.219)	(87.860)	(88.639)	(89.312)	(89.808)	(85.349)	(85.316)
Interbank* Market Stress			-0.097	-0.110			-3.352	-6.024*			-20.687*	-21.846***
			(0.125)	(100.505)			(8.129)	(3.509)			(11.321)	(1.151)
Capital	0.433	0.807	0.438	0.813	25.796	101.770***	25.972	102.114	22.260	80.763***	23.345	82.009
	(0.701)	(0.773)	(0.703)	(0.775)	(57.729)	(21.347)	(57.793)	(67.397)	(52.326)	(18.425)	(52.480)	(50.803)
Interbank	-0.064	-0.097	-0.063	-0.096	4.555	3.328	4.568	3.352	9.257	6.948	9.333	7.034
	(0.220)	(0.219)	(0.221)	(0.220)	(16.352)	(17.005)	(16.359)	(17.008)	(13.472)	(15.596)	(13.466)	(14.043)
Macro Controls	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6378	6366	6378	6366	6435	6423	6435	6423	6435	6423	6435	6423

The table shows regressions of Concentration Risks (proxied by the Share of Italian Government in columns 1-4, the HHI index of holdings by issuers in columns 5-8, and the HHI index of holdings by types of instrument in columns 9-12) by bank b at time *t*, as a function of a set of macroeconomic, and bank variables at time t-1 The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are double-clustered at bank and month level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 12: Evidence from the Recent COVIDCOVID-19 Shock

Dependent Variable:	Net Buys $_{s,b,t}$					
	Post COVID-19 Starting in March 2020			Post COVID-19 Starting in February 2020		
	(1)	(2)	(3)	(4)	(5)	(6)
Capital*Risk*Post COVID-19	0.810**	0.775**	0.883**	0.944**	0.985**	0.854**
	(0.395)	(0.388)	(0.378)	(0.377)	(0.378)	(0.418)
Capital*Risk	-0.135	-0.141	-0.132	-0.451	-0.526	-0.244
	(0.425)	(0.428)	(0.398)	(0.387)	(0.403)	(0.341)
Capital*Post COVID-19	0.307	0.311	0.335	0.606	0.655*	0.753
	(0.431)	(0.431)	(0.424)	(0.375)	(0.382)	(0.510)
Interbank*Risk*Post COVID-19		0.099	0.105		-0.182	-0.101
		(0.107)	(0.107)		(0.136)	(0.140)
Interbank*Risk		0.072	0.050		0.307**	0.165
		(0.157)	(0.157)		(0.124)	(0.126)
Interbank*Post COVID-19		-0.038	-0.011		-0.233	-0.183
		(0.159)	(0.166)		(0.146)	(0.184)
Security*Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24682	24682	23491	24467	24467	23332

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. The variable Risk is the yield of the security. The variable Post COVID-19 is equal to 1 for the months starting in March 2020 in the first three columns and starting in February 2020 in the last three columns and 0 otherwise. The sample includes in the first the three columns the months from September 2019 to August 2020, in the last three columns the months from August 2019 to July 2020. All bank variables are fixed in the last available quarter before the shock (December 2019). In columns 3 and 6 we fix the yield of the security in the last month before the shock (January 2020). The definitions of the variables are reported in Table A1 in the Appendix. Standard errors are double-clustered at bank and security level. *** p<0.01, ** p<0.05, * p<0.1

APPENDIX

Table A1: Description of Variables

Variable	*Description*	*Source*
Security Holdings		
Net Buys	Net buys of security *s*, by bank *b* during the month *t*. This growth rate is symmetric around 0 and it lays in the closed interval [-200,200] with final sales (initial purchases) corresponding to the left (right) endpoint (Davis and Haltiwanger, 1992)	Security Register
Δ Log (Holdings)	The difference between the logarithm of (holdings of security *s*, by bank *b* at time *t)* and the logarithm of (holdings of security *s*, by bank *b* at time *t-1).* When the holdings are equal to zero we set the logarithm of holdings equal to zero	Security Register
Security Characteristics		
Yield	Yield to redemption ("RY" in Datastream) minus the overnight interest rate for the EURO area (EONIA), in percentage	Datastream
Ratings	Ratings issued by Moody's	Factset
Italian	Dummy equal to 1 if the nationality of the issuer is Italian	Factset
Bank Characteristics		
Capital	Capital (shares subscribed, book value of equity plus retained earnings) in excess of the regulatory minimum divided by total assets, in percentage	Supervisory Reports
Leverage Ratio	Equity (shares subscribed, book value of equity plus retained earnings) divided by total assets, in percentage	Supervisory Reports
Net Worth	Leverage ratio plus ROA, in percentage	Supervisory Reports
Tier 1 Ratio	Equity (shares subscribed, book value of equity plus retained earnings) divided by risk-weighted assets, in percentage	Supervisory Reports
Precrisis Capital	Average of Excess Capital between January 2005 and June 2007, in percentage	
Interbank	Ratio of total borrowing from other banks to total assets, inclusive of deposits and repos from other banks, exclusive of deposits from the ECB or other national central banks, in percentage	Supervisory Reports
Liquidity	Sum of cash holdings and sovereign bonds divided by total assets, in percentage	Supervisory Reports
Size	Logarithm of total assets	Supervisory Reports
Bad Loans/Total Assets	Percentage of bad loans out of total bank assets, in percentage	Supervisory Reports
Share of Italian Government	Amount of Italian government bonds, divided by total securities	
HHI Issuers	HHI index of holdings by issuers	Security Register
HHI Type of Instruments	HHI index of holdings by type of instruments (mutual funds, abs, shares of Italian financial companies, shares of foreign financial companies, shares of Italian non financial companies, shares of foreign non financial companies, bonds of foreign financial companies, bonds of Italian financial companies, bonds of foreign non financial companies, bonds of Italian non financial companies, Italian government bonds, foreign government bonds)	Security Register
Market Stress Variables		
Δ Euribor-OIS Spread	Monthly change in the three months Euribor-OIS Spread	Bank of Italy
Dummy for Sovereign Crisis	This variable takes the value of one for the months between June 2011 and December 2012 and 0 otherwise	
Δ European CDS Index	Monthly change in the European Markit iTraxx Credit Default Swap Index (5 years)	EIKON Thomson Reuters
Δ Euro Area Systemic Stress Index	Monthly change in the Euro Area Composite Indicator of Systemic Stress (CISS)	ECB
Δ Euro Area Systemic Stress Index, Bond Market	Monthly change in the Euro Area Composite Indicator of Systemic Stress (CISS), subindice Bond Market	ECB
Δ Euro Area Systemic Stress Index, Money Market	Monthly change in the Euro Area Composite Indicator of Systemic Stress (CISS), subindice Money Market	ECB
Macro Variables		
Δ CPI	Monthly change in the Italian Consumer Price Index	Bank of Italy
Δ Unemployment	Monthly change in the Italian unemployment rate	Bank of Italy
Eonia	Overnight interest rate for the EURO area	Bank of Italy
LTRO Dummy	Dummy equal to 1 in the months of November 2011 and February 2012	

The table describes the main dependent and control variables we use in the paper.

Table A2: Further Controls

Dependent Variable:	Net Buys $_{s,b,t}$			
	(1)	(2)	(3)	(4)
Capital*Risk*Market Stress	1.423***	1.116**	1.450***	1.532***
	(0.512)	(0.534)	(0.550)	(0.523)
Capital*Risk	0.069	0.050	0.064	0.138
	(0.067)	(0.078)	(0.075)	(0.101)
Capital*Market Stress	1.751*	2.866**	1.636	1.746
	(1.013)	(1.124)	(0.988)	(1.131)
Size*Risk*Market Stress		-1.062*		
		(0.625)		
Capital*Risk*LTRO			0.428**	
			(0.193)	
Capital*Risk*EONIA				-0.080
				(0.072)
Bank Controls	Yes	Yes	Yes	Yes
Security*Time Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
Control for the Existing Portfolio	Yes	No	No	No
Observations	304568	304568	304568	304568

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. In column 1 we include additional controls for the existing portfolio of each bank at the beginning of each month, by including the shares of the bank portfolios invested in different type of securities according to the issuer: Italian government, foreign governments, Italian banks, foreign banks, Italian non-financial corporations, foreign non-financial corporations. In column 2 we add the triple (and double) interactions between Size, Yield and Market Stress. In column 3 we add the triple (and double) interactions between Capital, Yield and LTRO. In column 4 we add the triple (and double) interactions between Capital, Yield and EONIA. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes") or not included ("No"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A3: Alternative Dependent Variable: Change in Log (Holdings)

Dependent Variable:	Δ Log (Holdings)$_{s,b,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Capital*Risk*Market Stress	5.925**	5.469**	6.050***	7.645**	6.154**	5.686**
	(2.379)	(2.127)	(2.072)	(2.977)	(2.575)	(2.444)
Capital*Risk	0.352	0.256	0.287	0.204	0.192	0.182
	(0.270)	(0.331)	(0.280)	(0.314)	(0.290)	(0.292)
Market Stress*Risk	0.578	-1.400	-3.022	13.177*		
	(5.887)	(4.479)	(2.741)	(7.828)		
Capital*Market Stress	1.347	1.833	0.834	-0.062	3.142	5.331
	(2.903)	(3.289)	(3.516)	(4.469)	(3.615)	(4.551)
Market Stress	-0.778	2.904				
	(11.997)	(11.781)				
Macro Controls	Yes	Yes	-	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Security Fixed Effects	No	Yes	No	No	-	-
Time Fixed Effects	No	No	Yes	-	-	-
Rating*Maturity*Time Fixed Effects	No	No	No	Yes	-	-
Security*Time Fixed Effects	No	No	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	No	No	Yes
Observations	304568	304568	304568	232162	304568	304568

The table shows regressions of changes in Log (holdings) of security *s* by bank *b* between *t* and *t-1* as a function of a set of security, macro and bank variables at time t-1. The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A4: Alternative Definitions of Capital

Dependent Variable:	Net Buys $_{s,b,t}$		
	Leverage Ratio	Net Worth	Tier 1 Ratio
	(1)	(2)	(3)
Capital*Risk*Market Stress	1.320***	1.621***	0.530***
	(0.456)	(0.585)	(0.129)
Bank Controls	Yes	Yes	Yes
Security*Time Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Observations	304830	303866	304568

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. In column 1 the variable Capital is the Leverage Ratio. In column 2 the variable Capital is the Net Worth. In column 3 the variable Capital is the Tier 1 Ratio. The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A5: Additional Fixed Effects

Dependent Variable:	Net Buys $_{s,b,t}$		
	(1)	(2)	(3)
Capital*Risk*Market Stress	1.158**	1.155***	0.822**
	(0.521)	(0.392)	(0.337)
Bank Controls	Yes	Yes	Yes
Security*Time Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Bank*Time Fixed Effects	Yes	No	Yes
Security*Bank Fixed Effects	No	Yes	Yes
Observations	304536	301627	301601

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. The variable Risk is the yield of the security. The variable Market Stress is the monthly change in the Euribor-Ois spread. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes") or not included ("No"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table A6: Concentration Risks: Dummies of Italian issuers

Dependent Variable:	Net Buys $_{s,b,t}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital*Italian*Market Stress	-2.005	-2.261	-1.523	-0.870	1.773	1.497	-0.593	-0.209
	(2.543)	(2.517)	(2.925)	(2.989)	(3.290)	(3.276)	(2.821)	(2.849)
Interbank*Italian*Market Stress	0.362	0.321	0.307	0.354	0.418	0.434	-0.091	-0.097
	(0.452)	(0.444)	(0.505)	(0.499)	(0.628)	(0.607)	(0.638)	(0.631)
Capital*Italian	0.477	0.504	0.590*	0.553*	0.883	0.972	0.893**	1.120***
	(0.366)	(0.337)	(0.327)	(0.282)	(1.000)	(1.020)	(0.369)	(0.412)
Interbank*Italian	0.033	0.026	0.043	-0.045	-0.183	-0.176	-0.038	-0.059
	(0.062)	(0.059)	(0.054)	(0.070)	(0.277)	(0.271)	(0.065)	(0.067)
Capital*Market Stress	2.254**	2.074**	2.322*	2.546*	-0.440	-0.289	2.104	1.631
	(0.907)	(0.957)	(1.343)	(1.383)	(2.104)	(2.066)	(2.275)	(2.306)
Interbank*Market Stress	-0.357	-0.296	-0.209	-0.173	-0.425	-0.413	0.142	0.164
	(0.218)	(0.225)	(0.239)	(0.224)	(0.489)	(0.477)	(0.522)	(0.521)
Macro Controls	Yes	-	-	-	Yes	-	-	-
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	Yes	-	-	No	Yes	-	-
Security*Time Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes
Bank Fixed Effects	No	No	No	Yes	No	No	No	Yes
Observations	304568	304568	304568	304568	304568	304568	304568	304568

The table shows regressions of net buys of security *s* by bank *b* at time *t*, as a function of a set of security, macro and bank variables at time t-1. In the first four columns the Italian dummy is equal to 1 if the issuer of the security is the Italian government and 0 otherwise. In the last four columns the Italian dummy is equal to 1 if the nationality of the issuer of the security is Italian (either corporate or government) and 0 otherwise. The variable Market Stress is the monthly change in the Euribor-Ois spread. Macro controls include changes in Italian unemployment and consumer price index. Bank controls include capital, interbank, liquidity, bad loans/total assets and size. The definitions of the variables are reported in Table A1 in the Appendix. The sample period starts in January 2005 and ends in December 2013. Fixed effects are either included ("Yes"), not included ("No") or spanned by another set of effects ("-"). Standard errors are triple-clustered at bank, security and time level, and are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1