STRESSED BANKS?
EVIDENCE FROM THE LARGEST-EVER SUPERVISORY REVIEW*

PURIYA ABBASSI **RAJKAMAL IYER** **JOSÉ-LUIS PEYDRÓ** **PAUL E. SOTO**

ABSTRACT

We study short-term and medium-term changes in bank risk-taking as a result of supervision, and the associated real effects. For identification, we exploit the European Central Bank's asset-quality-review (AQR) in conjunction with security and credit registers. After the AQR announcement, reviewed banks reduce riskier securities and credit supply, with the greatest effect on riskiest securities. We find negative spillovers on asset prices and firm-level credit availability. Moreover, non-banks with higher exposure to reviewed banks acquire the shed risk. After the AQR compliance, reviewed banks reload riskier securities but not riskier credit, resulting in negative medium-term firm-level real effects. These effects are especially strong for firms with high ex-ante credit risk. Among these non-safe firms, even those with high ex-ante productivity experience negative real effects. Our findings suggest that banks' liquid assets help them to mask risk from supervisors and risk adjustments banks make in response to supervision have persistent corporate real effects.

JEL CLASSIFICATION : E58 ; G21 ; G28 ; H63 ; L51.

KEYWORDS: Corporate real effects from bank credit; Asset quality review; Stress tests; Supervision; Risk-masking; Costs of safe assets.

* This version is from January 2023. Puriya Abbassi: Deutsche Bundesbank, Frankfurt am Main, Germany, puriya.abbassi@bundesbank.de; Rajkamal Iyer: Imperial College London, United Kingdom; riyer@ic.ac.uk; José-Luis Peydró (corresponding author): Imperial College London, ICREA-Universitat Pompeu Fabra-CREI-BSE, CEPR, jose.peydro@gmail.com; Paul E. Soto: Federal Reserve Board, Washington D.C., USA, paul.e.soto@frb.gov. We are thankful for comments and suggestions from Elena Carletti, Jean Edouard Colliard, Bob DeYoung, Xavier Freixas, Nicola Gennaioli, Itay Goldstein, Anna Kovner (discussant), Ross Levine, Francesco Manaresi, Christoph Memmel, Steven Ongena, Marco Pagano, Michael Papageorgiou, Manju Puri, José Scheinkman, Javier Suarez, Jeremy Stein (discussant), Raghuram Rajan, Hélène Rey, Antoinette Schoar, Alexander Schulz, Andrei Shleifer, Amir Sufi, Ernst-Ludwig von Thadden, and Benjamin Weigert, and especially Victoria Ivashina (the editor), an anonymous Associate Editor and two referees, and to seminar participants at French Supervisory Authority ACPR, Banque de France, Bundesbank, Bank of Portugal, the European Systemic Risk Board, CSEF-IGIER Bocconi Symposium on Economics and Institutions, AEFIN Foro de Finanzas, NBER Summer Institute (Corporate Finance; and Risk of Financial Institutions groups), the FDIC/JFSR Bank Research Conference, INSEAD, Barcelona GSE Summer Forum, and UPF. Peydró acknowledges financial support from a 2018 Leonardo Grant for Researchers and Cultural Creators, BBVA Foundation; the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 648398), from the PGC2018-102133-B-I00 (MCIU/AEI/FEDER, UE) grant and from the Spanish Ministry of Economy and Competitiveness, through the Severo Ochoa Programme for Centres of Excellence in R&D (SEV-2015-0563). Paul Soto's research was largely conducted while he was affiliated with Universitat Pompeu Fabra. The analysis, conclusions, and opinions set forth in the paper are solely those of the authors and do not necessarily represent the views of the Bundesbank, Eurosystem, Federal Reserve Board, or the United States.

I. INTRODUCTION

Banking is among the most regulated sectors in modern societies. One of the main reasons for this is the large economic costs associated with disruptions in the banking sector. However, effective supervision is challenging, as bank assets are more opaque and banks hold a sizeable part of their portfolio in liquid assets, the riskiness of which can be changed quickly (Morgan, 2002; Myers and Rajan, 1998). The 2008 financial crisis aptly highlights the difficulty in supervision of banks (Duffie, 2019). In its aftermath, a major new component of the supervisory toolkit has been stress-testing. However, there is considerable debate regarding the effectiveness of stress-testing in curtailing bank risk (e.g., Tarullo, 2014; Coen, 2017).[1]

In this paper, we analyze short-term and medium-term response of banks' to the asset quality review (AQR) conducted by the European Central Bank (ECB) and study the associated firm real effects. We analyze whether banks cut risk, and whether these effects are just temporal. That is, we examine whether banks dress up for the regulators by masking their risk after the announcement of the ECB's AQR and undo this change in the risk composition after the culmination of the AQR. We examine whether banks alter specific types of assets, e.g., liquid securities vs. illiquid loans, in response to supervision (Myers and Rajan, 1998). Finally, we study the associated supply of credit to firms (and real effects), spillovers on asset prices, and the role played by unregulated nonbanks.

The ECB announced on October 23, 2013, that it would undertake an asset quality review, where bank assets were going to be reviewed in the form of a point-in-time assessment—December 31, 2013. This exercise was conducted for a pre-identified list of 130 (reviewed) banks within the Euro Area, totaling around EUR 22 trillion bank assets. These banks had to report their assets, in particular loans and securities. After a period of compliance (between January and June 2014), which was used by supervisors to consult reviewed banks to give them an opportunity to provide comments, the AQR was concluded in July 2014. The subsequent stress test results based on each bank's AQR were presented in October 2014. There was surprise in the timing and the criteria of the AQR, reflected in the stock market reaction on the day of the AQR announcement, as bank share prices significantly fell after the ECB unveiled its plans.[2] In consequence, the announcement of the

[1] There have been several instances of banks that have passed the stress tests and then failed within a short period time thereafter (e.g. "Dexia poses setback for EBA stress tests", *Financial Times*, on October 5, 2011).

[2] "Eurozone bank shares sink after ECB outlines health check plan", Financial Times, October 23, 2013; "European shares snap winning run as banks hit by ECB review", Reuters, October 23, 2013. E.g., Italian bank stocks fell by as

AQR with a pre-determined reference date presents a quasi-natural experiment to examine whether banks game the supervisory exercise with just short-term (temporary) changes in risk, in turn reducing the effectiveness of stress tests as a regulatory tool. This setting also allows us to examine the short-term and medium-term real effects of banking supervision for non-financial corporations.

We exploit a unique proprietary dataset from the Bundesbank, which is—together with the German federal financial supervisory authority 'BaFin'—the bank supervisor in Germany. The supervisory data provides detailed, granular information at the security level (at monthly frequency) and at the loan level (at quarterly frequency) for each bank in Germany covering the period before and after the ECB's AQR. The exhaustive detail on security-level holdings of each bank allows us to examine the risk characteristics of the securities traded by banks and the timing of the trades. Importantly, we also have the credit register containing information on the individual loans made by banks, including the ex-ante risk of each loan. The security and credit registers are matched with firm and bank balance sheet variables. Finally, we exploit a similar security register for nonbanks, investment funds, which are not similarly regulated.

Under the hypothesis that banks try to mask risk during the supervisory exercise, the main testable hypotheses that we examine are: (i) between the ECB's announcement of the supervisory exercise and the day that banks have to report their securities and loans to the ECB (December 31, 2013), banks will accumulate safer assets;[3] (ii) after the asset quality review is concluded, banks will liquidate these safer assets and will invest back in assets with a relatively higher risk. We also analyze the associated asset price and credit supply spillovers (including the real effects), and the role of unregulated intermediaries in absorbing risk shed by banks due to supervision.

We find that, after the announcement of the AQR, reviewed banks differentially increase their safe securities holdings as compared to non-safe securities. For reviewed banks unconditionally, safe (as compared to non-safe) securities holdings increase during the very short time period of the AQR relative to the period before the announcement. More formally, using a regression framework with controls, we find that between September and December 2013, reviewed banks as compared to non-reviewed banks buy on average between 3.5% and 4.0% more of the securities with top-tier as compared to securities with lower rating. We also find significant results if we analyze other risk measures as securities with high yield, securities from GIIPS-country headquartered borrowers,

much as 3% in early trading and most other leading banks in Spain, France and Germany saw share prices fall about 2% (see e.g., "Draghi says bank tests need failures for credibility; ECB probe", Financial Times, October 24, 2013).

[3] Banks have an incentive to accumulate securities that ECB considers to be highest quality e.g., securities with ratings from AAA to AA- or loans with low-risk weights (see ECB, 2005 and 2014).

long-term maturity, or long-term maturity non-safe (i.e. the riskiest) securities. In particular, we find with substantially stronger economic effects in the case of riskiest securities.

We also examine how reviewed banks respond to the AQR in terms of their lending behavior. Comparing the period after the announcement of the AQR versus before, and within the same firm and bank, we find that reviewed banks increase their supply of credit to safer firms relative to non-reviewed banks. We perform similar robustness tests as in the case of securities and find similar results. We find an increase of between 2.6% and 4.2% in the supply of credit to safe as compared to riskier firms by reviewed banks relative to non-reviewed banks after the ECB announcement. However, as compared to the larger difference in magnitudes for riskiest securities, the effects for the riskiest loans are relatively similar (3% drop) compared to the average loan risk.

Interestingly, reviewed banks also cut the overall supply of credit to firms in the real sector and reduce their overall level of security holdings (irrespectively of risk). That is, not only do reviewed banks relatively increase their lending to safer firms and safe securities holdings, but they downsize their overall balance sheets by reducing their supply of credit and security holdings. Hence, there is an active rebalancing of the securities and loan portfolio's risk composition concurrent with a relatively small reduction in the portfolio size. Economically, after the AQR, for all reviewed banks relative to non-reviewed banks, the average increase in safe as compared to non-safe securities corresponds approximately to EUR 12.25 billion, while the average increase in credit availability to safe as compared to non-safe firms amounts to EUR 41.23 billion. This relative increase of EUR 53.48 billion of safe assets is large, given the very short time (two months between announcement and compliance), accounting for 29% of reviewed banks' overall equity.

Importantly, the results are not due to a general end-of-year effect, but only related to the 2013 last quarter's ECB supervisory audit, as we do not find (neither statistically nor economically) significant effects in the last quarter of 2012 or of 2014 (which we use as placebo tests). We also find similar results in the 2015 AQR (for the stress tests of 2016). This suggests that the results are not driven by the first AQR (stress test) done by the ECB, but by banking supervision in general.

To understand to whom the risk (that banks are shedding) is being reallocated, we study who buys the assets that reviewed banks sell. We find that investment funds, especially the ones that pre-AQR hold securities issued by reviewed banks in their ex-ante portfolio, buy the non-safe securities that reviewed banks sell. This is consistent with exposed investment funds internalizing the negative spillovers to reviewed banks (as otherwise fire sales could be higher) and buying securities sold by

these banks. The results also suggest that the risk from the banking sector is being reallocated to the unregulated nonbanks.

Overall, the results above suggest that banks actively shift their portfolio towards safer assets due to the AQR announcement. However, a key question that arises is whether this shift is temporary or permanent. Thus, to understand the effectiveness of the supervisory exercise, it is necessary to also examine the response of banks in the post-AQR period. In the post-AQR period (after July 2014), we find that reviewed banks (as compared to non-reviewed banks) *partly* reload their risk back to the pre-AQR announcement levels. Results suggest that reviewed banks fully reload on riskier securities; however, this is not the case for riskier credit.

We also examine heterogeneous effects and find that results on dialing-up and dialing-down are stronger for reviewed banks with higher trading expertise (trading banks). Trading banks that are reviewed reduce risk as the other reviewed banks in securities after the AQR announcement, but they increase the non-safe securities more than other banks during the post-AQR period. However, on the lending front, trading banks compared to other reviewed non-trading banks stay at the same reduced risk-taking level during the post-AQR relative to the period after the AQR announcement.

Finally, we analyze the real effects for non-financial firms arising from bank supervision. We find that the risk-masking immediately (after AQR announcement until end of the year) induces negative spillovers on asset prices and credit supply for the more affected assets (i.e., those non-safe securities and loans that were held more by reviewed banks). We then analyze whether the (binding) reduction in credit supply after the AQR implies medium-term real effects. After the AQR, the reduction in credit supply to firms is not compensated by borrowing from other banks (e.g. non-reviewed banks) or by other sources of finance, and hence there is a firm-level decrease in total bank credit and total debt liabilities. That is, riskier firms that relied more on reviewed banks pre-AQR face a binding reduction in credit supply. This in turn generates an associated reduction in firm-level output (sales) and employment for more than three years after the policy announcement. Interestingly, results are especially stronger for firms with higher ex-ante credit risk. The effects are strong even for non-safe firms with high ex-ante productivity. That is, supervision with its associated increase in safe assets by banks not only generates *immediate* negative spillovers on asset prices and credit supply, but also *medium-term* negative real effects on non-financial corporations.

One of the main findings for our analysis is that while banks can dial-up and dial-down the risk in terms of their securities portfolio, the changes in credit portfolio are quite sticky. One policy

implication that directly stems for this finding is that higher fraction of securities holdings in bank portfolios makes banking supervision more difficult (Myers and Rajan, 1998). Furthermore, as banks move their credit portfolio more towards safer firms in response to supervision, this has implications for credit supply to non-safe firms in an economy. Thus, risk responses by banks to supervision have real effects that persist over time, with significant medium-term effects. This is important to consider when designing stress-tests or bank supervision more generally.[4]

Our paper contributes to the literature that studies supervision of banks. Several papers in this literature study window dressing by banks (e.g., Allen and Saunders, 1992, vs. Kotomin and Winters, 2006; van Horen and Kotidis, 2018; Munyan, 2017; Banegas and Tase, 2016; Anbil and Senyuz, 2018).[5] In contrast to these papers, we show a more holistic view of banks with *all* of the assets. We find that banks dial-up safe (vs. non-safe) securities and credit in response to supervision, however they reload their non-safe securities but not credit. These results are consistent with Myers and Rajan (1998) who argue that it is easier to change bank risk by changing liquid assets (securities) in contrast to illiquid assets (loans). Moreover, and consistent with the previous result, the changes to safe (compared to non-safe) credit in response to supervision are sticky in the medium term. We find that changes in credit supply by supervised banks have medium-term effects on firm-level real outcomes.[6] Finally, we also find spillovers on asset prices due to banking supervision.[7]

We also contribute to the literature analysing the increased demand of safe assets (Gorton, Lewellen and Metrick, 2012) and its potential costs. Consistent with theory, we show that supervision incentivizes increased holdings of safe assets among affected banks. However, it also implies adverse medium-term real consequences for non-safe firms, even the ones with high ex-ante productivity. Thus, our results highlight that, adjustments made by banks to their portfolios, in response to a temporary supervision exercise (and not a permanent increase in regulation) can have persistent real effects on non-financial corporations.

[4] For the theoretical literature that examines the optimal design of regulation see Stigler, 1971; Posner, 1975; Glaeser and Shleifer, 2001; Becker and Opp, 2013 and Goldstein and Sapra, 2014.
[5] Papers that analyze window dressing in banking, differently from us, do not analyze supervision and use bank-level rather than security and credit register data and do not analyze longer-term effects for borrowers. Furthermore, the focus is mainly on liability side adjustments in banks' balance sheet (Hellwig, 2010; Demirguc-Kunt et al., 2013; Acharya et al., 2013 and 2014; Boyson et al., 2016; Owens and Wu, 2015).
[6] See also Agarwal et al., 2014; Lucca et al., 2014; Granja et al., 2017; Granja and Leuz, 2019; Hirtle et al., 2020.
[7] See Du et al., 2018, and Abbassi and Bräuning, 2021, who find asset price spillovers, but due to banking regulation. Note that none of our results are driven by a *change in regulation*, but just a supervisory exercise.

The remainder of the paper is structured as follows. Section II discusses ECB's AQR. Section III presents our data. Section IV reviews the empirical strategy and results. Section V concludes.

II. ECB'S ASSET QUALITY REVIEW

On October 23, 2013, the European Central Bank (ECB) officially announced Europe's most comprehensive asset quality review (AQR) of the banking sector in order "to foster transparency, to repair and to build confidence". The timing and the criteria of the AQR came as a surprise.[8] Banks were informed that the central bank, along with national competent authorities (NCAs) responsible for banking supervision, would review the carrying value of assets on the banks' balance sheets as of December 31, 2013.[9] The AQR was thus a point-in-time assessment.

The banks that were selected to participate in this exercise ('reviewed banks', hereafter) were identified based on the following criteria: (i) total value of the bank's assets exceeded EUR 30 billion, (ii) the ratio of the bank's total assets to GDP of its country of establishment exceeded 20%, unless the total value of their assets was below EUR 5 billion, and (iii) the institution was among the three largest credit institutions in a participating member state, regardless of size. A bank was included if any of these criteria applied. In the end, the ECB identified a list of 130 credit institutions (25 of which were German banks) from 18 European Union member states that had total assets of around EUR 22 trillion.[10]

The detailed asset-level review covered all types of assets including securities and credit exposures. The review, in general though, intended to check the riskier assets on banks' balance sheets; therefore, for banks with large trading books, reviewers paid stronger attention.[11] After banks' reporting ('bottom-up') as of December 31, 2013, in a next step, NCAs and the ECB

[8] The surprise in the content of the announcement is reflected in the stock market reaction on the day of the AQR announcement, as bank share prices fell after the ECB unveiled its plans.

[9] The execution of this exercise involved several parties. While NCAs were responsible for all national project management activities, NCAs appointed so-called NCA bank teams comprising of NCA staff and external auditors, property appraisers and valuation advisors providing their expertise, know-how and independence. In total, the complete exercise spanned over 6,000 experts. https://www.ecb.europa.eu/press/pr/date/2013/html/pr131023.en.html. "*An asset quality review, as elaborated below, examining the asset side of bank balance sheets as on 31 December 2013. This assessment will be broad and inclusive, comprising credit and market exposures.*" (See ECB, 2013).

[10] While these banks are the biggest banks in the euro area, they are not the same 'significant credit institutions' that are currently supervised by the ECB's single supervisory mechanism (SSM).
https://www.ecb.europa.eu/pub/pdf/other/aggregatereportonthecomprehensiveassessment201410.en.pdf.

[11] The ECB applied a risk-based approach while determining the portfolios that were reviewed in the AQR. That is, for each bank, "at least 50% of credit risk-weighted assets and half of the material portfolios" were selected. The assessment was a prudential rather than accounting exercise implying that the outcomes of the review were not necessarily reflected directly in the banks' accounts following the exercise.

engaged in quality assurances until the summer of 2014 to ensure the reported data was consistent and accurate, and then the stress tests followed. While the final report of the entire comprehensive assessment was published on October 26, 2014, the ECB published the bank-level disclosure template on July 17, 2014, comprising detailed AQR results (identical to the EBA's disclosure template). The subsequent stress test results based on each bank's AQR were presented in October 2014 (ECB, 2013 and 2014).

Figure A1 illustrates the timeline of the ECB's AQR, which highlights its four key periods. The period before October 2013 denotes the period before the AQR-announcement ('pre-AQR'), while October, November and December 2013 are the months in the run-up to the AQR reporting due date as of December 31, 2013, which is why we refer to it as the 'AQR' period. We define the period between January 2014 and June 2014 as the 'AQR-compliance' period, which was used by supervisors to consult reviewed banks to give them an opportunity to provide comments and suggestions. The period from July 2014 onwards describes the 'post-AQR' period. Our analysis ends just before the results on the stress tests were released and the European single supervisory mechanism (SSM) became effective.

To ensure symmetry around the AQR, we choose our sample to have nine months before the AQR announcement and nine months after the AQR due date, yielding a sample of 21 months from January 2013 through September 2014. As explained in the empirical strategy, we also study the data only around the AQR announcement in October 2013, comparing the AQR reporting due date (December 31, 2013) to *just before* the AQR announcement.

After the implementation of the ECB's SSM, which became effective in November 2014, the ECB's SSM conducts stress tests on the supervised banks every two years (e.g., 2016). For these stress-testing exercises, however, the ECB's SSM requires banks to provide information on their prior year's end-December bank balance sheet assets. That is, for the stress test in 2016, banks were required to report information on their assets as on the end of 2015. Therefore, we will also analyze end-of-year effects (e.g. 2012 and 2014) vs. AQR years (2013, and 2015).

III. DATA

For our analysis, we use proprietary security and credit register data that we obtained from the Deutsche Bundesbank, which—together with the German federal financial supervisory authority 'BaFin'—is the macroprudential and microprudential bank supervisor in Germany. We have

access to the micro data on securities investments of banks (negotiable bonds and debt securities, equities, and mutual fund shares) at the security level for each bank in each month. The data comprise of investments of German banks at the security level on a monthly frequency from January 2013 through September 2014. For each security held, banks report the nominal value at the end of each month (stock at the end of each month).[12] We use the unique International Security Identification Number (ISIN) associated with every security to merge the data on security investments with security-level information on rating and yield from FactSet, and on price, maturity and the issuer from the Eurosystem's CSDB.[13]

We also obtain data on individual loans made by banks from the German credit register maintained by the Deutsche Bundesbank. The credit register provides information on the amount of loans outstanding at the borrower level for each bank. In addition, it also provides for selected banks borrower-level information on estimated probability of default (PD) for a loan, and the date of a given default (where applicable). For the credit register, banks had to report, on a quarterly frequency, all borrowers whose overall credit exposure exceeds EUR 1.5 million. The credit register covered nearly 70% of the total credit volume in Germany.

We append the security and credit register data to confidential supervisory monthly balance-sheet statistics at the bank level. As most securities held by banks are bonds (81%), we only analyse bonds within bank securities.[14] In particular, we collect monthly balance sheet items such as each bank's equity, total assets, and total loans. Moreover, we follow the ECB's AQR procedure and focus primarily on credit exposures to non-monetary financial institutions, including large non-financial corporates. Also, we restrict ourselves to banks with a credit exposure to a firm for which we observe a value on its probability of default (PDs). We have this information for 93 distinct banks.[15] Note that this restriction on the availability of borrower PDs reduces the set of banks to those with the most economically meaningful credit portfolios as only those banks provide the PDs for their borrowers. Both restrictions are necessary to explore banks' securities investments and

[12] Note that the reporting requirement specifies that securities holdings, which are passed on or acquired as part of a repo contract, are not double-counted in the securities database. Thus, the transactions we capture are not a mechanical artifact of repo transactions (see also Amann, Baltzer, and Schrape, 2012). While we know the security holdings of the banks, we do not know whether they are classified as trading book assets, available for sale or held to maturity.

[13] The Centralised Securities Database (CSDB) contains information on all debt securities, equities and mutual fund shares/units issued by residents of EU Member States or by others.

[14] E.g., if we would analyze the stock of shares, the risk measures would be very different between securities and credit, and moreover, shares cover a small share of banks' investments (less than 4% of total assets). Therefore, for the sake of comparison between securities and loans, and for the sake of quantitative importance, we restrict our analysis to bonds.

[15] We replace each borrower's PD with its cross-sectional average PD across all banks that assigned a PD to that borrower, hence any bank's individual PD-reporting does not drive our results (similar to Abbassi and Schmidt 2018).

credit supply depending on the ex-ante security and borrower risk type (safer versus riskier).

There are two further data sources that we obtain. To further shed light on the implications of our results for real activity, we obtain annual data from Bureau van Djik on firm financial statements, which we merge with our credit register data.[16] Finally, to examine who buys the securities that banks may sell, we use security register data for investment funds at the fund-security-month level.

IV. Empirical Strategy and Results

In this section, we will discuss the empirical identification strategy and the results. We analyze the following testable predictions under the hypothesis that banks try to mask risk. First, we examine whether before the supervisory exercise, banks accumulate safer assets, especially those that the ECB considers to be of high quality. Second, we examine if, after the conclusion of the asset quality review, banks liquidate these safer assets and invest back in assets with a relatively higher risk.

To test for these hypotheses, we first analyze the securities holdings and loans of banks before and after the AQR. We exploit the fact that the ECB required banks to report their assets as on December 31, 2013 (point-in-time assessment) and examine the evolution of security holdings and loans around this cut-off date. We examine whether reviewed banks increase their holdings of safe assets compared to non-reviewed banks during this period. Second, we analyze whether after July 2014 the reviewed (versus non-reviewed) banks increase their risk back to the levels similar to that before the ECB announcement in October 2013. For the first hypothesis, we analyze the period of three months around the ECB announcement, whereas for the second hypothesis we use all the data, i.e. nine months around the AQR.

To study heterogeneity in risk behavior across different securities and across different loans, we analyze securities holdings at the *bank-security-month* level and loans at the *bank-firm(borrower)-quarter* level. In a difference-in-differences setting, we analyze *before* and *after* each main event, whether *reviewed* banks change their holdings depending on the ex-ante security or firm (loan) risk, as compared to *non-reviewed* banks.

As in Germany, the size of a bank is the dominant factor that determined whether or not a given institution was being reviewed, we analyze only the 25 largest non-reviewed banks (with respect

[16] See Schild, Schultz, and Wieser (2017) for a detailed description of the methodology.

to their size), thus matching the same number of banks being reviewed.[17] We analyze whether reviewed or non-reviewed banks differ in other-end-of–year periods (placebo tests in 2012 and 2014), as well as in the following stress test of 2016 based on the AQR as on the end of 2015. For robustness, we also conduct the analysis with very few reviewed and non-reviewed banks of similar size (around the cut-off of EUR 30 billion). In addition, we also analyze unconditionally the behavior of only reviewed banks before and after each of the two main events. This helps address the concern that our results might be driven by systematically different time trends between reviewed and non-reviewed banks. We provide summary statistics on the main variables in Appendix Table A2. Table A1 contains the definitions of the variables used in the paper.

IV.1 Dialing-Up of Safe Assets in the Run-Up to the AQR

The first testable hypothesis, which we examine in this paper, is that after the announcement of the supervisory exercise banks will accumulate safer assets, especially those with a better rating that would perform well in the supervisory test. We also analyze other risk measures as part of our robustness checks, for example based on yield, maturity or whether the borrower is headquartered in a GIIPS country (i.e., Greece, Ireland, Italy, Portugal, or Spain). Note that to penalize risk inherent to bank assets, the Eurosystem primarily relies on ratings rather than yields and the origin of issuance (e.g., GIIPS). Also, there is substantially more penalization with regard to lower ratings than in maturity (see ECB, 2005, 2013 and 2014). To judge the riskiness of loans, we use the ex-ante probability of default, which is comparable to the ex-ante rating in securities. We start by studying the securities holdings of reviewed banks versus non-reviewed banks at the *bank-security-month* level using the following econometric model:

$$\text{Log(securities holdings)}_{b,s,t} = \beta(\text{Safe}_{s,t-1} \cdot \text{AQR}_t \cdot \text{Reviewed}_b) + \alpha_b + \alpha_s + \alpha_t + \delta' controls + \varepsilon_{b,s,t} \quad (1)$$

, where the dependent variable is the logarithm of nominal holdings of security *s* by bank *b* at month *t*.[18] Our sample is constructed symmetrically around the AQR announcement, i.e. 3 months before the announcement (i.e., end of July, August, and September 2013) versus 3 months after the announcement (i.e., end of October, November, and December 2013). 'AQR' is a (post)

[17] Reviewed banks are larger than non-reviewed banks (e.g. differences in bank sizes of 182 vs. EUR 2 billion), but with rather similar levels of securities holdings (19.48% vs. 21.84% of total assets) and safe credit (77.45% vs. 73.77%), though some differences in the level of credit (44.32% vs. 58.92%) and safe securities (39.36% vs. 26.47%).

[18] Note that we use the nominal values (as opposed to fair values) to ensure that a decrease (or increase) in holdings is due to an actual decrease (or increase) in any given security position. In Table A5 and A6 of the Appendix, we show that our results are similar for alternative specifications with respect to the dependent variable and the estimation method (weighted least squares).

dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (i.e. during October, November and December 2013), and zero before. We follow the Eurosystem's harmonized rating scale for the definition of safe assets and define a security as safe when the security has a rating between AAA to AA-. That is, 'Safe' is a dummy variable that equals the value of one whenever the security has a rating between AAA and AA-, and zero otherwise. 'Reviewed' is a binary variable that equals the value of one for any bank reviewed under the AQR, and zero otherwise. The estimated coefficient β then measures the differential securities holdings of safe (versus risky) securities by reviewed banks as compared to non-reviewed banks before versus after the AQR announcement. That is, a positive (negative) estimated coefficient would suggest that reviewed banks hold differentially more (less) safer securities in the months after the AQR announcement than non-reviewed banks. Lower order interaction terms of 'Safe', 'AQR' and 'Reviewed', respectively, are included. We cluster standard errors at the bank and security level.

For identification, we saturate our analysis with different fixed effects to account for potential confounding factors. Our tightest identification includes two key sets of fixed effects. First, banks may have a particular preference for specific securities, e.g. due to their different risk-appetite, in which case they might hold relatively more of some securities than some of their peers. We account for this bank-security level relationship by saturating our specification with bank*security fixed effects to rule out the possibility that the effects are driven by compositional differences in the pool of securities held by the banks in our sample. Note that the inclusion of bank*security fixed effects implicitly accounts for bank fixed effects and securities fixed effects. Second, we include Time fixed effects to suppress general time variation in banks' securities holdings and focus on identifying the differential effect between reviewed and non-reviewed banks in safe securities holdings after the AQR announcement. This set of fixed effects, for instance, accounts for the fact that banks, in general, have a higher demand for safe securities towards the end of the year than at other months.

Based on Figure A2—unconditionally, i.e., before imposing any controls such as those in equation (1)—we find that, after the announcement of the AQR, reviewed banks increase the share of their safe (as compared to non-safe) securities on average by more than 2% during the very short time period of the AQR relative to the period before the announcement. More formally, estimating equation (1), we find in column 1 of Table 1 that, after the AQR announcement, reviewed banks

reduce their share of securities by 1.68% as compared to the largest non-reviewed banks.[19] In column 2, we add bank fixed effects and find that our main result remains very similar in terms of significance and magnitude, despite that the R2 increases by 36 percentage points (Altonji et al. 2005). Columns 3 and 4 replicate the estimation of column 1 and 2 but include security and security*bank fixed effects to ensure that our results are not affected by unobserved time-invariant security variables. Results remain similar, and the magnitudes are slightly larger.

Regarding the composition of safe assets, we find that reviewed banks increase their safe (as compared to non-safe) securities holdings compared to non-reviewed banks after the announcement of the AQR (column 5). In the most saturated model in column 6, reviewed banks increase safe (as compared to non-safe) securities by 3.46% during the AQR period as compared to non-reviewed banks. In addition, in columns 7 and 8 of Table 1, we restrict ourselves only to reviewed banks. We find that reviewed banks on average increase their safe (as compared to non-safe) securities holdings by 2.26% after the AQR announcement (note that in column 8, we control for security*bank fixed effects).

To get a sense of the magnitude increase in safe (as compared to non-safe) securities for all reviewed banks (as compared to non-reviewed banks), we use the estimated effects from Table 1 and approximate based on the total security holdings of banks at the start of the AQR.[20] This calculation suggests that reviewed banks increase their safe (as compared to non-safe) securities holdings by EUR 12.25 billion in the period after the AQR announcement as compared to non-reviewed banks.[21] This amount is large given the capital of banks and the very short time period.[22] In sum, our regressions show an active rebalancing of the portfolio's risk composition concurrent with a reduction in the portfolio size. In particular, columns 1- 4 show that there is a reduction on the overall portfolio size (e.g. 2.9% in column 4) after the AQR announcement for reviewed as compared to non-reviewed banks, while columns 5 and 6 show that the percentage of safe (as

[19] Note that the interpretation of coefficient estimates on dummy variables as percent changes in logarithm dependent variable is not correct in the strictest sense, see Halvorsen and Palmquist (1980). Yet, given our predominantly small coefficient estimations throughout the paper, our interpretation is a fair approximation to the first decimal. In the very few places in which the estimated coefficients are large, we do not provide the % change.

[20] The sum of all safe securities holdings of all reviewed banks amounts to a total of EUR 350 billion as on the end of September 2013. Using the estimated coefficient on Safe*AQR*Reviewed from Table 1 column 6, results suggest a differential increase (decrease) in holdings of safe (non-safe) securities by EUR 12.25 billion for reviewed banks relative to non-reviewed banks (3.5%*EUR 350 billion).

[21] The sum of all safe securities holdings of all reviewed banks amounts to a total of EUR 350 billion as on the end of September 2013. Using the estimated coefficient on Safe*AQR*Reviewed from Table 1 column 6, results suggest a differential increase (decrease) in holdings of safe (non-safe) securities by EUR 12.25 billion for reviewed banks relative to non-reviewed banks (3.5%*EUR 350 billion).

compared to non-safe) assets relatively increase by around 3.5% (column 6) for the reviewed (compared to non-reviewed) banks.

In Appendix Table A8, to show the robustness of the results, we gradually introduce fixed effects. In some specifications, we also include bank*time fixed effects as well as security*time fixed effects. Adding these fixed effects does not alter much the magnitude of the estimated coefficient on our key interaction term Safe*AQR*Reviewed but substantially increases the explained variation by means of R-squared. This suggests that unobservable variation along these dimensions is less likely to be a concern (Altonji et al. 2005). For robustness, we also restrict the sample of both reviewed and non-reviewed banks to those whose total value of total assets lies within the range of +/− EUR 10 billion around the EUR 30 billion threshold (see Section II). Our results remain qualitatively similar but larger in magnitude (see Table A3 of the Appendix). This suggests that our results are not driven by very large reviewed banks.

In columns 1 and 2 of Table 3, Panel A, we replicate columns 6 and 8 of Table 1. The only difference being that now we compare end of September to end of December 2013. This is to account for the fact that our securities regressions are run on monthly data while loan regressions that we discuss below will be run on quarterly data. Thus, to ensure robustness and facilitate comparison, we run our securities analysis on equal footing (i.e., using quarterly data). As can be seen, the results are very similar to that reported in Table 1.

In Panel A of Table 3, we move on to further examine the compositional shift in portfolio of banks after the announcement of the AQR. We show that reviewed banks decrease riskier securities holdings measured by (i) high-yield securities (columns 3 and 4), (ii) securities whose issuer is headquartered in GIIPS countries (columns 5 and 6), (iii) long-term securities (columns 7 and 8), and (iv) long-term non-safe securities (columns 9 and 10). Note that based on the last two columns, which are for the riskiest securities, estimated effects imply a reduction of the riskiest securities larger than six times the estimated coefficients of the other variables. All in all, these results suggest that reviewed banks increase their safe (as compared to non-safe) securities holding as compared to non-reviewed banks after the announcement of the AQR.

As credit was also a major part of the ECB's AQR, in a next step we examine the response in the lending behavior of banks during the AQR. To that aim, we exploit the data at the *borrower-bank-quarter* level and use the following estimation equation:

$$\text{Log(Credit)}_{b,j,t} = \beta\left(\text{Safe}_{j,t-1}\cdot\text{AQR}_t\cdot\text{Reviewed}_b\right)+\alpha_b+\alpha_j+\alpha_t+\delta'\text{controls}+\varepsilon_{b,j,t} \qquad (2)$$

, where the dependent variable is the logarithm of the loan amount by bank *b* to firm *j* during quarter *t*. In analogy to Table 1, we use the same symmetric sample around the AQR announcement, i.e., July, August, and September 2013 vs. October, November, and December 2013. To assess the riskiness of a given borrower, we resort to the ex-ante probability of default (PD) that any bank assigns to its borrower. Since only a subset of banks (relatively large banks) provide these PDs, this restricts us to only analyzing those banks and borrowers for which we have a PD. That is, once we observe a PD for a given firm in a given time, we will use this information to assess this firm's riskiness across all of its credit relationships. We then define the binary variable 'Safe', which equals the value of one for all borrowers whose PD is below the cross-sectional mean, and zero otherwise. The median PD in this group equals 0.2% and corresponds to PDs observed globally for investment-grade firms that have the lowest risk weights (e.g., Standard and Poor's 2012; Joint Committee of the European Supervisory Authorities, 2014). In comparison, the median PD in the group of riskier firms (i.e., when 'Safe' equals the value of zero) is 4.3%, which refers to PDs observed for below-investment-grade firms. Our binary variables 'AQR' and 'Reviewed' are constructed as before. The estimated coefficient β then measures the differential lending behaviour to safe (versus non-safe) borrowers by reviewed banks versus non-reviewed banks before versus after the AQR announcement. That is, a positive (negative) estimated coefficient would suggest that reviewed banks provide differentially more (less) loans to safer borrowers in the months after the AQR announcement than non-reviewed banks. Lower order interaction terms of 'Safe', 'AQR' and 'Reviewed', respectively, are included. We cluster standard errors at the bank and borrower level.

As before, we saturate our analysis with different fixed effects to account for potential confounding factors. In analogy to our securities regressions, our tightest identification includes two key sets of fixed effects, that is bank*firm fixed effects and time fixed effects. The former helps take into possibility of matching between bank and firms. Thus, controlling for bank-specific, borrower-specific, and other bank-firm level observed and unobserved heterogeneity (e.g. firm-level credit demand as in e.g., Khwaja and Mian, 2008 or geographical distance and relationship lending as in e.g., Petersen and Rajan, 1995). The inclusion of time fixed effects, as before, helps to suppress general time variation in banks' lending behaviour and focus on identifying the differential effect between reviewed and non-reviewed banks after the AQR announcement.

In column 1 of Table 2, we find that reviewed banks, as compared to non-reviewed banks, decrease their supply of credit by 1.76% after the AQR announcement. In column 2, we include

firm*bank fixed effects and find that our estimated coefficient on AQR*Reviewed bank remains statistically significant, qualitatively similar. In column 3 and 4, we use firm and firm*bank fixed effects respectively, to ensure that our results are not driven by time invariant firm or firm-bank characteristics. Our results remain qualitatively similar.

From columns 5 and 6, we see that reviewed banks increase their supply of credit to safer firms by 2.63%, as compared to non-reviewed banks. Note that in column 6, we include firm*bank fixed effects. Using a similar back of the envelope calculation as with securities holdings, we approximate that there was an increase of credit supply to safer borrowers in the amount of EUR 41.23 billion in total for all reviewed banks as compared to non-reviewed banks in the period after the AQR announcement.[23] In columns 7 and 8, we restrict ourselves to reviewed banks only and find that on average reviewed banks increased credit to safer firms by 2.45% (with firm fixed effects) and 2.38% (with firm*bank fixed effects) after the AQR announcement (Figure A3 also illustrates similar results without any control).

We show in the appendix, how our estimated coefficient is affected by different fixed effects, including a more conservative fixed effect structure. From, Appendix Table A9, where we can see that the inclusion of firm fixed effects and then bank*firm fixed effects affects both the estimated coefficient also the explained sum of squares. However, saturating the regression by bank*time fixed effects and firm*time fixed effects does not alter much the magnitude of the estimated coefficient on our key interaction term Safe*AQR*Reviewed. It also does not substantially increase the explained variation by means of R-squared. Also, using firm*time fixed effects imposes a very strong identification restriction thereby reduces the number of observations. This in turn increases the standard errors, thereby rendering the estimated coefficient insignificant. Importantly though, the estimated coefficient remains qualitatively similar. Therefore, the most preferred specification we use is one with bank*firm fixed effects.

As a robustness check, we also restrict the sample of both reviewed and non-reviewed banks to those whose total value of total assets lies within the range of +/− EUR 10 billion around the EUR 30 billion threshold. Our results remain qualitatively similar but somewhat larger in magnitude (see Table A3 of the Appendix). In Panel B of Table 3, we show that our results are robust to the application of different cut-offs to the ex-ante probability of default and to using the ex-ante

[23] The sum of all credit to safer firms of all reviewed banks amounts to a total of EUR 1,568 billion as on the end of September 2013. Using the estimated coefficient on Safe*AQR*Reviewed from Table 2 column 6, results suggest a differential increase (decrease) in lending to safer (non-safe) firms by EUR 41.23 billion for reviewed banks as compared to non-reviewed banks (2.63%*EUR 1,568 billion).

continuous probability of default. Different than securities, estimated effects do not vary much based on the riskiness of credit (across different thresholds of riskiness, the estimates are similar).

In sum, the results suggest that, after the announcement of the AQR, reviewed banks differentially increase safe assets, both bonds and loans. Economically, our calculations suggest that reviewed banks–relative to non-reviewed banks–increase safe securities (as compared to non-safe) by EUR 12.25 billion and credit supply to safe (as compared to non-safe) firms by EUR 41.23 billion after the AQR announcement. This is economically significant given the very short period of time (basically two months between announcement and compliance). This also accounts for 29% of reviewed banks' overall common equity capital. Moreover, effects are substantially stronger for the riskiest securities as compared to the riskiest credit. Note that while our results suggest that there are effects of AQR in terms of risk composition of banks' balance sheet, we cannot derive a complete-picture given the difference-in-differences approach employed in this paper.

Finally, from Table 4 we can see that our results are not due to a general end-of-year effect, but only related to the ECB supervisory audit at the end of the fourth quarter in 2013. We do not find (statistically or economically) significant effects in the last quarter of 2012 and 2014, respectively. Importantly, however, we find similar effects for 2015, where end-of-year assets were reported to the ECB for the 2016 stress test exercise (see Table A4 of the Appendix).

IV.2 Immediate Spillovers on Asset Prices and Firm-Level Credit Availability

We next test whether these results have immediate implications for security-level prices and firm-level credit availability. To examine this hypothesis, we first extend our security analysis using pricing data that we obtain from Eurosystem's CSDB in the following estimation equation:

$$Price_{s,t}=\beta_1\left(Safe_s\cdot AQR_t\cdot Reviewed_s\right)+\beta_2\left(AQR_t\cdot Reviewed_s\right)+\alpha_s+\alpha_t+\delta'controls+\varepsilon_{s,t} \qquad (3)$$

, where the dependent variable is the price of security *s* during month *t* in the period July 2013 and December 2013, i.e., 3 months before and 3 months after the AQR announcement. 'Safe' is a binary variable that takes the value of one whenever the security has an above-investment-grade issuer rating as on September 2013, and zero otherwise. 'Reviewed' is a binary variable that equals one when the security is primarily held (i.e., more than 50th percentile) by reviewed banks as on September 2013, and zero otherwise. As in previous regressions, 'AQR' measures the period after the AQR announcement, and security and time fixed effects as well as lower-order interaction

terms (where applicable) are included, but not specifically shown in equation 3 for clarity. Note that our data is at the security-time level, which does not allow to control for security*bank fixed effects (as in the tables before).

Column 1 of Table 5 shows the results for securities prices. As we can see from the double and triple interactions, non-safe bonds that were largely held by reviewed banks exhibit lower prices after the AQR. That is, the lower demand from reviewed banks for riskier bonds reduce the prices of these bonds, over the two-month period after the AQR.

In column 2 of Table 5, we employ a similar approach to credit as follows:

$$\text{Log(firm credit)}_{j,t}=\beta_1\left(\text{Safe}_j\cdot\text{AQR}_t\cdot\text{Reviewed}_j\right)+\beta_2\left(\text{AQR}_t\cdot\text{Reviewed}_j\right)+\alpha_j+\alpha_t+\delta'\text{controls}+\varepsilon_{j,t} \quad (4)$$

, where the dependent variable is the logarithm of loan amount borrowed by firm j during quarter t in the period September 2013 and December2013. 'Safe' is a dummy variable that equals the value of one if loan j has a probability of default (PD) below the cross-sectional mean PD of all borrowers' PDs as on September 2013, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than 50th percentile) provided by reviewed banks as on September 2013, and zero otherwise. As in previous regressions, 'AQR' equals the value of one for the month December 2013, and zero otherwise, lower-order interaction terms are included in 'controls' and there are firm and time fixed effects. Note that our data is at the borrower-time level, which does not allow to control for firm*bank fixed effects.

The estimated coefficients of the triple and double shown in column 2 of Table 5 indicates that non-safe firms that (pre-AQR) were mainly cut credit from reviewed banks received less overall bank credit availability relative to the other firms. These results suggest that our previously documented cut in credit supply at the loan level also holds at the firm level. Note that effects reported are immediately after the AQR, i.e. during the last quarter of 2013.

IV.3 Who is Buying Securities Sold by Reviewed Banks?

To further understand to who is taking on the risk that reviewed banks are shedding, we examine who buys the securities that reviewed banks sell. There is a rich body of research that suggests that there is a growing non-bank sector, to which risk is being reallocated from the banking sector (see Plantin, 2014; Martinez-Miera and Repullo, 2018; Farhi and Tirole, 2021; Buchak et al., 2018; Irani et al., 2021). Based on this literature, we conjecture that investment funds, especially the ones

that (pre-AQR) hold securities issued by reviewed banks in their portfolio are the ones that buy the riskier securities sold by reviewed banks.[24] Our notion rests on the idea that investment funds with higher exposure to reviewed banks would experience losses if the prices of reviewed banks in their portfolio fell (recall that investment funds' net asset value is marked to market). Therefore, it is plausible that investment funds buy securities that reviewed banks sell to prevent a large drop in prices of these securities, which in turn would have led to higher losses for reviewed bank and triggered a larger drop in reviewed banks' own security prices. To test this notion, we run the following empirical analysis:

$$\text{Log(securities holdings)}_{i,s,t} = \beta\left(\text{Non-Safe}_{s,t-1} \cdot \text{AQR}_t \cdot \text{Exposure to Reviewed}_i\right) + \alpha_{i,s} + \alpha_t + \delta' \text{controls} + \varepsilon_{i,s,t} \quad (5)$$

, where the dependent variable refers to the logarithm of the nominal holdings of security *s* by investment fund *i* at month *t* in the period from July 2013 to December 2013, i.e., 3 months before and 3 months after the AQR announcement. 'Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating, and zero otherwise. 'Exposure to Reviewed' is a binary variable that equals the value of one whenever an investment fund holds a large share of bonds (top 25th percentile) issued by reviewed banks in their ex-ante portfolio, and zero otherwise. As in previous regressions, we exploit 'AQR' and control for different effects: time fixed effects and security-investor fixed effects, which allows us to analyze the same security before and after the AQR, while controlling for intermediary-security specific heterogeneity. Table 6 provides the estimation results. As before, lower order interaction terms of all right-hand-side variables are included, but absorbed for expositional clarity.

In columns 1 and 2, the sample includes all purchased securities. The results suggest a higher differential buying behaviour of riskier securities by funds with an ex-ante higher exposure to reviewed banks. This holds true also when we use the continuous variable to measure the ex-ante exposure to reviewed banks (column 2). In column 3, we restrict the sample to securities that were not previously sold by reviewed banks; consistently there is *no* differential buying behavior. In columns 4 and 5, the sample is restricted to those securities that were previously sold by reviewed banks. The estimated coefficient in column 4 suggests a differential buying behavior by investment funds with an ex-ante higher exposure to reviewed banks. In column 5, we use ECB's credit quality buckets (ECB CQS) as an alternative definition for riskier assets. 'ECB CQS 2' refers to a dummy

[24] As the supervisory exercise was conducted at the bank holding group, investment funds owned by banks could not buy those securities. In unreported results, we can indeed confirm that bank-owned investment funds did not buy any of these securities.

variable that equals the value of one if the security has a rating between A+ to A-, and zero otherwise. 'ECB CQS 3' equals the value of one if the security has a rating between BBB+ to BBB-, and zero otherwise. 'ECB CQS Non-Eligible' is a binary variable that equals the value of one if the security has a rating below BB+, and zero otherwise. We find that the buying behaviour by funds with higher exposure is higher for previously sold securities of lower rating.[25]

These results suggest that investment funds, especially the ones that (pre-AQR) hold securities issued by reviewed banks in their portfolio are the ones that buy the riskier securities sold by reviewed banks. This is consistent with investment funds internalizing the negative spillovers to reviewed banks and buying securities sold by these banks. The findings also suggest that the risk is being reallocated from the banking sector to nonbanks. In Appendix Table A7 we also find that this differential buying behaviour bears implications for asset prices of purchased bonds. Especially, we can see that riskier securities purchased by funds with low exposure to reviewed banks are associated with smaller price changes as compared to those purchased by funds with ex-ante higher exposure to reviewed banks.

IV.4 Dialing-Down of Safe Assets after the AQR Overall Exercise

The second testable hypothesis that we examine in this paper is that, after the AQR compliance exercise is concluded, banks will liquidate the previously acquired safer assets and invest in riskier assets. To examine this mechanism, we extend our security and credit analysis from the previous section (Equations 1 and 2 respectively) by just adding all the different AQR time periods (following Figure A1), with identical dependent variables and identical asset risk (*safe*) and bank (*reviewed*) variables. We extend our sample but maintain a symmetric window around the AQR period, i.e. nine months before the AQR announcement and nine months after the AQR due date (with the 3 months of the AQR period). This yields a total sample of 21 months covering the period from January 2013 to September 2014. This allows us to estimate the differential effects across the different periods related to the overall AQR exercise as depicted in Figure A1.

Table 7 presents the results. 'AQR' is constructed as before and thus equals the value of one only for the months October, November, December 2013, and zero otherwise. 'AQR-Compliance' is a binary variable that equals the value of one for the months January to June 2014, and zero

[25] We also examined whether securities are being passed on to investment funds that belong to the reviewed banking holding group, or whether reviewed banks sell riskier securities to their clients. However, we do not find evidence for either one of these channels. This is consistent with the fact that supervision was executed for the whole banking group.

otherwise. 'Post-AQR' refers to a dummy variable that equals the value of one for the months from July 2014 onwards, and zero otherwise. This leaves the period before the AQR announcement as the benchmark period. That is, the three estimated coefficients in Table 7 (of the triple interactions of the three different time periods with asset risk and reviewed bank) measure the effect for each sub-period *relative to the period before the AQR announcement*.

In Table 7 column 1, we find that the increase of safe (as compared to non-safe) securities during the AQR period persists qualitatively during the AQR-compliance period, i.e., while the point estimate is somewhat similar, the estimated coefficient loses all its significance. In the period after the AQR compliance exercise though, the coefficient on Safe*Post-AQR*Reviewed is negative and insignificant, even within reviewed banks (column 2). That is, the holdings of safe (as compared to non-safe) securities after the overall AQR exercise are back to the levels held before the AQR announcement. This suggests that reviewed banks indeed reduce safe (as compared to non-safe) securities after temporarily increasing them during the AQR period (see also Figure A2, which graphically illustrates this behavior). In columns 3 and 4, we mimic the security analysis and examine the differential effect on credit supply by reviewed banks versus non-reviewed banks during the AQR cycle. Similar to our security regressions, we find that, during the AQR-compliance period, reviewed banks' credit supply to safer firms remain at elevated levels as compared to the period before the AQR announcement. However, in contrast to the security analysis, in the period after the AQR compliance period we find that these levels continue to be elevated similar to the levels observed during the AQR period (columns 3 and 4, see also Figure A3 without controls, which graphically illustrates this behavior). This result is intuitive as banks need to have opportunities (applications) to lend to riskier borrowers.

To provide further evidence on the validity of our identification strategy and analyze the persistence, in Figure A4 and A5, we present an event study figure for securities and credit, respectively. More precisely, in Figure A4, we report coefficient estimates on our key interaction term, i.e., Safe*AQR*Reviewed, while conducting our analysis on safe securities holdings relative to the pre-AQR announcement. The results show that safe (as compared to non-safe) securities holdings prior to the AQR announcement is not significantly different for reviewed and non-reviewed banks. A similar pattern arises from Table A5 for credit. Thus, we cannot reject the parallel trends assumption, thereby supporting the validity of our identification approach. Moreover, Figure A4 also shows that the positive impact of the AQR on safe (as compared to non-safe) securities holdings for reviewed banks lasts for one quarter and is not distinguishable from

zero after two quarters. In Figure A5, we can see that the identified effect of Safe*AQR*Reviewed on credit remains high even after three quarters.

As discussed in Section II, the AQR intended to focus especially on the riskiest portfolios on the banks' balance sheets and thus gave special attention to banks with significant trading books. Banks with a larger trading book may therefore feel more pressured to adjust their asset portfolio for the AQR exercise than other banks. Following Abbassi, Iyer, Peydró, and Tous (2016) we exploit banks' trading expertise, and analyze heterogeneous effects based on bank trading expertise. [26] In Table 8 we interact our main variable 'Safe*AQR' with the binary variable 'Trading bank', which equals the value of one if the reviewed bank has membership to the largest fixed-income platform in Germany (Eurex Exchange), and zero otherwise. In column 1 of Table 8 we find that during the AQR period there is no additional differential effect for securities holdings within the group of reviewed banks depending on trading expertise. That is during the AQR period reviewed banks increase safe (as compared to non-safe) securities holdings irrespective of further bank-specific characteristics.[27] However, after the AQR overall exercise, reviewed banks with trading expertise reduce their safe (as compared to non-safe) assets to levels below that observed before the AQR period (i.e., the estimated coefficient of 'Safe*Post-AQR*Trading bank' is negative and significant). From column 2, reviewed banks with trading expertise increase credit to safer firms more than other reviewed banks after the AQR announcement. During the post-AQR period though, both reviewed banks with and without trading specialization remain at roughly similar elevated levels of safe (as compared to non-safe) credit as observed during the AQR period. All in all, trading banks that are reviewed reduce risk as the other banks in securities but increase it more than other banks during the post-AQR period.

IV.5 Real Effects

We now shed light on the short-term and medium-term implications of our results for real activity. To that aim, we analyze how firms, which were curtailed credit faired economically according to their balance sheets over the period 2011-2014. We, therefore, run the following

[26] To proxy for active presence and expertise in securities markets, Abbassi, Iyer, Peydró, and Tous (2016) use the notion that banks that generally engage in trading activities and thus have expertise will have a trading desk in place and the necessary infrastructure, such as direct membership to the trading platforms to facilitate trading activities. Using this line of reasoning, they proxy for trading expertise by direct membership of banks to the largest, fixed-income trading platform in Germany (Eurex Exchange).

[27] In unreported robustness regressions, we have also tried other bank-specific variables such as the bank's leverage ratio, its Tier-1 capital adequacy ratio, its size, and the share of non-performing loans. Yet, we do not find any further differential heterogeneity at the bank level.

regression analysis:

$$\text{Log(real outcome)}_{j,t} = \beta\left(\text{Safe}_j \cdot \text{AQR}_t \cdot \text{Reviewed}_j\right) + \alpha_j + \alpha_t + \delta'\text{controls} + \varepsilon_{j,t} \quad (6)$$

, where the dependent variable is the logarithm of total firm debt, sales, and employment, respectively, of firm *j* during year *t* in the period 2011-2014, i.e., before and after the AQR announcement. We refer to this sample as 'Short-term' effect. We also measure the 'medium-term' effect by extending our sample to 2016. 'Safe' is a dummy variable that equals the value of one if borrower *j* has a probability of default (PD) above the cross-sectional mean PD of all borrowers' PDs as on September 2013, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than the 50th percentile) provided by reviewed banks as on September 2013 (pre-AQR), and zero otherwise. 'AQR' is a binary variable and equals the value of one for the (end of) years 2013 onward, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period. That is, each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement. We further include the logarithm of the firm's equity in t-1 as a time-varying firm control. Our fixed effects strategy follows equation 4.

In Table 9, we find that safe (as compared to non-safe) firms, which received relatively higher credit predominantly from reviewed banks before the AQR announcement experience relative increases in firm-level total debt, sales and employment over a period of more than a year after the AQR announcement, i.e., both short-term (columns 1-3) and medium-term (columns 4-6). More precisely, we find that safe (as compared to non-safe) firms that received credit primarily from reviewed banks before the AQR announcement have a 5.1% higher overall firm debt, 6.4% higher sales, and 3.7% higher employment in the years up to 2016 following the AQR as compared to their peers, that received credit from non-reviewed banks. Table 9 provides evidence that the supervision audit generates medium-term real effects, not just immediate spillovers on credit supply around the supervisory audit.

We also present event study figures for each of our real economic variables (firm debt, sales and employment). More precisely, in Figure A5-A7, we report our baseline coefficients Safe*AQR*Reviewed from Table 9 columns 4-6. The results show that our economic variables prior to the AQR announcement are not significantly different for firms with credit predominantly from reviewed or non-reviewed banks. That is, we cannot reject the parallel trends assumption, which validates our identification approach. Moreover, while the positive impact of the AQR on

firm debt and employment for firms whose credit is primarily provided by reviewed banks lasts even up to 2016, for sales, we observe a declining trend already in 2015.

One may ask whether the differential effect after the AQR on our real economic variables stem from safe firms vs. non-safe firms or from both types of firms. To that aim, we replicate columns (4)-(6) of Table 9 but decompose the analysis into one that focuses on 'within safe firms' and another on 'within non-safe firms'. This analysis helps assess the effect for each type of firm (i.e., safe versus non-safe) separately. The results are presented in Table 10.

Interestingly, we find a negatively signed estimated coefficient for the analysis within non-safe firms and a positively signed coefficient for the analysis within safe firms. That is, for non-safe firms associated with reviewed banks there is a decline in total debt, sales and employment as compared to ones associated with non-reviewed banks. Similarly, for safe firms associated with reviewed banks there is an increase in total debt and employment. Importantly, economic effects are stronger for non-safe firms, consistent with higher difficulty in switching financing sources for riskier firms as compared to safer firms (see columns 1 vs 4). Therefore, there are some real effects for safe firms but results suggest that these effects are economically smaller than those for riskier firms. While the intended effect of the regulation is to reduce risky assets, it might have real consequences for productive non-safe firms. That is, non-safe firms even though they might be risky, might still have high levels of productivity. To get at this, we examine whether the effect varies within non-safe firms based on their ex-ante labor productivity.

The results of this exercise are presented in Table 11, where we mimic our analysis from Table 10, but add 'Productive' as a further interaction term. 'Productive' refers to a binary variable that takes the value of one whenever a firm's level of labor productivity (measured as gross-profit over number of employees) exceeds the cross-sectional top-decile in 2012, i.e., prior to the AQR, and zero otherwise. In Table 11, across columns (1) through (6) we can see that the interaction term 'AQR*Reviewed*Productive' is statistically (and economically) not significant. This shows that there are real effects for non-safe firms regardless of their productivity. This suggests that the real effects stemming from the supervisory exercise have effect even on firms that have higher ex-ante levels of productivity (even if they have high ex-ante credit risk).

IV.6 Discussion of Results and External Validity

It is worth noting that the actual intent of supervision is to reduce bank risk, and hence it is important

to analyze whether the AQR has a beneficial effect on future bank risk metrics such as loan loss reserves, non-performing loans or even Tier1-capital (equity over risk weighted assets).[28] To that aim, we collect data for each bank in our sample and examine how reviewed banks' risk metrics evolved in the period after the AQR as compared to non-reviewed banks and pre-AQR period. Our results are depicted in Appendix Table A10, where we document that the AQR has a positive effect on reviewed banks' future risk metrics. Both loan loss provisions and non-performing loans are differentially lower and Tier1 capital ratio is higher for reviewed banks after the AQR as compared to non-reviewed banks. This is consistent with active rebalancing of the portfolio's risk composition that we obtain with more granular data that is reported in the main tables of our paper. These results suggest that, at the aggregate bank level, there was a reduction in risk for reviewed banks as compared to non-reviewed banks after the AQR. That is, consistently with the intended effects of bank supervision, reviewed banks relatively improve their risk at the bank level, in particular loan provisions, non-performing loans and Tier 1 capital (capital over RWA) ratio.

However, our results provide a more nuanced view of these intended effects of bank supervision. Our results show: (i) riskier securities are bought back in a relatively short period of time. That is, there are only some very short-term effects that arise from the reduction of non-safe securities. (ii) Changes to credit are more sticky. (iii) There are strong, medium-term negative real effects for firms with high ex-ante credit risk, even for the most productive ones. (iii) Non-supervised/regulated nonbanks outside supervised banks buy the riskier assets sold.

A key question that arises is the general applicability of our main findings. While features of this exercise were unique in terms of the period and supervisory exercise, we believe that there is a lot to be learned from how the ECB conducted its asset quality review in 2013. While bank supervisors sometimes engage in random audits or daily supervision, it is important to highlight that large-scale supervisory exercises, such as stress tests, are done through point-in-time asset quality reviews. The reason being that these are massive supervisory exercises which cannot be done on a particular day or very short period of time. Importantly, these are also regular exercises, every year or two years (across many countries including Europe and USA). Thus, given that point-in-time exercises are still done (and will probably continue to be done), our results hold important implications. Our results highlight that banks may cut (and hence mask) their risks temporarily and potentially reload

[28] In unreported regressions, we can that on average there are no significant immediate differences between reviewed banks and non-reviewed banks across different size dimensions (notably total assets, total securities, total lending, as well as total borrowing, deposits and net worth) of the balance sheet when the analysis is done at the aggregate bank level.

on the risk once the supervisory test is done. However, our results also show that this reloading of risk is primarily limited to securities (liquid assets), not credit (illiquid assets).

Our results raise several broad issues. First, our findings relate to Myers and Rajan (1998) that argue that liquid securities in banks' balance sheet make it easy to shift risk and makes bank supervision therefore more challenging (Morgan, 2002). Second, banks revert to pre-review dynamics in some assets, in our case with securities holdings (see also, Du et al., 2018, Abbassi and Bräuning, 2021, Cenedese, Della Corte, and Wang, 2021). Thus, our results point to the need for more continuous supervision. However, as discussed above, at least for the time being continuous supervision is difficult from a practical point of view. Third, there is bank risk transferred from supervised banks to less regulated nonbanks, thereby affecting the impact of bank supervision in terms of overall financial stability (Farhi and Tirole, 2021). Finally, there are not just short-term but also medium-term negative spillovers for firm real effects (including firms with high productivity), thus highlighting some potential costs of supervision (Petersen and Rajan, 1995).

CONCLUSIONS

Government regulation requires effective supervision, but regulated entities may deviate from regulation by taking unobserved actions to supervisors. In this paper, we analyze the banking sector, exploiting a quasi-natural experiment—ECB's 2014 asset quality review (AQR)—in conjunction with the security and credit registers, and study whether banks' mask their risk in response to supervision. We also examine the associated real effects.

Our results show that, after the ECB's announcement of the AQR, reviewed banks increase their safe (vs. non-safe) securities holdings and reduce their supply of credit to riskier (as compared to safer) firms, relative to non-reviewed banks. The largest impact of reducing non-safe assets is on the riskiest securities, not on the riskiest credit. Moreover, there are immediate negative spillovers on asset prices and firm-level credit availability. Interestingly, exposed (unregulated) nonbanks buy the shed risk.

Moreover, in the period after the AQR compliance though, we find that reviewed banks fully reload back on riskier securities. This is, however, not the case for riskier credit. For non-safe firms associated with reviewed banks, our results suggest (binding) reduction in credit supply after the AQR. This reduction in credit supply has real effects at the firm level over more than three years after the AQR. Thus, there are persistent effects over the medium-term. These effects are especially

strong for firms with high ex-ante credit risk. Among these non-safe firms, even those with high ex-ante productivity experience negative real effects. That is, the increase in safe (as compared to non-safe) assets by banks due to supervision brought by the stress tests' AQR implies significant medium-term effects for firm-level real effects.

Overall, results suggest that banks partly mask risk in supervisory audits, notably on liquid securities that are easier to trade (different from credit), with not only short-term spillovers on asset prices and credit supply, but also with medium-term implications for the real economy (corporate real effects). The results hold important implications for policy. In particular, the results carry policy implications for stress tests in particular, and for the design of supervision in general. The results suggest that pre-defining the timing and structure of a supervisory exercise incentivizes window-dressing behavior of banks, as it is optimal from a bank's perspective (see e.g., Tarullo, 2014; Goldstein and Sapra, 2014; Coen, 2017). Thus, it might be necessary to have an element of surprise in the supervisory exercise, both with respect to the timing of the audits (either more continuous or random in time) and the degree of transparency over the specific process (i.e., methods and models used, and assets and type of risks assessed). The results also indicate that it is easier for banks to change the composition of liquid assets (securities trading) than illiquid ones (loans to firms). Thus, the results also point out that regulation of banks with substantial volume of marketable assets may pose significant challenges for supervision, with strong consequences for the overall economy. Finally, there are not just short-term but also medium-term negative spillovers for non-financial firm real effects (including firms with high productivity), thus highlighting some potential costs of banking supervision.

REFERENCES

Abbassi, P. and Bräuning, F., 2021. Demand Effects in the FX Forward Market: Micro Evidence from Banks' Dollar Hedging, *Review of Financial Studies*, 34(9), 4177-4215.

Abbassi, P., Iyer, R., Peydró, J.L. and Tous, F.R., 2016. Securities trading by banks and credit supply: Micro-evidence from the crisis, *Journal of Financial Economics*, 121(3), 569-594.

Abbassi, P. and Schmidt, M., 2018. A comprehensive view on risk reporting: Evidence from supervisory data, *Journal of Financial Intermediation*, 36, 74-85.

Acharya, V., Engle, R. and Pierret, D., 2014. Testing macroprudential stress tests: The risk of regulatory risk weights, *Journal of Monetary Economics*, 65, 36-53.

Acharya, V., Schnabl, P. and Suarez, G., 2013. Securitization without risk transfer, *Journal of Financial Economics*, 107(3), 515-536.

Agarwal, S., Lucca, D., Seru, A. and Trebbi, F., 2014. Inconsistent regulators: Evidence from banking, *Quarterly Journal of Economics*, 129(2), 889-938.

Allen, L. and Saunders, A., 1992. Bank window dressing: theory and evidence, *Journal of Banking and Finance*, 16(3), 585-632.

Altonji, J., E. Todd, and Taber, C., 2005. Selection on observed and unobserved variables: Assessing the effectiveness of catholic schools, *Journal of Political Economy*, 113(1), 151-184.

Amann, M., Baltzer, M. and Schrape, M., 2012. Microdatabase: Securities Holdings Statistics, a flexible multi-dimensional approach for providing user-targeted securities investments data, Bundesbank Technical Documentation.

Anbil, S. and Senyuz, Z., 2018. The regulatory and monetary policy nexus in the repo market, Finance and Economics Discussion Series 2018-027.

Banegas, A. and Tase, M., 2016. Reserve balances, the federal funds market and arbitrage in the new regulatory framework, Finance and Economics Discussion Series 2016-079.

Becker, B. and Opp, M., 2013. Regulatory reform and risk-taking: replacing ratings, National Bureau of Economic Research Working Paper No. 19257.

Bernanke, B., 2013. Stress testing banks: What have we learned? Speech at the "Maintaining Financial Stability: Holding a Tiger by the Tail", Federal Reserve Bank of Atlanta, Georgia.

Boyson, N., Fahlenbrach, R. and Stulz, R.M., 2016. Why don't all banks practice regulatory arbitrage? Evidence from usage of trust-preferred securities, *Review of Financial Studies*, 29(7), 1821-1859.

Buchak, G., Matvos, G., Piskorski, T. and Seru, A., 2018. Fintech, regulatory arbitrage, and the rise of shadow banks, *Journal of Financial Economics*, 130(3), 453-483.

Caballero, R.J. and Farhi, E., 2017. The safety trap, *Review of Economic Studies*, 85(1), 223-274.

Caballero, R.J., Farhi, E. and Gourinchas, P.O., 2016. Safe asset scarcity and aggregate demand, *American Economic Review*, 106(5), 513-18.

Caballero, R.J., Farhi, E. and Gourinchas, P.O., 2017. The safe assets shortage conundrum, *Journal of Economic Perspectives*, 31(3), 29-46.

Cenedese, G., Della Corte, P. and Wang, T., 2021. Currency Mispricing and Dealer Balance Sheets, *Journal of Finance*, 76, 2763-2803.

Coen, W., 2017. Regulatory equivalence and the global regulatory system. Keynote address at the International Financial Services Forum London, Thursday 25 May.

Demirguc-Kunt, A., Detragiache, E. and Merrouche, O., 2013. Bank capital: Lessons from the financial crisis, *Journal of Money, Credit and Banking*, 45(6), 1147-1164.

Dewatripont, M. and Tirole, J., 1994. The prudential regulation of banks. Cambridge, MIT Press.

Duffie, D., 2019. Prone to fail: the pre-crisis financial system, *Journal of Economic Perspectives*, 33(1), 81-106.

Du, W., Tepper, A. and Verdelhan, A., 2018. Deviations from covered interest rate parity, *Journal of Finance*, 73(3), 915-957.

European Central Bank, 2005. The new Basel capital framework and its implementation in the European Union, ECB Occasional Paper Series No. 42.

European Central Bank, 2013. Note comprehensive assessment October 2013.

European Central Bank, 2014. Aggregate report on the comprehensive assessment.

Farhi, E. and Tirole, J., 2021. Shadow banking and the four pillars of traditional financial intermediation, *Review of Economic Studies*, 88(6), 2622-2653..

Fleming, S., 2017. Fed banking watchdog nominee plans more ‘transparency’ in stress tests, *Financial Times*.

Fleming, S. and Steen, M., 2013. Draghi says bank tests need failures for credibility; ECB probe. *Financial Times*, London Ed1 (October 24, 2013). Retrieved from Factiva database.

Glaeser, E.L. and Shleifer, A., 2001. A reason for quantity regulation, *American Economic Review*, 91(2), 431-435.

Goldstein, I. and Sapra, H., 2014. Should banks' stress test results be disclosed? An analysis of the costs and benefits, *Foundations and Trends in Finance*, 8(1), 1-54.

Gorton, G., Lewellen, S. and Metrick, A., 2012. The safe-asset share, *American Economic Review*, 102(3), 101-06.

Granja, J. and Leuz, C., 2019. The death of a regulator: Strict supervision, bank lending and business activity, National Bureau of Economic Research Working Paper No. 24168.

Granja, J., Matvos, G. and Seru, A., 2017. Selling failed banks, *Journal of Finance*, 72(4), 1723-1784.

Halvorsen, R. and Palmquist, R., 1980. The Interpretation of Dummy Variables in Semilogarithmic Equations, *American Economic Review*, 70(3), 474-475.

Van Horen, N. and Kotidis, A., 2018. Repo market functioning: The role of capital regulation. Bank of England Working Paper No. 746.

He, J., Ng, L., and Wang, Q., 2004. Quarterly trading patterns of financial institutions, *Journal of Business*, 77(3), 493-509.

Hellwig, M.F., 2010. Capital regulation after the crisis: business as usual? Mimeo.

Hirtle, B., Kovner, A. and Plosser, M.C., 2020. The impact of supervision on bank performance, *Journal of Finance*, 75(5), 2765-2808.

Irani, R.M., Iyer, R., Meisenzahl, R.R. and Peydro, J.L., 2021. The rise of shadow banking: Evidence from capital regulation, *Review of Financial Studies*, 34(5), 2181-2235.

Joint Committee of the European Supervisory Authorities, 2014. Mapping of Standard & Poor's ratings services' credit assessments under the standardized approach.

Khwaja, A.I. and Mian, A., 2008. Tracing the impact of bank liquidity shocks: Evidence from an emerging market, *American Economic Review*, 98(4), 1413-1442.

Kotomin, V. and Winters, D., 2006. Quarter-end effects in banks: preferred habitat or window dressing? *Journal of Financial Services Research*, 29(1), 61-82.

Laffont, J-J. and Tirole, J. 1993. A theory of incentives in procurement and regulation, Cambridge, MA: MIT Press.

Lakonishok, J., Shleifer, A., Thaler, R. and Vishney, R., 1991. Window dressing by pension fund managers, *American Economic Review*, 81(2), 227-231.

Lucca, D., Seru, A. and Trebbi, F., 2014. The revolving door and worker flows in banking regulation, *Journal of Monetary Economics*, 65, 17-32.

Martinez-Miera, D. and Repullo, R., 2019. Markets, Banks, and Shadow Banks, ECB WP 2234.

Morgan, D., 2002. Rating banks: Risk and uncertainty in an opaque industry, *American Economic Review*, 92(4), 874-888.

Munyan, B., 2017. Regulatory arbitrage in repo markets, *Office of Financial Research WP*.

Musto, D., 1999. Investment decisions depend on portfolio disclosures, *Journal of Finance*, 54(3), 935-952.

Myers, S.C. and Rajan, R.G., 1998. The paradox of liquidity, *Quarterly Journal of Economics*, 113(3), 733-771.

Ng, L. and Wang, Q., 2004. Institutional trading and the turn-of-the-year effect, *Journal of Financial Economics*, 74(2), 343-366.

Owens, E. and Wu, J., 2015. Quarter-end repo borrowing dynamics and bank risk opacity, *Review of Accounting Studies*, 20(3), 1164-1209.

Petersen, M.A. and Rajan, R.G., 1995. The effect of credit market competition on lending relationships, *Quarterly Journal of Economics*, 110(2), 407-443.

Plantin, G., 2014. Shadow banking and bank capital regulation, *Review of Financial Studies*, 28(1), 146-175.

Posner, R.A., 1975. The social costs of monopoly and regulation, *Journal of Political Economy*, 83(4), 807-827.

Schild, C.-J., Schultz, S. and F. Wieser, 2017. Linking Deutsche Bundesbank Company Data using Machine-Learning-Based Classification, Deutsche Bundesbank Technical Report 2017-01.

Standard & Poor's Ratings Services, 2012. Default, transition, and recovery: 2012 annual global corporate default study and rating transitions. Available online: https://www.nact.org/resources/NACT_2012_Global_Corporate_Default.pdf.

Stigler, G.J., 1971. The theory of economic regulation, *Bell Journal of Economics and Management Science*, 3-21.

Tarullo, D.K., 2014. Stress testing after five years. Speech given at the Federal Reserve Third Annual Stress Test Modelling Symposium, Boston, Massachusetts. Available online: https://www.federalreserve.gov/newsevents/speech/tarullo20140625a.htm.

Tirole, J. 2014. Market failures and public policy. Nobel Prize Lecture, December 8, 2014.

The White House, 2015. Occupational licensing: A framework for policymakers. The Council of Economic Advisers, July.

TABLE 1
DIALING-UP OF SAFE SECURITIES AFTER THE AQR ANNOUNCEMENT
+/− 3 MONTHS AROUND AQR ANNOUNCEMENT

	Dependent variable: Log(securities holdings)							
	Reviewed vs. largest non-reviewed banks						Within reviewed banks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Safe*AQR*Reviewed					0.0397***	0.0346***	0.0191***	0.0226***
					(0.01)	(0.01)	(0.01)	(0.01)
Safe*AQR					-0.0202***	-0.0121***		
					(0.01)	(0.00)		
Safe					-0.0113	-0.0308		
					(0.05)	(0.04)		
AQR*Reviewed	-0.0168***	-0.0208***	-0.0215***	-0.0291***	-0.0370***	-0.0428***		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)		
Safe*Reviewed					0.0628*	0.0489	0.0376	0.0193
					(0.03)	(0.06)	(0.05)	(0.04)
AQR control	Y	Y	-	-	-	-	-	-
Reviewed control	Y	-	-	-	-	-	-	-
Security FE	N	N	Y	-	Y	-	Y	-
Bank FE	N	Y	Y	-	Y	-	Y	-
Security*Bank FE	N	N	N	Y	N	Y	N	Y
Time FE	N	N	Y	Y	Y	Y	Y	Y
Observations	316,221	316,221	316,221	316,221	316,221	316,221	191,066	191,066
R-squared	0.085	0.444	0.611	0.987	0.611	0.987	0.553	0.978

The dependent variable is the logarithm of securities nominal holdings by each bank b of security s during month t in the period July 2013 to December 2013, i.e., +/− three months around the AQR announcement. 'Safe' is a dummy variable that equals the value of one whenever the security has a rating between AAA and AA-, and zero otherwise. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of October, November and December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1 to 6, we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 7 and 8, we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are either included ('Y'), not included ('N'), or spanned by another set of fixed effects ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and security level and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 2
DIALING-UP OF SAFE CREDIT AFTER THE AQR ANNOUNCEMENT
+/− 3 MONTHS AROUND AQR ANNOUNCEMENT

	Dependent variable: Log(credit)							
	Reviewed vs. largest non-reviewed banks						Within reviewed banks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Safe*AQR*Reviewed					0.0422***	0.0263**	0.0245***	0.0238***
					(0.02)	(0.01)	(0.01)	(0.01)
Safe*AQR					-0.0159	-0.0026		
					(0.01)	(0.01)		
Safe					0.0027	0.0062		
					(0.05)	(0.02)		
AQR*Reviewed	-0.0176***	-0.0177***	-0.0177***	-0.0182***	-0.0500***	-0.0378***		
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)		
Safe*Reviewed					-0.0310	-0.0293	-0.0283	-0.0231**
					(0.06)	(0.02)	(0.02)	(0.01)
AQR control	Y	Y	-	-	-	-	-	-
Reviewed control	Y	-	-	-	-	-	-	-
Firm FE	N	N	Y	-	Y	-	Y	-
Bank FE	N	Y	Y	-	Y	-	Y	-
Firm*Bank FE	N	N	N	Y	N	Y	N	Y
Time FE	N	N	Y	Y	Y	Y	Y	Y
Observations	160,624	160,624	160,624	160,624	160,624	160,624	141,774	141,774
R-squared	0.001	0.125	0.899	0.977	0.899	0.977	0.903	0.977

The dependent variable is the logarithm of loan amount by each bank b to borrower j during quarter t in the period September 2013 to December 2013, i.e., +/− three months around the AQR announcement. 'Safe' is a dummy variable that equals the value of one if loan j has a probability of default (PD) below the cross-sectional mean PD of all borrowers' PDs in time t-1. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1 to 6, we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 7 and 8, we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are either included ('Y'), not included ('N'), or spanned by another set of fixed effects ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and firm level and reported in parentheses (rounded to the second decimal. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 3 PANEL A
DIALING-UP OF SAFE SECURITIES AFTER THE AQR ANNOUNCEMENT
OTHER RISK MEASURES

	Dependent variable: Log(securities holdings)									
Variable:	Safe		High Yield		GIIPS		Long-Term		Long-Term Non-Safe	
	Reviewed vs. largest non-reviewed banks	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable *AQR*Reviewed	0.0204**	0.0132*	-0.0660***	-0.0552***	-0.0375***	-0.0194*	-0.0434***	-0.0419***	-0.2590***	-0.3259***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.06)	(0.06)
Variable *AQR	-0.0072		0.0108		0.0181**		0.0015		-0.0669***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.01)	
Variable	-0.0132		-0.0335***				-0.3178***		-0.1455	
	(0.05)		(0.01)				(0.08)		(0.11)	
AQR*Reviewed	-0.0388***		-0.0315***		-0.0253***		-0.0262***		-0.0277***	
	(0.01)		(0.01)		(0.00)		(0.00)		(0.00)	
Variable *Reviewed	-0.0005	-0.0138	0.0298	-0.0037			0.1452	-0.1726**	0.3717**	0.2263**
	(0.08)	(0.06)	(0.02)	(0.02)			(0.11)	(0.08)	(0.15)	(0.09)
Security*Bank FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	106,952	63,414	78,526	45,044	106,952	63,414	106,952	63,414	106,952	63,414
R-squared	0.989	0.982	0.988	0.979	0.989	0.982	0.989	0,983	0.989	0,983

This table replicates Table 1, but restricts the sample to September 2013 and December 2013. The dependent variable is the logarithm of securities nominal holdings by each bank b of security s during month t. 'Safe' is a dummy variable that equals the value of one whenever the security has a rating between AAA and AA-, and zero otherwise. 'High Yield' is a dummy variable that equals the value of one whenever the security has a higher yield than the cross-sectional mean of all yields in t-1, and zero otherwise. 'GIIPS' is a dummy variable that equals the value of one whenever the issuer of the security is headquartered in Greece, Ireland, Italy, Portugal, or Spain, and zero otherwise. 'Long-Term' is a dummy variable that equals the value of one whenever the security has a residual maturity of higher than 10 years, and zero otherwise. 'Long-Term Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating *and* a residual maturity of higher than 10 years, and zero otherwise. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1, 3, 5, 7, and 9 we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 2, 4, 6, 8, and 10 we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are included ('Y'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and security level and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 3 PANEL B
DIALING-UP OF SAFE CREDIT AFTER THE AQR ANNOUNCEMENT
OTHER RISK CUT-OFFS

	Dependent variable: Log(credit)							
Variable:	Median		75%		90%		Continuous	
	Reviewed vs. largest non-reviewed banks	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable *AQR*Reviewed	0.0172[a]	0.0248***	0.0231**	0.0262***	0.0279**	0.0287***	0.0393**	0.0447***
	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
Variable *AQR	0.0076		0.0031		0.0008		0.0054	
	(0.01)		(0.01)		(0.01)		(0.01)	
Variable	0.0091		0.0259		0.0329		-0.0137	
	(0.03)		(0.02)		(0.02)		(0.03)	
AQR*Reviewed	-0.0248***		-0.0329***		-0.0401***		-0.0132**	
	(0.00)		(0.00)		(0.01)		(0.00)	
Variable *Reviewed	-0.0135	-0.0044	-0.0575**	-0.0315***	-0.0414	-0.0085	-0.0345	-0.0483*
	(0.03)	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.04)	(0.02)
Firm*Bank FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	161.328	142.436	161.328	142.436	161.328	142.436	161.328	142.436
R-squared	0,978	0,977	0,978	0,977	0,978	0,977	0,978	0,977

This table replicates Table 2, but uses different cut-offs to compute 'safe' credit. The dependent variable is the logarithm of loan amount by each bank b to borrower j during quarter t in the period September 2013 to December 2013, i.e., +/− three months around the AQR announcement. 'Median' ('75%' and '90%', respectively) is a dummy variable that equals the value of one if loan j has a probability of default (PD) below the cross-sectional median (75th percentile and 90th percentile, respectively) PD of all borrowers' PDs in time t-1. 'Continuous' equals the probability of default (PD) of borrower j in time t-1. For the sake of convenient presentation, we multiplied in columns 7 and 8 each coefficient that involves 'Continuous' with (-1). 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1, 3, 5, and 7 we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 2, 4, 6, and 8, we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are included ('Y'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and firm level and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level; [a]: Significant at 12% level.

TABLE 4
PLACEBO TEST: *2012 AND 2014*

	Reviewed vs. largest non-reviewed			
Placebo:	*Sept 2012 vs. Dec 2012*		*Sept 2014 vs. Dec 2014*	
	Dependent variable:			
	Log(securities holdings)	Log(credit)	Log(securities holdings)	Log(credit)
	(1)	(2)	(3)	(4)
Safe**Placebo* *Reviewed	-0.0080	-0.0031	-0.0031	0.0042
	(0.02)	(0.01)	(0.01)	(0.01)
Safe**Placebo*	Y	Y	Y	Y
Safe	Y	Y	Y	Y
Placebo *Reviewed	Y	Y	Y	Y
Safe*Reviewed	Y	Y	Y	Y
Security*Bank FE	Y	-	Y	-
Firm*Bank FE	-	Y	-	Y
Time FE	Y	Y	Y	Y
Observations	168,380	190,376	400,972	150,530
R-squared	0.982	0.978	0.997	0.977

This table replicates our main estimation (column 6) from Table 1 and 2, but for 2012 and 2014, respectively. The dependent variable in columns 1 and 3 is the logarithm of securities nominal holdings by each bank b of security s during month t. The dependent variable in column 2 and 4 is the logarithm of loan amount by each bank b of borrower j during quarter t. Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. 'Placebo' is a dummy variable that equals the value of one for October, November, and December 2012 (and 2014, respectively), and zero otherwise. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. Lower-order interaction terms are included ('Y'), but coefficients are left unreported for clarity. Fixed effects are either included ('Y') or not applicable ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 5
SPILLOVERS AFTER THE AQR ANNOUNCEMENT

	Dependent variable:	
	Price	Credit
	(1)	(2)
Safe*AQR*Reviewed	0.6865***	0.0227**
	(0.14)	(0.01)
Safe*AQR	-1.6707***	0.0019
	(0.08)	(0.01)
AQR*Reviewed	-0.7796***	-0.0384***
	(0.14)	(0.01)
Securities FE	Y	-
Firm FE	-	Y
Time FE	Y	Y
Observations	11,217	130,266
R-squared	0.985	0.982

The dependent variable in column 1 is the price of security s during month t in the period from July 2013 to December 2013, i.e., before and after the AQR announcement. 'Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating as on September 2013, and zero otherwise. 'Reviewed' is a binary variable that equals one when the security is primarily held (i.e., more than 50th percentile) by reviewed banks as on September 2013, and zero otherwise. The dependent variable in column 2 is the logarithm of loan amount borrowed by firm j during quarter t in the period September 2013 and December 2013. 'Non-Safe' is a dummy variable that equals the value of one if loan j has a probability of default (PD) below the cross-sectional mean PD of all borrowers' PDs as on September 2013, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than 50th percentile) provided by reviewed banks as on September 2013, and zero otherwise. In column 1,'AQR' is a binary variable and equals the value of one for the months October, November, and December 2013, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). In column 2, 'AQR' is a binary variable and equals the value of one for the month December 2013, and zero otherwise. Fixed effects are either included ('Y') or not applicable ('-'). Standard errors are clustered at the asset level (i.e., security or firm, respectively) and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 6
WHO IS BUYING SECURITIES THAT REVIEWED BANKS SELL?

	Dependent variable: Log(securities holdings)				
	All securities		Unsold securities	Sold securities	
	(1)	(2)	(3)	(4)	(5)
Non-Safe*AQR*Exposure to Reviewed	0.0396**	0.1972*	-0.0009	0.0415**	
	(0.02)	(0.11)	(0.02)	(0.02)	
ECB CQS 2*AQR*Exposure to Reviewed					0.0389**
					(0.02)
ECB CQS 3*AQR*Exposure to Reviewed					0.0472**
					(0.02)
ECB CQS Non-Eligible*AQR*Exposure to Reviewed					0.0696
					(0.04)
Investor*Security FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Observations	96,137	96,137	4,903	91,234	91,234
R-squared	0.980	0.980	0.987	0.979	0.979

This table shows the buying behaviour of investment funds with exposure to reviewed banks conditional on buying. The dependent variable is the logarithm of the securities holdings (in nominal value) by investment fund i of security s during month t in the period July 2013 and December 2013, i.e., 3 months before and 3 months after the AQR announcement. In columns 1 and 2, results refer to the sample including all purchased securities. In column 3, the sample restricted to securities that are purchased, but not sold by reviewed banks. In columns 4 and 5, the sample is restricted to purchased securities that sold by reviewed banks. 'Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating, and zero otherwise. ECB CQS refers to the ECB's credit quality steps (https://www.ecb.europa.eu/paym/coll/risk/ecaf/html/index.en.html). 'ECB CQS 2' refers to a dummy variable that equals the value of one if the security has a rating between A- to A+, and zero otherwise. 'ECB CQS 3' equals the value of one if the security has a rating between BBB+ to BBB-, and zero otherwise. 'ECB CQS Non-Eligible' is a binary variable that equals the value of one if the security has a rating below BB+, and zero otherwise. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of October, November December 2013, and zero before. In columns 1, 3, 4, and 5,'Exposure to Reviewed' is a binary variable that equals the value of one whenever an investment fund holds a large share of bonds (top 25th percentile) issued by reviewed banks, and zero otherwise. In column 2, 'Exposure to Reviewed' refers to the continuous share of bonds issued by reviewed banks (as opposed to an indicator variable). In all columns, lower order interaction terms of all right-hand-side variables are included, but absorbed here for expositional clarity. Fixed effects are included accordingly ('Y'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at fund and security level and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 7
DIALING-DOWN OF SAFE ASSETS AFTER THE AQR OVERALL EXERCISE
+/− 9 MONTHS AROUND AQR ANNOUNCEMENT

	Dependent variable:			
	Log(securities holdings)		Log(credit)	
	Reviewed vs. largest non-reviewed banks	Within reviewed banks	Reviewed vs. largest non-reviewed banks	Within reviewed banks
	(1)	(2)	(3)	(4)
Safe*AQR*Reviewed	0.0149**	0.0152**	0.0355***	0.0329***
	(0.01)	(0.01)	(0.01)	(0.01)
Safe*AQR-Compliance*Reviewed	0.0180	0.0103	0.0453***	0.0553***
	(0.01)	(0.01)	(0.01)	(0.01)
Safe*Post-AQR*Reviewed	-0.0058	-0.0087	0.0426***	0.0559***
	(0.02)	(0.01)	(0.02)	(0.01)
Safe*AQR	0.0022		-0.0026	
	(0.01)		(0.01)	
Safe*AQR-Compliance	-0.0056		0.0100	
	(0.01)		(0.01)	
Safe*Post-AQR	-0.0012		0.0134	
	(0.01)		(0.01)	
Safe	-0.0223		-0.0070	
	(0.03)		(0.01)	
AQR*Reviewed	-0.0442***		-0.0540***	
	(0.01)		(0.01)	
Safe*Reviewed	0.0131	-0.0120	-0.0234*	-0.0303***
	(0.05)	(0.04)	(0.01)	(0.01)
AQR-Compliance*Reviewed	-0.0734***		-0.0733***	
	(0.01)		(0.01)	
Post-AQR*Reviewed	-0.1012***		-0.0712***	
	(0.01)		(0.01)	
Security*Bank FE	Y	Y	-	-
Firm*Bank FE	-	-	Y	Y
Time FE	Y	Y	Y	Y
Observations	1,075,282	648,889	572,421	505,667
R-squared	0.961	0.940	0.946	0.945

The dependent variable in columns 1 and 2 is the logarithm of securities nominal holdings by each bank b of security s during month t in the period January 2013 to September 2014, i.e., +/− nine months around the AQR. The dependent variable in columns 3 and 4 is the logarithm of loan amount by each bank b to borrower j during quarter t in the period January 2013 to September 2014, i.e., +/- nine months around the AQR. 'AQR' equals the value of one for the months October, November, December 2013, and zero otherwise; 'AQR-Compliance' equals the value of one for the months January to June 2014, and zero otherwise; 'Post-AQR' equals the value of one for the months from July 2014 onwards, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1 and 3, we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 2 and 4, we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are either included ('Y') or spanned by another set of fixed effects ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 8
DIALING-DOWN OF SAFE ASSETS AFTER THE AQR OVERALL EXERCISE DEPENDING ON TRADING EXPERTISE
+/− 9 MONTHS AROUND AQR ANNOUNCEMENT

	Within reviewed banks	
	Dependent variable:	
	Log(securities holdings)	Log(credit)
	(1)	(2)
Safe*AQR	0.0280**	0.0171**
	(0.01)	(0.01)
Safe*AQR*Trading bank	-0.0176	0.0255**
	(0.02)	(0.01)
Safe*AQR-Compliance	0.0366*	0.0307***
	(0.02)	(0.01)
Safe*AQR-Compliance*Trading bank	-0.0344	0.0323***
	(0.02)	(0.01)
Safe*Post-AQR	0.0309	0.0273**
	(0.02)	(0.01)
Safe*Post-AQR*Trading bank	-0.0463*	0.0348**
	(0.03)	(0.01)
Safe	0.0349	0.0229***
	(0.07)	(0.01)
AQR*Trading bank	0.0175*	-0.0477***
	(0.01)	(0.01)
Safe*Trading bank	-0.0407	-0.0634***
	(0.08)	(0.01)
AQR-Compliance*Trading bank	0.0032	-0.0254***
	(0.01)	(0.01)
Post-AQR*Trading bank	-0.1100***	-0.0006
	(0.01)	(0.01)
Securities*Bank FE	Y	-
Firm*Bank FE	-	Y
Time FE	Y	Y
Observations	663,380	524,731
R-squared	0.941	0.947

The dependent variable in column 1 is the logarithm of securities nominal holdings by each bank b of security s during month t in the period January 2013 to September 2014, i.e., +/− nine months around the AQR. The dependent variable in column 2 is the logarithm of loan amount by each bank b to borrower j during quarter t in the period January 2013 to September 2014, i.e., +/- nine months around the AQR. 'AQR' equals the value of one for the months October, November, December 2013, and zero otherwise; 'AQR-Compliance' equals the value of one for the months January to June 2014, and zero otherwise; 'Post-AQR' equals the value of one for the months from July 2014 onwards, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. We restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one. 'Trading bank' is a binary variable that equals one when the reviewed bank has membership to the largest-fixed income platform in Germany (Eurex Exchange), and zero otherwise, which proxies for banks with higher trading expertise. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB, i.e., when 'Reviewed' equals the value of one. Fixed effects are either included ('Y') or spanned by another set of fixed effects ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 9: REAL EFFECTS

	Dependent variable:					
	Total Firm Debt	Sales	Employment	Total Firm Debt	Sales	Employment
	Short-Term			Medium-Term		
	(1)	(2)	(3)	(4)	(5)	(6)
Safe*AQR*Reviewed	0.0301***	0.0357**	0.0235***	0.0508***	0.0637***	0.0367***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
AQR*Reviewed	-0.0217***	-0.0377***	-0.0175**	-0.0372***	-0.0613***	-0.0274***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Safe*AQR	-0.0058	-0.0026	0.0005	-0.0102	-0.0118	-0.0043
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
Firm FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Observations	85,155	54,136	82,636	117,464	74,951	114,947
R-squared	0.967	0.977	0.985	0.956	0.971	0.978

The dependent variables in columns 1 and 4, 2 and 5, 3 and 6 are the logarithm of total firm debt, sales, and employment, respectively, of firm j in year t in the period 2011-2014 ('short-term') and 2011-2016 ('medium-term'), i.e., before and after the AQR announcement. 'Safe' is a dummy variable that equals the value of one if borrower j has a probability of default (PD) below the cross-sectional mean PD of all borrowers' PDs as on September 2013, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than 50th percentile) provided by reviewed banks as on September 2013, and zero otherwise. 'AQR' is a binary variable and equals the value of one for the years 2013 onwards, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential short-term and medium-term effect, respectively, relative to the period before the AQR announcement). We further include the logarithm of firm's equity in t-1 as time-varying firm control. Fixed effects are included ('Y'). Standard errors are clustered at firm and year level and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 10: REAL EFFECTS
SAFE AND NON-SAFE DECOMPOSITION

	Dependent variable:					
	Total Firm Debt	Sales	Employment	Total Firm Debt	Sales	Employment
	Medium-Term			Medium-Term		
	Within Non-Safe			Within Safe		
	(1)	(2)	(3)	(4)	(5)	(6)
AQR*Reviewed	-0.0373***	-0.0611***	-0.0273***	0.0137*	0.0023	0.0093*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Firm FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Observations	70,531	40,633	68,442	46,933	34,318	46,505
R-squared	0.945	0.964	0.977	0.957	0.973	0.979

The dependent variables in columns 1 and 4, 2 and 5, 3 and 6 are the logarithm of total firm debt, sales, and employment, respectively, of firm j in year t in the period 2011-2016 ('medium-term'), i.e., before and after the AQR announcement. 'Safe' ('Non-Safe') is a dummy variable that equals the value of one if borrower j has a probability of default (PD) below (above) the cross-sectional mean PD of all borrowers' PDs as on September 2013, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than 50th percentile) provided by reviewed banks as on September 2013, and zero otherwise. 'AQR' is a binary variable and equals the value of one for the years 2013 onward, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential medium-term effect, respectively, relative to the period before the AQR announcement). We further include the logarithm of firm's equity in t-1 as time-varying firm control. Fixed effects are included ('Y'). Standard errors are clustered at firm and year level and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 11: REAL EFFECTS
SAFE AND NON-SAFE DECOMPOSITION
FURTHER HETEROGENEITY

	Dependent variable:					
	Total Firm Debt	Sales	Employment	Total Firm Debt	Sales	Employment
	Medium-Term Within Non-Safe			Medium-Term Within Safe		
	(1)	(2)	(3)	(4)	(5)	(6)
AQR*Reviewed	-0.0299***	-0.0535***	-0.0274***	0.0131*	0.0015	0.0090*
	(0.01)	(0.01)	(0.01)	(0.007)	(0.01)	(0.005)
AQR*Reviewed*Productive	-0.0394	-0.0218	0.0044	0.0085	0.0092	0.0036
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)
AQR*Productive	-0.0096	-0.0381***	-0.0113	-0.0524**	-0.0591***	-0.0149
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Firm FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Observations	70,531	40,633	68,442	46,933	34,318	46,505
R-squared	0.945	0.964	0.977	0.957	0.973	0.979

The dependent variables in columns 1 and 4, 2 and 5, 3 and 6 are the logarithm of total firm debt, sales, and employment, respectively, of firm j in year t in the period 2011-2016 ('medium-term'), i.e., before and after the AQR announcement. 'Safe' ('Non-Safe') is a dummy variable that equals the value of one if borrower j has a probability of default (PD) below (above) the cross-sectional mean PD of all borrowers' PDs as on September 2013, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than 50th percentile) provided by reviewed banks as on September 2013, and zero otherwise. 'AQR' is a binary variable and equals the value of one for the years 2013 onwards, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential medium-term effect, respectively, relative to the period before the AQR announcement). 'Productive' refers to a binary variable that takes the value of one whenever a firm's level of labor productivity (measured as gross-profit over number of employees) exceeds the cross-sectional top-decile in 2012, i.e., prior to the AQR, and zero otherwise. We further include the logarithm of firm's equity in t-1 as time-varying firm control. Fixed effects are included ('Y'). Standard errors are clustered at firm and year level and reported in parentheses (rounded to the second decimal). ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.