EUROPEAN CENTRAL BANK

EUROSYSTEM

Working Paper Series

Claudio Bassi, Markus Behn, Michael Grill, Martin Waibel

Window dressing of regulatory metrics: evidence from repo markets

No 2771 / February 2023

Abstract

This paper investigates both the magnitude and the drivers of bank window dressing behaviour in euro-denominated repo markets. Using a confidential transaction-level data set, our analysis illustrates that banks engineer an economically sizeable contraction in their repo transactions around regulatory reporting dates. We establish a causal link between these reductions and banks' incentives to window dress and document the role of the leverage ratio and the G-SIB framework as the most relevant drivers of window dressing behaviour. Our findings suggest that regulatory action is warranted to limit banks' ability to window dress.

Keywords: banking regulation, window dressing, repo markets, leverage ratio, G-SIBs
JEL Classification Codes: C23, G14, G18, G21, G28

Non-technical Summary

This paper leverages on a confidential transaction-level data set available at the European Central Bank to investigate both the magnitude and the drivers of bank window dressing behaviour in the market for euro-denominated repurchase agreements (repos). Window dressing refers to the practice of financial intermediaries to engineer a contraction of their balance sheets at regulatory reporting dates so as to report more favorable regulatory metrics, and ultimately save funding costs. The short-term nature of repos makes them particularly apt for window dressing purposes.

We document economically sizeable and long-lasting reductions in balance sheet repo volumes around quarter- and year-ends for a sample of 36 large euro area banks. Specifically, at the aggregate level, we find that banks reduce their balance sheet repo volumes by around 12.5 percent prior to quarter-ends and by up to 25 percent before year-ends. Our econometric analysis suggests that the observed contractions are indeed attributable to bank window dressing behaviour. That is, they are due to a reduction in banks' demand for repos around regulatory reporting dates, rather than a reduction in the supply of repo funds around period-ends.

We further employ the granularity of our novel data set to identify the main drivers of banks' window dressing behaviour by analysing variations in period-end balance sheet repo volumes between banks that differ with respect to the level of their leverage ratio, their G-SIB status, or other regulatory variables that could affect incentives to window dress. We find that banks with relatively low leverage ratios (below the median) reduce their balance sheet repo exposure at quarter-ends and year-ends more than banks with relatively high leverage ratios. We also find that, on average, compared with non-G-SIBs, G-SIBs significantly reduce their repo market activity at quarter-ends and year-ends.

Our findings have important policy implications as window dressing behaviour can have adverse effects on financial stability for two main reasons. First, a reduction in repo transaction volumes around period-end dates can result in unwarranted disruptions in the provision of key financial services, thereby imperiling the smooth transmission of monetary policy or even creating spillover externalities to other financial markets. Second, reported and disclosed regulatory metrics may overstate both the resilience of individual institutions and the aggregate resilience of the banking system over the course of the reporting period; an effect that is further exacerbated by the observation that the banks engaging in the most aggressive window dressing behaviour are those with the lowest leverage ratios. Overall, our findings support the view that regulatory action is warranted to limit banks' ability to window dress their regulatory metrics.

1 Introduction

"Window-dressing by banks is unacceptable, as it undermines the intended policy objectives of the leverage ratio requirement and risks disrupting the operations of financial markets."

- BCBS, *Statement on leverage ratio window-dressing behaviour*, October 2018

Window dressing is a growing concern for regulators and supervisors around the world and refers to a practice by which banks contract their balance sheets towards the end of a period with the aim of reporting and disclosing more favourable regulatory metrics (Committee on the Global Financial System (2017), Bank for International Settlements (2018), Basel Committee on Banking Supervision (2018b)).[1] Such behaviour can have adverse effects on financial stability for two main reasons. First, financial market functioning may be adversely affected if banks reduce the provision of certain services towards the end of a reporting period (Du et al. (2018), Brand et al. (2019)), where heightened volatility can also imperil the proper functioning of monetary policy (Duffie and Krishnamurthy (2016), Banegas and Tase (2019)). Second, window dressing may imply that reported and disclosed regulatory metrics overstate the resilience of individual institutions and the banking system as a whole and may also distort the estimation of banks' overall systemic importance under the G-SIB framework (Behn et al. (2019), Garcia et al. (2021)), resulting in a possible underestimation of risk and a misallocation of capital requirements in the banking system.

In this paper, we take a deeper look at potential window dressing in the market for euro-denominated repurchase agreements – henceforth, "repos" – using a new transaction-level database available at the European Central Bank (ECB) to document the magnitude and identify the possible drivers of euro area banks' window dressing behaviour. The short-term nature of repo contracts makes them particularly easy to be used for window dressing purposes as banks can quickly adjust their repo exposure around reporting dates. The sudden reduction in repo market liquidity around regulatory reporting dates and the associated drop in repo rates have been well documented and have raised concerns regarding the implications of window dressing for the functioning of repo markets (see for example Committee on the Global Financial System (2017)).[2] Our empirical analysis further informs this on-going debate by making use of a unique, purpose-built data set with daily frequency that allows to quantify banks' window dressing behaviour and repo market volatility around quarter- and year-end dates. Moreover, the transaction-level nature of the data set enables us to establish a causal link between observed drops in repo quantities and prices as well as banks' desire to report more favourable regulatory metrics. Finally, we further leverage on the granularity of the data to analyse the main drivers of window dressing behaviour, relating

[1]For example, the reporting and disclosure of the Basel III leverage ratio at quarter-ends and the calculations of banks' scores in the global systemically important bank (G-SIB) framework at the year-end are based on snapshots of the balance sheet on a single day.

[2]Moreover, Fritsche et al. (2020) illustrate that repo market disruptions can spill over to other markets by increasing volatility of bid-ask spreads in bond markets and limiting the potential for arbitrage in swap markets. To mitigate these concerns, the Basel Committee on Banking Supervision (BCBS) has recently taken action to limit the incentives for banks to use repos for window dressing purposes. In particular, the BCBS has agreed to an additional disclosure requirement for the leverage ratio, requiring banks to calculate and disclose their ratios based on quarterly averages of daily values of their securities financing transactions (SFTs), including repos (Basel Committee on Banking Supervision (2018b), Basel Committee on Banking Supervision (2019)). The additional disclosure is on top of the existing requirement to disclose the leverage ratio based on the end-of-quarter balance sheet. Banks in the EU have to provide such additional disclosure since the end of 2021.

variation in period-end repo volume reductions to differences across banks with respect to the level of their leverage ratio, their G-SIB status, or other regulatory variables that could affect the incentives to window dress.

We document substantial declines in banks' balance sheet repo positions around reporting dates. Specifically, at aggregate level, we find that banks reduce their balance sheet repo volumes by around 12.5 percent prior to quarter-ends and by up to 25 percent before year-ends. We further show that at year-ends (quarter-ends) banks start to contract repo volumes 6-7 (2-3) days prior to the reporting date and require more than 10 (7) days until pre quarter-end volumes are reached. Together, this underscores both the severity and the extended period during which the repo market is affected by window dressing around regulatory reporting dates. Moreover, we provide compelling evidence that the observed period-end declines in repo volumes can be causally attributed to banks engineering a contraction of their balance sheets near period-ends to report more favorable regulatory metrics. First, we document that during the last four trading days prior to a reporting date (i.e. when a one-week repo, but not an overnight repo, ends up on the balance sheet on the reporting date) banks significantly reduce their balance sheet volumes in one week repo contracts, but not in overnight repos. This effect is also documented for different tenor combinations and vanishes when conducting placebo tests where the treatment period is arbitrarily shifted to a period where none of the contracts exert balance sheet pressure. Second, we find that volume contractions directly map into repo rate declines. In equilibrium, this downward rate shift can be reconciled with a contraction in banks' demand for repo, but not with a contraction of repo supply which further strengthens the interpretation that the observed volume drops are indeed attributable to bank window dressing. Lastly, exploiting information on the counterparty type in banks' repo transactions we show that volume contractions are also present vis-à-vis counterparties with no window dressing incentives such as central banks.

Our results further suggest that the leverage ratio and the G-SIB framework are the most significant drivers of period-end window dressing behaviour. We find that banks with relatively low leverage ratios (below the median) reduce their balance sheet repo exposure at quarter-ends and year-ends by an average of EUR 1.7 billion and EUR 2.3 billion, respectively, more than banks with relatively high leverage ratios (above the median). This effect is both statistically and economically significant, considering that the average daily balance sheet repo book of a bank is only EUR 15.8 billion. We also find that, on average, compared with non-G-SIBs, G-SIBs reduce their repo market activity by an additional EUR 2.7 billion and EUR 4.9 billion at quarter-ends and year-ends, respectively. Furthermore, the engineered reduction in repo volumes according to tenor structures is driven by banks with below-median leverage ratios, and by G-SIBs that are close to a bucket threshold, both of which suggests that these regulatory factors are indeed driving the observed window dressing behaviour. In contrast, other regulatory metrics do not appear to exert a significant impact on banks' window dressing behaviour in repo markets.

Lastly, we exploit two recent changes to the calculation of the leverage ratio that allowed some banks in the EU to exempt certain exposures (i.e. certain state guaranteed deposits in France and central bank reserves during the pandemic) from the leverage ratio. These policy changes increased leverage ratios of affected banks, possibly reducing their window dressing incentives. While we find no effect for the exemption of guaranteed deposits, the results for the exemption of central bank reserves suggest some modest reduction in window dressing incentives, in line with our findings on the general relevance of the leverage ratio for window dressing activity.

Our paper contributes to a growing literature on window dressing behaviour in the banking sector. Allen and Saunders (1992) are the first to document such behaviour for U.S. banks, identifying money market instruments such as Federal Funds purchases, repos, Eurodollar deposits and certificates of deposit as low transaction cost financing for window dressing activities. In their seminal paper, they distinguish between active and passive window dressing. The former relates to endogenous bank behaviour, reflecting regulatory and market incentives. The latter results from factors exogenous to the banking sector, such as incentives for corporates or fund managers to reduce quarter-end borrowing. This distinction is adapted from Lakonishok et al. (1991), who examine window dressing by pension fund managers. While Allen and Saunders (1992) focus in particular on active window dressing, Kotomin and Winters (2006) confirm the presence of quarter-end reductions in bank balance sheets but argue that customer preferred habitats rather than active window dressing behaviour could be driving the observed patterns. Owens and Wu (2015) revisit the issue while focusing in particular on repo liabilities and conclude that quarter-end deviations are likely to reflect both active window dressing and passive customer-driven liquidity dynamics. Compared with these bank-level studies our paper uses much more granular (transaction-level) data, which significantly enhances our ability to distinguish active from passive window dressing behaviour and allows us to clearly identify and provide compelling evidence of the former.

Our paper also relates to studies analysing the impact of post-crisis regulation on repo market functioning, which most often focuses on the effects of the Basel III leverage ratio. Munyan (2017) illustrates that window dressing in repo markets is mainly driven by European and Japanese banks which are required to report regulatory ratios only at the quarter-end, whereas U.S. banks report both quarter-end and quarter-average ratios. In a similar fashion, Anbil and Senyuz (2018) examine the interaction of the Basel III capital reforms and U.S. monetary policy and find that European repo dealers borrow less on financial reporting dates while money market funds, their main lenders, shift part of their lending to the Fed Reverse Repo facility, thus smoothing potential effects of the Basel III reforms. Allahrakha et al. (2018) investigate changes in the U.S. tri-party repo market after the leverage ratio was announced, documenting a reduction in repo borrowing, an increase in the use of more volatile collateral, and an increase of the share of non-bank dealers. Kotidis and van Horen (2018) assess the impact of a change in U.K. regulation on reporting and measurement of the leverage ratio and find that dealers subject to a more binding leverage ratio reduced liquidity in the repo market.[3] Finally, Reghezza et al. (2022) find that for U.S. bank holding companies (BHCs) the requirement to report their leverage ratios on a quarter-average basis has wiped out incentives to engage in window dressing behaviour. However, they show that the persistence of window dressing is related to the computation of the Federal Deposit Insurance Corporation assessment base, which motivates banks to window dress to reduce the deposit insur-

[3]In contrast, for the euro area, Baldo et al. (2018) do not find evidence that secured activity is reduced outside reporting dates, and Grill et al. (2017) establish that regulatory reforms did not lead to a material reduction in repo services provided by euro area banks.

ance premium. While many of these studies also rely on daily transaction-level data, our paper improves on identification as we estimate banks' daily balance sheet repo positions by taking into consideration the netting of repo and reverse repo transactions thanks to the granular counterparty information available in the ECB data set. Banks' daily balance sheet repo positions are the repo levels ultimately relevant for regulatory metrics and, hence, enable our analysis of the link between regulatory metrics and reductions in repo volumes at quarter- or year-ends. Specifically, our findings illustrate that window dressing is heterogeneous across banks and clearly identifies the factors that are driving banks' behaviour, thus adding on the papers cited above.

The remainder of the paper proceeds as follows. Section 2 outlines how regulatory constraints affect window dressing incentives. Section 3 describes our data set and our novel approach to estimate balance sheet repo positions as well as provides descriptive evidence of the reduction in repo volumes at period-ends. Section 4 outlines the empirical strategy while section 5 displays our main results. Section 6 performs additional tests and robustness checks. Finally, Section 7 concludes the paper.

2 Institutional Setting and Incentives to Window Dress

This section explains how regulatory constraints may affect banks' incentives to window dress via reductions in repo market activities at quarter- or year-ends. It explains the main relevant features of repo contracts and elaborates on the possible role of different regulatory metrics.

2.1 Repurchase Agreements

A repurchase agreement is a loan secured by collateral, in which one party sells securities to a counterparty while simultaneously committing to repurchase the same or similar assets from the counterparty at an agreed future date. At the settlement date, the borrower turns over the collateral to the lender in exchange for cash. At maturity, cash is repaid to the lender along with interest (at a previously agreed-upon repo rate), and the collateral is returned to the borrower. Repo contracts can have different maturities, although a majority of transactions are carried out with a one business day (overnight) maturity. From the perspective of the owner of the security and the borrower of liquidity, the agreement is referred to as a *repo* while from the lender's perspective the same agreement is referred to as a *reverse repo*.

Over the course of the repo agreement, the borrower of liquidity retains ownership of the underlying security. Therefore, under accounting rules, a repo transaction increases both the assets and the liabilities of the party lending the security (and borrowing liquidity) and thus has a balance sheet increasing effect from the perspective of the borrower. Conversely, for the provider of liquidity, entering a reverse repo transaction has a neutral effect on the overall balance sheet size as liquidity is simply exchanged for a financial asset. The differences in the accounting treatment of both legs of the transaction, coupled with the short-term nature of the agreements, results in a confluence of incentives that render the repo market particularly apt for window dressing behaviour.

2.2 Role of Regulatory Metrics

2.2.1 Leverage Ratio

The Basel III leverage ratio is a non-risk weighted regulatory metric requiring banks to use equity financing in proportion to their overall leverage exposure (assets plus some off-balance sheet positions). The leverage ratio is intended to restrict the build-up of leverage in the banking sector to avoid destabilising deleveraging processes that can damage the broader financial system and the economy, and reinforce the risk-based requirements with a simple, non-risk-based "backstop" measure (Basel Committee on Banking Supervision, 2014). The leverage ratio requirement came into force as of January 2019, but public disclosure has been occurring since 2015, already affecting banks' behaviour due to market pressure. Importantly, under the Capital Requirements Regulation (CRR) banks need to report their leverage ratio based on balance sheet values at the last day of the quarter, i.e. the regulatory reporting date.

From a conceptual point of view, repo transactions directly impact the leverage ratio, as the cash received (or the transaction for which the cash is subsequently used) adds to the leverage ratio exposure measure, which in turn leads to a decline in the bank's leverage ratio. More specifically, when a bank enters a repo transaction, the underlying collateral is left in the bank's securities portfolio, and the cash received increases a bank's assets by a magnitude of the securities pledged as collateral minus a haircut. Liabilities increase accordingly.[4] In contrast, reverse repos do not create the same leveraging effect as entering a reverse repo results in an exchange of cash with a financial asset and is thus balance sheet neutral under existing accounting rules. In sum, the short-term nature in combination with the fixed underlying tenor of repo contracts and the reporting of the leverage ratio based on quarter-end snapshots may provide incentives for banks to engineer a contraction in their repo business towards the last trading day in a quarter, to be able to report a more favourable leverage ratio.

2.2.2 G-SIB Framework

The G-SIB framework poses another potential source of window dressing incentives. In the aftermath of the financial crisis the Basel Committee on Banking Supervision introduced higher loss absorbency requirements aimed at reducing the likelihood and severity of the failure of global systemically important banks (G-SIB). The classification of banks as a G-SIB relies on an indicator-based approach. Specifically, the final G-SIB score aggregates scores from five risk categories reflecting: (i) size, (ii) interconnectedness, (iii) substitutability of financial infrastructure or services provided, (iv) cross-jurisdictional activity, and (v) complexity into one final G-SIB score. Banks with a G-SIB score higher than a specific minimum cut-off value are then classified as G-SIBs and are further allocated into specific G-SIB buckets that determine the additional loss absorbency requirements ranging from 1 to 3.5 percent of risk-weighted assets (Basel Committee on Banking Supervision, 2018a).

[4] The cash received may be deposited at another bank or at the central bank, or could be lent out via reverse repos. As the leverage ratio uses the asset side as the basis of the exposure measure, what is directly relevant for its calculation is the amount of cash, central bank reserves or reverse repos (after netting against repos with the same counterparty and maturity) on the asset side of the balance sheet that results from an additional repo liability.

The calculation of the G-SIB score is based on year-end balance sheet values and thus creates an additional incentive for banks to strategically adjust their year-end activities. With respect to repo contracts, Behn et al. (2019) show that by reducing repo volumes at the year-end banks can simultaneously improve their G-SIB scores for size, interconnectedness, and cross-jurisdictional activity. More specifically, lower repo volumes impact a bank's size indicator by lowering the total amount of leverage exposure. In addition, repos are often conducted with other financial sector entities and represent a large share of banks' cross-border transactions, thus impacting the interconnectedness and cross-jurisdictional activity score. Consequently, the G-SIB framework provides additional incentives for banks to contract their balance sheet repo volumes prior to year-ends.

2.2.3 Other Regulatory Requirements

In addition to the leverage ratio and the G-SIB framework, in theory also other regulatory requirements have the potential to create window dressing incentives and may thus partly drive the observed quarter-end contractions in outstanding repo volumes: such metrics include the risk-weighted CET1 ratio, the liquidity coverage ratio (LCR), and, in the case of the euro area, banks' contributions to the Single Resolution Fund (SRF).[5]

Window dressing incentives arising from the risk-based capital framework are rather small. Repos are generally collateralized with sovereign bonds, which are considered high-quality assets, and therefore received a zero, or at least a very low, risk weight for the calculation of the CET1 ratio. Similarly, period-end contractions in repo volumes do not improve the LCR metric. Repos are usually short-dated and, for the calculation of the LCR, all transactions that mature within 30 days are treated as if they have matured under the so-called "unwind mechanism". Hence, the LCR would be calculated by disregarding the cash received and including the underlying security.

Other than Basel norms, also local rules may induce window dressing. One potential factor affecting euro area banks is their contribution to the SRF (Committee on the Global Financial System (2017)). The SRF is an emergency fund that can be used in the resolution of failing banks under the powers conferred to the Systemic Risk Board. The annual fees, or contributions, levied on banks are calculated based on year-end reported figures. The calculation of individual contributions is derived from the size of the bank's liabilities and is adjusted in proportion to the bank's risk profile. Banks, hence, have an incentive to shrink their repo exposure at the year-end to concurrently reduce their asset size and enhance their risk profile by increasing their leverage ratio.

3 Data and Descriptive Evidence

The data set for our empirical analysis covers the period from September 2016 to June 2021 and combines granular information from different data bases that are available at the European Central

[5] In this paper we are unable to analyse the impact of the Net Stable Funding Ratio (NSFR), due to a lack of high-quality data. The first reporting reference date for the NSFR is 30 June 2021 and many banks in our dataset either do not disclose their NSFR until late in the sample or fail to disclose on a quarterly basis.

Bank (ECB). First, data on banks' repo market activity is obtained from the ECB's confidential money market statistical reporting (MMSR) database. MMSR collects transaction-level data on euro-denominated repo and reverse repo transactions that are conducted by a sample of euro area reporting agents, including 36 large banks that represent close to 50 percent of the European banking system's total assets (see Table 1, Panel A, for a breakdown of banks by country). The data set includes information on the transaction volume, the repo rate, the identity of the intermediating bank and counterparty, the counterparty type, and specific repo characteristics such as the underlying tenor and collateral specification (on the ISIN level). In 2020, MMSR captured around EUR 600 billion of daily traded repo and reverse repo transactions, and around EUR 1,550 billion of daily repo and reverse repos outstanding, representing close to 32 percent of estimated total repo market volumes.[6] For the analysis in the paper, we focus on the secured (collateralized) market segment that makes up for roughly 95 percent of total transaction volumes throughout our sample period (see Corradin et al. (2020)). That is, we consider all secured transactions denominated in euro with a maturity of up to one year between the respective intermediating bank (reporting agent) and counterparty, be it financial corporations, general governments, central banks as well as non-financial corporations.

A novel and distinguishing feature of our study is the analysis of the repo market from the perspective of a bank's daily balance sheet repo book. For our main empirical analysis, we aggregate all of a bank's outstanding repo and reverse repo volumes on a daily basis, i.e. all repo market transactions that have settled but not yet matured on each respective day. To account for reductions in reported repo volumes stemming from master netting agreements, we net repo and reverse repo transaction volumes with the same counterparty and matching maturity dates, allowing us to obtain an estimate of the bank's overall balance sheet repo position on a day-by-day basis.[7] Building such a daily measure of balance sheet repo positions is important for analysing how regulatory metrics affect banks' incentives to window dress, since these metrics are calculated based on balance sheet positions rather than total outstanding repo volumes, as using the latter would overstate the amount of relevant repo transactions and possibly bias the results.

[Figure 1 about here]

Figure 1 shows the evolution of daily gross repos outstanding, balance sheet repo volumes, and nettable repo amounts in euro-denominated secured repo markets over our sample horizon.[8]

[6] The International Capital Market Association (ICMA)'s 41st European Repo Market Survey estimates the total value of repos and reverse repos outstanding in Europe in June 2021 to be EUR 8,726 billion, of which 54.5 percent was euro-denominated (see here).

[7] International accounting standards allow entities with large volumes of transactions of financial instruments with the same counterparty to enter into a master netting agreement (see IFRS IAS 32, paragraphs 42 and 50). Such an agreement creates a right to offset financial instruments and present netted amounts in the statement of financial position. This principle is reflected in Articles 205 and 206 of the Capital Requirements Regulation (CRR), which allows master netting agreements, covering repo transactions, as an eligible form of credit risk mitigation for balance sheet reporting. Netting rules are also taken into account in the calculation of leverage exposures used to determine the leverage ratio (Article 429 CRR).

[8] *Gross repos outstanding* includes all repo contracts that have settled but not yet matured. *Nettable repo amounts* are the aggregate estimated accounting reductions in reported repo volumes arising from master netting agreements among banks. *Balance sheet repo volumes* refer to the difference between gross repos outstanding and nettable repo amounts and are an estimate of banks' daily balance sheet repo positions.

Window dressing patterns are clearly visible as the data display two trends. First, we note an overall increase in gross repo volumes and nettable amounts from the start of the sample until mid 2019, followed by a stabilization on a slightly lower level thereafter. During the same period, balance sheet repo volumes grow at a lower rate, indicating that there has been a shift in repo markets away from balance sheet intensive transactions, consistent with a desire by banks to reduce constraints on their balance sheets.[9] Second, we observe sharp quarter-end and, in particular, year-end declines in volumes for both gross and balance sheet repos. The decreases are stronger for balance sheet repos and are driven by both a reduction in overall volumes and an increase in nettable amounts. Balance sheet repo volumes systematically drop by more than 12.5 percent at quarter-ends and more than 25 percent at year-ends, respectively. These magnitudes are substantial, resulting in a reduction in market volumes of EUR 66 billion at the quarter-end and EUR 132 billion at the year-end. This pattern occurs consistently at each period-end in our sample.[10]

The daily data on repo transactions is augmented with bank-specific characteristics. Balance sheet, income statement, and regulatory variables are sourced from the COREP and FINREP supervisory reporting templates, which are available at quarterly frequency. As can be seen in Table 1, Panel B, the average bank in our sample is large with EUR 521 billion in total assets. In addition, the average bank in our sample has a leverage ratio of 5.27 percent, a CET1 ratio of 15.53 percent and a return on risk-weighted assets of 0.8 percent.[11]

[Table 1 about here]

4 Empirical Strategy

This section lays out the empirical strategy for our analysis. First, we quantify the magnitude of window dressing around reporting dates at quarter- or year-end. Second, we causally attribute the observed contractions in banks' balance sheets around these dates to their window dressing incentives. Third, we uncover the main drivers of banks' window dressing behaviour.

4.1 Magnitude of Window Dressing

In a first step of our analysis, we quantify the extent to which banks contract their balance sheet repo volumes prior to quarter- and/or year-ends, relative to the volume throughout the quarter. To this end, we estimate panel event study regressions that allow to infer both the size and dynamics of potential balance sheet around period-ends. Specifically, our baseline regression is as follows:

[9] Committee on the Global Financial System (2017) notes as well that UK and Swiss banks have consistently reduced repo transactions ineligible for netting. This suggests that banks are not reducing repo market exposures across the board but are rather responding with targeted measures to regulation-driven balance sheet constraints.

[10] Period-end drop in repo volumes are prevalent even across different countries of bank incorporation (see Figure A2) and amongst different counterparties (see Figure A3). For an analysis separately by collateral issuer location refer to Table A4.

[11] Figure A1 displays a correlation matrix of the regulatory metrics and the balance sheet variables.

$$(1) \qquad Y_{i,d} = \sum_{k=\underline{L}}^{k=\overline{L}} \beta_k D_k + \alpha_{i,q,y} + \epsilon_{i,d}$$

where $Y_{i,d}$ is the overall balance sheet repo position of bank i on day d, and D_k is a dummy variable that is one on event day k and zero else with $k \in \{-27, 28\}$.[12] Bank $\times$ quarter $\times$ year fixed effects, $\alpha_{i,q,y}$, control for observed and unobserved bank-specific and time-varying heterogeneity.[13] Finally, $\epsilon_{i,d}$ is a random error term. We cluster standard errors on the bank $\times$ year level.

The primary advantage of equation 1 is that it allows to flexibly assess the pattern in banks' balance sheet repo volumes around quarter- or year-end periods. Specifically, β_k shows (pre) quarter-end adjustments for $k \leq 0$ and measures how quickly banks rebound to more normal repo volumes after the reporting date for $k > 0$. To be able to interpret the coefficients as deviations from banks' normal repo market activity, all effects are estimated relative to a reference date at time $d - 28$, i.e. 28 trading days prior to the reporting date. For the dependent variable, we also consider breakdowns at the tenor-collateral level instead of using only aggregate balance sheet repo volumes. That is, for each bank we construct the balance sheet repo positions per tenor segment m and per collateral country c, and then re-estimate equation 1 with these further differentiated dependent variables, thus also controlling for security-segment characteristics. Moreover, exploiting information on repo tenors allows to visually examine whether banks reduce repo positions in accordance with their tenor schedule, and thus get first indicative evidence on whether banks engineer period-end contractions mainly for window dressing purposes.

4.2 Attribution to Window Dressing Incentives

While equation 1 is able to quantify the magnitude of contractions in balance sheet repo volumes around quarter- or year-end periods, it is not able to identify whether such contractions are caused by banks' window dressing incentives or by other factors that are exogenous to the banking system. For example, lenders' own business dynamics could lead to a decline in the supply of repo funds provided by entities outside the banking sector at quarter- or year-end, and in turn force banks to reduce their repo positions in a corresponding manner (Owens and Wu (2015)).

To address this concern and causally attribute observed period-end contractions to bank window dressing behaviour, we estimate difference-in-differences (DiD) regressions at the security level and in the spirit of Du et al. (2018) and Ranaldo et al. (2021), exploiting variation in the balance sheet intensity of different repo contracts at period-ends. Intuitively, from the perspective of the bank, a repo contract is only balance sheet intensive if the contract does not mature before the regulatory reporting date. Building on this observation, our identification strategy exploits

[12]For a detailed description of the construction of event days please refer to Section A.1 in the appendix. We limit the event window to 28 days around the period-end to account for the fact that trading days that are 29 and more days away from the reporting day are not equally distributed across different quarters due to calendar effects.

[13]For the bank-level regressions, we include bank $\times$ quarter $\times$ year fixed effects for Q1-Q3 regressions, and bank $\times$ year fixed effects for Q4 regressions. For the aggregate regressions, we include quarter $\times$ year fixed effects for Q1-Q3 regressions, and year fixed effects for Q4 regressions.

variation in both the tenors and the settlement dates of specific repo contracts, as illustrated in Figure 2. Specifically, an overnight repo contract will only end up on the balance sheet if it is settled (and therefore has not yet matured) on the reporting date. Similarly, a one-week repo contract will remain on the balance sheet for five trading days from the settlement date onward. Against this background, if they are driven by active window dressing behaviour on the side of banks, we would expect repo volume contractions to vary with the maturity structure of the loans. That is, repo volumes with a maturity of two weeks should contract 10 days before the reporting date at the latest, while repo volumes with a maturity of one week should contract 5 days before the reporting date at the latest, and so on.

[Figure 2 about here]

Econometrically, the setup described above allows us to use repo contracts that do not become balance sheet intensive at period-ends as a control group for repo contracts that do become balance sheet intensive. For example, two-week repo contracts would be included in the treatment group from time $T-9$ to T, one-week repo contracts would be in the control group from $T-9$ to $T-5$ and in the treatment group from $T-4$ to T, and overnight repos would be in the control group from $T-9$ to $T-1$ and in the treatment group only at the reporting date T. To test whether there are differences in volume contractions at period-ends between contracts in the treatment and control group, we follow Ranaldo et al. (2021) and estimate equations of the following type:

$$
\begin{aligned}
Y_{i,c,m,d} = {} & \beta_1\, \mathbb{1}\left[m = 1\,week\right] + \beta_2 \mathbb{1}\left[d \in \{T-4, T-1\}\right] \\
& + \beta_3\, \mathbb{1}\left[d \in \{T-4, T-1\}\right] \times \mathbb{1}\left[m = 1\,week\right] + \gamma'\, \mathbf{X_{m,d}} \\
& + \alpha_c + \alpha_{i,q,y} + \epsilon_{i,c,m,d}
\end{aligned} \tag{2}
$$

where $Y_{i,c,m,d}$ denotes the balance sheet position of bank i in repos with collateral from country c and tenor m on day d. $\mathbb{1}\left[m = 1\,week\right]$ is an indicator variable that takes the value one in case the underlying repo contract has a one week tenor. $\mathbb{1}\left[d \in \{T-4, T-1\}\right]$ is an indicator variable that is one in case the settlement date of the repo contract is between four days and one day prior to the reporting date.[14] $X_{m,d}$ is a vector of daily control variables that includes the tenor-specific covered interest rate parity (CIP) basis and the EURO STOXX 50 implied volatility index.[15] Finally, α_c are collateral issuer country fixed effects, $\alpha_{i,q,y}$ are bank × quarter × year fixed effects, and $\epsilon_{i,c,m,d}$ is a random error term. The fixed effect specification systematically controls for characteristics of the underlying repurchase contracts and heterogeneity over time.[16]

[14]Throughout all regressions we pairwise compare two different repo tenors at a time. Equation 2 refers to the example of one-week vs. overnight repo contracts. This equation can be flexibly adjusted to the analysis of different tenor combinations.

[15]For details regarding the calculation of the CIP basis refer to Table A9. Following Ranaldo et al. (2021), we include the CIP basis to control for spillover effects from foreign exchange markets that might have an important effect on repo demand and supply. Additionally, we control for the EURO STOXX 50 implied volatility index as it is an important determinant of how much margin must be deposited at CCPs, which in turn determines how much cash CCPs must invest in reverse repos, again affecting repo demand and supply.

[16]As shown in Figure A4, banks in our sample predominately engage in repo contracts that are secured with collateral from the country in which the bank is incorporated. Hence, analyzing repo volumes on the tenor ×

Throughout all specifications we cluster the standard errors on the bank × year × quarter level.

4.3 Drivers of Window Dressing

The above research design allows us to quantify the magnitude of period-end contractions in repo volumes and to examine whether these contractions are causally attributable to bank window dressing behaviour. However, it does not identify the specific underlying drivers of potential window dressing behaviour. Thus, our empirical strategy exploits bank-level heterogeneity in regulatory metrics to further examine whether and to what extent these metrics are driving banks' window dressing behaviour.

Specifically, for the leverage ratio, we hypothesise that the incentives to window dress are stronger for banks that are closer to the regulatory minimum, since these banks may feel pressure from supervisors or investors to improve their regulatory ratio. Similarly, we assume that banks that are designated as G-SIBs have stronger incentives to contract repo volumes at year-end, since repo volumes are a key determinant of the G-SIB score that ultimately determines the additional capital requirement for these banks. Exploiting these types of heterogeneity, we estimate DiD regression models that assess whether the observed reduction in repo market activity at the quarter- and/or year-end depends on a bank's incentive to window dress. Specifically, we estimate the following model:

$$
\begin{aligned}
Y_{i,d} = {} & \beta_0 + \beta_1 \mathbb{1}\left[QE=1\right] + \beta_2 \mathbb{1}\left[YE=1\right] + \beta_3 \mathbb{1}\left[Reg_{i,q} \leq Q^{50}_{Reg_{i,q}}\right] \times \mathbb{1}\left[QE=1\right] \\
& + \beta_4 \mathbb{1}\left[Reg_{i,q} \leq Q^{50}_{Reg_{i,q}}\right] \times \mathbb{1}\left[YE=1\right] + \alpha_i + \alpha_{q,y} + \varepsilon_{i,d}
\end{aligned} \tag{3}
$$

where the dependent variable $Y_{i,d}$ is the balance sheet repo position of bank i on day d. $\mathbb{1}\left[QE=1\right]$ and $\mathbb{1}\left[YE=1\right]$ are dummy variables equal to one for all observations at the end of a quarter (1-day window) or at the end of a year (3-day window), respectively.[17] $Reg_{i,q}$ refers to the regulatory variable of interest (varying at the quarterly level for each bank, and lagged by one quarter) and $Q^{50}_{Reg_{i,q}}$ indicates the median regulatory ratio across all sample banks in quarter q. Depending on the specification, $\mathbb{1}\left[Reg_{i,q} \leq Q^{50}_{Reg_{i,q}}\right]$ is a dummy variable equal to one if either the leverage ratio, the CET1 ratio, the liquidity coverage ratio, or the bank-specific contributions to the single resolution fund is in the bottom half of the distribution across all sample banks in a specific quarter, or if the bank is classified as a G-SIB.[18] The specification also includes bank

collateral-issuer-location level brings the additional benefit that we can control for unobserved heterogeneity on the collateral level by including issuer location fixed effects.

[17] We chose a 3-day window for year-ends to account for the "holiday effect", which results in a reduction in financial market activity during the week preceding the end of the year, as documented in Lakonishok and Smidt (1984) and Lakonishok and Smidt (1988).

[18] For the liquidity coverage ratio and for the contributions to the single resolution funds we use dummy variables based on quartiles rather than the median. Specifically, in case of the liquidity coverage ratio the dummy is equal to one for banks for which the ratio is among the lowest 25 percent in a given quarter. We choose a different threshold because most banks are well above the regulatory minimum for the liquidity coverage ratio throughout the entire sample period, so that a dummy based on the median would not identify constrained banks in a meaningful manner (see Table 1, Panel B). Similarly, given that most banks have low contributions to the single resolution fund, the corresponding dummy is equal to one only for banks in the top quartile of the distribution, to identify those banks for which there is a meaningful impact.

fixed effects, α_i, and quarter $\times$ year fixed effects, $\alpha_{y,q}$, that systematically control for observed and unobserved bank-specific and time-varying heterogeneity. In robustness regressions in the appendix we also control for a set of balance sheet variables including the log of total assets to control for bank size, the return on risk-weighted assets to control for bank profitability, and the ratio of non-performing exposures to total loans to control for asset quality. All balance sheet controls are lagged by one quarter to mitigate potential concerns about endogeneity. Finally, $\varepsilon_{i,d}$ denotes the error term. Throughout all specifications the standard errors are clustered at the bank $\times$ year level. In a final step, we combine the estimation strategies in equation 3 and 2 to improve on the causal determination of the underlying drivers. Specifically, we re-estimate equation 2 by applying a sample split along both the leverage ratio and the G-SIB surcharge (see Section 5.3 for further discussion and explanation). This allows us to test hypotheses regarding the underlying drivers of the observed quarter-end contractions also in our causal estimation framework.

5 Main Results

This section summarises the results of our empirical analyses on the magnitude of period-end reductions in repo volumes, causal attribution of observed effects to window dressing incentives, and underlying drivers of banks' behaviour.

5.1 Magnitude of Period-End Reductions in Repo Volumes

Figure 3 plots regression coefficients from event study panel regressions on period-end contractions in balance sheet repo volumes, separately for Q1 to Q3 quarter-ends and year-ends (Q4). The coefficients illustrate that balance sheet repo volumes contract substantially at both quarter-ends and year-ends, and that the effect is considerably stronger at year-ends (see yellow bars for the difference between year-ends and other quarter-ends). On aggregate, at year-ends (quarter-ends) all sample banks cumulatively contract their balance sheet repos by EUR 131.7 (66.3) billion relative to their balance sheet positions outside period-ends.[19] These contractions are both statistically and economically significant, representing a 25 percent (12.5 percent) decline at year-ends (other quarter-ends) relative to the average aggregate balance sheet repo volumes outside these periods.[20] The cumulative contraction of the average bank amounts to EUR 3.9 (2.0) billion at year-ends (other quarter-ends). With respect to the dynamics of the period-end adjustments, the charts illustrate that banks start to significantly contract their repo volumes around six days prior to the reporting date at year-ends and around three to four days prior to the reporting date at quarter-ends. At the beginning of a new quarter, it takes banks around ten trading days until balance sheet repos are back to prior volumes, while it takes considerably longer during year-ends (more than 28 days), thus highlighting the long-lasting impact of banks' window dressing activities

[19]We choose $T-28$ as the reference period for this comparison as this trading day is exactly in the middle of the quarter and hence should be best suited as a benchmark level for banks' repo activities absent strong window dressing incentives. For details regarding the event date construction we refer to Section A.1 in the appendix. For detailed regression results refer to Table A2 in the appendix.

[20]Average balance sheet volumes outside these periods are computed as the average across total daily volumes excluding the last three trading days prior to the reporting date. This average amounts to EUR 528.2 billion at the aggregate level.

on aggregate repo market functioning.[21]

[Figure 3 about here]

Figure 4 expands on these findings and plots event study regression coefficients at the tenor-collateral level. It is clearly visible that banks contract balance repo volumes according to the underlying tenor structure, depending on when specific contracts become balance sheet intensive at reporting dates. Specifically, two-week repo contracts start to contract ten to eleven trading days prior to the respective period-end, one-week repo contracts start to contract five to six trading days prior to the period-end, and overnight repo volumes contract only during the last two trading days.[22] Overall, these patterns are suggestive evidence that the observed contractions are indeed driven by banks' window dressing incentives, which is an issue that we will examine further in the next sub-section.

[Figure 4 about here]

We further document that the patterns for repo volumes are accompanied by corresponding patterns for repo rates. Specifically, Figure 5 shows that average repo rates decline by about 10 basis points at quarter-ends and by about 97 basis points at year-ends. Moreover, Figure 6 illustrates that the rates of repo contracts with overnight tenor decline sharply on the last trading day, whereas rates of one (two) week repos decline already five (ten) trading days prior to the period-end. Again, the observation that repo rates drop in conjunction with repo volumes is indicative of a repo demand-side effect by which banks are unwilling to enter repo contracts close to period-ends to reduce their balance sheet size, rather than a repo supply-side effect by which liquidity providers are unwilling to enter reverse repo contracts around these dates (in the latter case, we would have expected repo rates to increase around reporting dates). We will examine this issue in more detail in the next section.

[Figure 6 about here]

[21] According to conversations with market participants, these asymmetric patterns at year-ends are at least partially due to a "holiday effect". That is, repo market activity remains depressed for some time at the beginning of the year and gradually picks up again as traders come back to the office from their holidays. The presence of this holiday effect also explains why the asymmetries are much more pronounced around year-ends when compared with other quarter-end periods. Besides the holiday effect, a second factor underlying the observed asymmetries relates to the slowly returning demand from customers for repos with longer tenors. Provided that banks' customers smooth over the banks' reduced repo intermediation by relying on longer-term repo contracts vis-à-vis alternative suppliers, they will only demand these repo contracts again from banks once they have to roll over the contracts with their alternative suppliers.

[22] Overnight repos include repo contracts with the following tenors: Overnight/Next (O/N), Spot/Next (S/N) and Tomorrow/Next (T/N). For further details regarding the tenor structure, see MMSR reporting.

5.2 Attribution to Window Dressing Incentives

A potential caveat when attributing the observed quarter-end contractions in repo volumes to banks' window dressing activities is that the drop in volumes could be exogenous to the banking system, and rather be driven by cash lenders hoarding liquidity at period-ends (see Section 4.2). As noted in the previous sub-section, the observation that repo rates also decline at reporting dates suggest that banks' repo demand rather than cash lenders' repo supply is driving the observed patterns. To further study this issue, we proceed with estimating DiD specifications at the security level, as specified in equation 2.

Table 2 reports results for the baseline DiD regressions. For each regression, we restrict the sample to repo contracts with two different tenors, so as to isolate the causal effect of differences in balance sheet intensity at reporting dates on repo volume contractions. Specifically, we compare overnight with one week contracts in columns 1 and 2, and overnight with two week contracts in columns 3 and 4. The coefficients in column 1 show that during the last four trading days of a quarter (i.e. a period where one-week repos are balance sheet intensive at period-end while overnight repos are not) the relative importance of balance sheet positions in one-day and one-week repos changes significantly. While overnight repo positions remain constant, one-week positions decline by a statistically significant EUR 56 million on average. This effect is economically significant as it represents a contraction of around 18 percent relative to the average one week repo volumes across collateral segments. The regression includes collateral fixed effects and time fixed effects as well as market control variables, and is also robust to the inclusion of bank $\times$ year $\times$ quarter fixed effects in column 2. Moreover, we obtain similar results when comparing overnight contracts with two-week repos in columns 3 and 4. Finally, we conduct placebo test in columns 5 and 6, considering hypothetical treatment dates where neither of the contracts end up on the balance sheet, and do not detect any differences in volume adjustments for repo contracts with different tenors.[23]

[Table 2 about here]

Taken together, these results can be interpreted as causal evidence that banks actively contract their repo volumes at quarter-ends to reduce their balance sheet size at reporting dates. While it is theoretically possible that repo suppliers reduce the amount of liquidity provided in specific collateral-tenor segments precisely on the day when the repo becomes balance sheet intensive, the pattern for repo rates around reporting dates that we documented in the previous sub-section is inconsistent with such an explanation. We will now examine in more detail whether regulation is a driving force behind banks' window dressing behaviour and, if so, which metrics matter most.

[23]Specifically, when comparing one week and overnight repos we define the treatment period indicator, $D[d \in [T-4, T-1]]^{placebo}$, to be one during the period nine days prior to the regulatory reporting date and five days prior to the reporting date. During this period neither an overnight nor a one-week repo contract are balance sheet intensive. Similarly, when comparing overnight and two-week repo contracts we define the treatment period indicator to be one during the period 19 days prior to the reporting date and 10 days prior to the reporting date.

5.3 Drivers of Window Dressing Behaviour

While the above results suggest that banks actively contract their repo volumes towards quarter-ends, they do not suffice to determine the underlying drivers of this behaviour. Therefore, in a next step, we investigate whether the extent of window dressing behaviour depends on certain bank balance sheet and regulatory characteristics, that is, we estimate equation 3.

Regression results are reported in Table 3 and indicate that banks with lower leverage ratios and banks that are designated as G-SIBs reduce balance sheet repos significantly more at quarter- and year-ends than banks with higher leverage ratios and banks that are not G-SIBs. Column 1 of Table 3 shows that the average bank in our sample reduces balance sheet repo volumes by EUR 1.8 billion at a quarter-end and by an additional EUR 2.5 billion at a year-end, which is consistent with the patterns at aggregate level shown in the event study graphs in Figure 3. Moreover, these effects are driven by banks with leverage ratios in the bottom half of the distribution, which reduce their balance sheet repo volumes by EUR 1.7 billion at the end of a quarter and an additional EUR 2.3 billion at the end of a year when compared with banks with leverage ratios in the upper half of the distribution (see column 2). Similarly, column 3 illustrates that the effects are particularly pronounced for G-SIBs, which exhibit a stronger reduction of EUR 2.7 billion at the quarter-end and an additional EUR 4.9 billion at the year-end, when compared with non-G-SIBs.

[Table 3 about here]

The stronger effect for G-SIBs at the year-end is consistent with the window dressing incentives provided by the G-SIB framework, which is based on year-end data. In contrast, for the leverage ratio, one would not necessarily expect stronger effects at the year-end, since the ratio needs to be reported and disclosed at the end of each quarter (and not only at the end of the year). The fact that we do identify an additional year-end effect for the leverage ratio in column 2 can potentially be explained by correlation between our variables of interest: G-SIBs tend to have leverage ratios in the bottom half of the distribution (for eight out of the nine G-SIBs in our sample, the leverage ratio is lower than the median), so it is possible that the negative coefficient for the year-end interaction in column 2 is driven by the G-SIB status of the banks rather than the fact that they have low leverage ratios. By the same logic, the significant coefficient for the quarter-end interaction in column 3 could be explained by the fact that many G-SIBs also have low leverage ratios, which induces them to improve their ratios at all reporting dates.

Column 4 to 6 illustrate that differential effects are less pronounced for the other three variables that we consider, including the risk-weighted CET1 ratio, the LCR, and the contributions to the SRF. Nevertheless, we obtain significant coefficients for some of the interaction terms, which could again be due to correlation between our variables of interest.[24] Indeed, when including all explanatory variables simultaneously in columns 7 and 8, significance for the CET1 ratio, the LCR and the SRF contributions mostly vanishes, while coefficients for the leverage ratio and the G-SIB

[24]See Figure A1 for an overview of the correlation structure between the regulatory metrics.

interaction terms exhibit a stable magnitude and remain highly statistically significant. Overall, the results suggest that the leverage ratio and the G-SIB framework are the main regulatory drivers for the observed window dressing behaviour, in line with the conceptual discussion that is provided in Section 2.[25]

In a last step, we combine the causal identification strategy from the previous sub-section with the analysis on potential drivers of bank window dressing to further improve identification. Specifically, we re-estimate the regression model in equation 2 for different sub-samples based on the regulatory metrics considered above. In line with the results in Table 3, we focus on the leverage ratio and the G-SIB framework as the main drivers of window dressing. To disentangle the effect of the two regulatory metrics, we further leverage on differences in the reporting schedule and on institutional features of the G-SIB process. First, as already noted, the leverage ratio has to be reported at the end of each quarter, while G-SIB surcharges are computed based on year-end values. Hence, abstracting from correlation between the two variables, we would expect the effects of the G-SIB framework to arise exclusively in the fourth quarter, whereas the leverage ratio should affect bank window dressing behaviour at all quarter-ends. Second, we leverage on the fact that banks' G-SIB status is based on a scoring approach where a bank's effective G-SIB surcharge depends on the specific bucket to which the bank is assigned based on its G-SIB score (see Section 2 for further discussion). Given that switching from one bucket to another bucket is associated with material changes in capital requirements, we would expect that G-SIBs for which the score is closer to a bucket threshold have larger incentives to adjust their G-SIB scores at year-end, and thus have larger incentives to contract their balance sheet repo volumes around these dates, compared with G-SIBs that are further away from a bucket threshold.

[Table 4 about here]

Results for the regressions with sample splits are reported in Table 4. Column 1 and 2 show results for the regressions where the sample is split into banks with above and below median leverage ratio, respectively. The coefficient for the interaction term between the variables of interest is statistically significant in column 1 but not in column 2, indicating that the causal effect previously documented in Table 2 is driven by banks in the lower half of the leverage ratio distribution. Specifically, while overnight repo positions remain constant over the period from $T-4$ to $T-1$ for these banks, one-week balance sheet repo positions contract by a significant amount of around EUR 59 million on average (19 percent of the average one-week repo volumes). A similar reduction in one-week repo volumes during this period is not observed for banks with above-median

[25] Table A5 to Table A7 provide further robustness checks. Specifically, in Table A5 we re-estimate the above regression including balance sheet controls. In Table A6 we interact the respective regressors with the continuous version of the regulatory metrics instead of the dummy variable indicating whether the bank's respective metric is above or below the sample median. Reassuringly, both including additional balance sheet controls and resorting to continuous versions of the drivers leaves the results unchanged both with respect to qualitative and quantitative implications. In addition, in Table A7, we re-estimate the regressions while restricting the sample from September 2016 to January 2020, i.e. excluding the period of the COVID-19 pandemic, because Hüser et al. (2021) show that repo volumes and spreads behave differently in times of stress compared to normal times. The results in Table A7 are fully consistent with our main results in Table 3, indicating that our findings are not driven by the COVID-19 period.

leverage ratios (column 2). As outlined in Section 4, this setting allows us to interpret these results as the causal effect of constraints from the leverage ratio on bank window dressing behaviour.

Column 3 to 6 of Table 4 restrict the sample to G-SIBs exclusively and report regression results for sample splits based on the banks' distance to the next G-SIB bucket and further differentiating between year-ends and other quarter-ends.[26] The results in column 3 to 6 confirm the hypothesis that the G-SIB surcharge induces banks to window dress their repo volumes prior to year-ends, but not prior to other quarter-ends. Specifically, column 3 shows that prior to year-ends, G-SIBs that are closer to the next G-SIB bucket significantly reduce their one week, but not their overnight repo volumes during the last four days before the reporting date. In contrast, a similar year-end effect is not found for those banks that are in the upper half of the distance distribution and thus have less incentives to window dress. Moreover, we do not detect statistically significant differences in either sub-sample when focusing on the time around other quarter-ends (Q1 to Q3) in columns 5 and 6. Taken together, these findings can be interpreted as showing that the G-SIB framework is indeed a major driver of year-end window dressing in repo markets. In aggregate, this may imply an overall underestimation of banks' systemic importance as well as a distortion in their relative ranking, with implications for banks' ability to absorb losses (see also Behn et al. (2019) on this point).

6 Additional Tests

This section provides additional results that expand on the main results in the previous section. Specifically, we further differentiate by different counterparties, examine the effects of two policy experiments on window dressing behaviour, investigate the role of investor pressure as a possible driver for window dressing behaviour, and look at the relevance of the magnitude of a bank's repo market exposure.

6.1 Differentiation by Counterparty

The results in Section 5 provide strong support for the hypothesis that the observed contractions in repo volumes are indeed attributable to bank window dressing behaviour, with the aim to improve regulatory metrics at reporting dates. To further strengthen this line of argument and rule out that external factors could also explain the observed patterns, we make use of granular information on repo counterparties that is available in the MMSR data base. Specifically, for each bank we construct the daily repo volumes separately for each of five counterparty types: central banks, other banks, central counterparties (CCPs), investment firms, and other counterparties (which include pension funds, insurance companies and others).[27] Making use of this breakdown, we can examine whether the reduction in repo volumes exhibits some differential pattern across

[26]To allow for comparability across banks, we condition the analysis on the G-SIB status and further split G-SIBs into those banks that are closest to the next G-SIB bucket (i.e., below median absolute distance to the next bucket) and those that are further away. Specifically, we only retain banks that have been classified at least once as a G-SIB during the sample period. Most banks that have never been classified as a G-SIB have scores that are far away from inducing changes in regulatory capital. Therefore, conditioning on G-SIB status is important when isolating the effect of G-SIB surcharges on bank window dressing.

[27]The evolution of balance sheet repos for five different types of counterparties is displayed in Figure A3.

counterparties by estimating panel regression models of the following type:

$$Y_{i,d}^{j} = \beta_1^j \mathbb{1}\left[ME = 1\right] + \beta_2^j \mathbb{1}\left[QE = 1\right] + \beta_3^j \mathbb{1}\left[YE = 1\right] + \alpha_{i,q,y} + \varepsilon_{i,d}^{j} \tag{4}$$

where i denotes the bank, d denotes the trading day, and j denotes the counterparty type. The dependent variable $Y_{i,d}^{j}$ refers to the daily counterparty type-specific bank balance sheet repo volumes expressed in billions of euro. $\mathbb{1}\left[ME = 1\right]$, $\mathbb{1}\left[QE = 1\right]$ and $\mathbb{1}\left[YE = 1\right]$ are dummy variables equal to one for all observations at the end of a month (1-day window), quarter (1-day window) or at the end of a year (3-day window), respectively. As before, we include bank × quarter × year fixed effects, $\alpha_{i,q,y}$, to control for any observed and unobserved time-varying heterogeneity across banks, while $\varepsilon_{i,t}^{j}$ denotes a random error term. Throughout all specifications the standard errors are clustered at the bank level.

[Table 5 about here]

Table 5 reports regression results for equation 4, showing the breakdown by type of counterparty. The results support the hypothesis that window dressing behaviour is endogenous to the banking system, as banks contract their repo volumes mainly vis-à-vis central banks, other banks and CCPs. In Allen and Saunders (1992) parlance, window dressing is therefore *active* and reflects the regulatory incentives faced by banks rather than exogenous factors. In April 2016, before the start of our sample period, the ECB started its asset purchase programme (APP) securities lending facility, enabling banks to receive or post collateral in exchange of cash via repo market operations (see Brand et al. (2019)). Unlike other types of counterparties, the ECB is not subject to supply, regulatory, balance sheet, or market constraints. Declines in repo volumes at period-ends therefore must be driven by banks' demand for repo market financing rather than supply considerations. Similarly, the reduction in repo volumes between banks would suggest that banks themselves, rather than exogenous actors, are unwilling to borrow cash on regulatory reporting dates. With respect to clearing houses, Ranaldo et al. (2021) outline that CCPs, if at all, increase the supply of repos at period-ends because the European market infrastructure regulation (EMIR) requires European CCPs to convert unsecured cash holdings into highly liquid assets around these dates.[28] Hence, the strongly negative coefficients for balance sheet repos vis-à-vis CCPs at quarter- and year-ends in column 3 can be seen as strong supporting evidence for period-end contractions being driven by active bank window dressing behaviour. Finally, results are much weaker and mostly insignificant for investment firms and other counterparties, confirming that factors that are exogenous to the banking sector but affect the supply of repo funds at period-ends are unlikely to drive our results.

[28]More specifically, EMIR requires CCPs to invest their unsecured cash holdings from the collection of margins into highly liquid assets. Ranaldo et al. (2021) highlight that in practice CCPs mostly choose to invest their cash holdings in reverse repos. Importantly, the authors establish that there is no significant change in CCP reverse repo investment at quarter-ends.

6.2 Leverage Ratio Exemptions

Given the relevance of the leverage ratio for our findings, this section considers two recent changes to its calculation and examines whether these changes had any impact on observed window dressing behaviour. Both events are interesting from a research point of view as they provide plausibly exogenous variation in the way that banks' calculate their leverage ratio. More specifically, the changes allowed banks to exempt certain exposures from the leverage ratio exposure amount (i.e. the denominator of the ratio), so that the affected banks experience an exogenous increase in their leverage ratio, and are consequently less constrained by the regulation. Therefore, it could be that banks that benefit more from these exemptions reduce their window dressing activities in response to the changes, relative to banks that benefit less.

The first change that we consider is the ruling by the General Court of the European Union in July 2018, which allowed six large French banks to exempt their livret A deposits from the calculation of the leverage ratio. Livret A deposits are guaranteed and tax-free savings instruments available to any individual in France, very popular among French depositors. The French banks that administer the saving vehicle are obligated by law to deposit the bulk of the money collected under the Livret A scheme with the state-owned Caisse des Dépôts (CDC).[29] In 2016, the ECB denied a request from a group of French banks to exempt the Livret A deposits from the calculation of the leverage ratio. On 13 July 2018, the General Court of the European Union annulled the decision of the ECB and allowed six French credit institutions to exclude Livret A deposits from the calculation of the leverage ratio, thus increasing their ratios.[30] The court ruling arguably came as a surprise: it was the first time that the General Court annulled a supervisory decision by the ECB since it took up supervisory responsibilities for the banking union in 2014. We can therefore treat this event as an exogenous shock affecting the degree to which the impacted French banks' leverage ratio is binding. Indeed, Figure 7b illustrates that five out of eight French banks in our sample report taking up leverage ratio exemptions right from the start of the period where the information is available.[31]

The second change that we consider relates to the ECB's decision in September 2020 to allow banks to exempt their central bank reserves (CBRs) from the calculation of the leverage ratio in response to the outbreak of the COVID-19 pandemic. As stated by the ECB Governing Council, this measure was mainly aimed at easing the implementation of monetary policy against the backdrop of *"exceptional circumstances due to the coronavirus (COVID-19) pandemic"*.[32] Specifically, banks were allowed to exempt deposits held at the central bank from the leverage ratio exposure measure. Initially, banks were allowed to benefit from the exemption until 27 June 2021, this was subsequently extended until March 2022. Similarly to the Livret A exemption, banks that make use of the exemption rules experience an automatic increase in their leverage ratio. In addition, the exemption may provide incentives to banks to accept cash in repo transactions as

[29] For a more detailed description of the Livret A deposits and its regulatory treatment refer to Duquerroy et al. (2021).

[30] For details regarding the court ruling see here.

[31] Unfortunately the data on leverage ratio exemptions starts only in September 2018 and is thus not available for the period before the court ruling. Moreover, the data does not allow to differentiate different types of exemptions, as it includes only information on aggregate exemptions.

[32] See here for a detailed overview of the ECB Governing Council decision.

it could turn around and deposit the cash at the ECB in the form of reserves, compared to the case without exemption where the received cash would need to be recorded in the leverage ratio exposure measure irrespective of where it will be deposited. Therefore, the ECB central bank exposure exemption can be used in the same spirit as the Livret A exemption, to test whether banks that benefit more from exempting their central bank reserves from the leverage ratio reduce their window dressing activities near period-ends, relative to banks that benefit less. Figure 7b displays that 24 out of the 36 banks in our sample report the use of the exemption at least once after the CBR exemption decision.[33] Similarly, Figure 7a illustrates that in response to the CBR exemption rule many more banks make sizeable use of the exemption rule, resulting in an average exemption rate of 10.9 percent of their total exposure measure.

[Table 6 about here]

Table 6 reports regression results examining the effects of the leverage ratio exemptions described above, starting with the exemptions of Livret A deposits in columns 1 and 2. We do not observe any differential effects in the adjustment of balance sheet repo positions around period-ends between banks that benefited from the exemptions and banks that did not, neither before (column 1) nor after (column 2) the ruling of the General Court of the European Union. Possible explanations for this might be: i) the relatively low take-up of the exemption which generates a material effect for only one bank (see Figure 7a), ii) and low statistical power more generally due to the small number of affected banks.

Indeed, we find more meaningful effects when considering the central bank reserves exemption in September 2020, possibly due to the additional channel arising from the possibility to deposit cash received in repo transactions at the central bank reserve with no impact on the leverage ratio exposure measure. Column 3 shows that there was no significant adjustment in banks' aggregate repo volumes after the announcement of the exemption, and also no differential effect depending on whether or not a specific bank made use of the exemption. In column 4, we condition on those banks that did make use of the central bank exemption and find that those banks that benefited more (because they had a higher amount of reserves that could be exempted) increased their balance sheet repos after the event, relative to banks that benefited less (see positive coefficient for the interaction term). Finally, we also examine whether the exemptions altered the adjustment of balance sheet repo positions around period-ends. Specifically, columns 5 and 6 of Table 6 split the sample into the periods before and after the announcement of the exemptions and test for either period whether banks benefiting more from the exemptions differentially adjust their balance sheet repo volumes at quarter-ends. Indeed, we find such differential effects in the period

[33]Following the declaration of exceptional circumstances by the ECB, a precondition for exempting central bank reserves for the duration of these circumstances, banks themselves had to decide whether they would like to make use of it and inform their supervisors accordingly. Until June 2021, when the leverage ratio was a reporting and disclosure requirement only, more banks opted for the exemption compared to the period starting June 2021 when the leverage ratio also became a binding requirement. A likely reason is that the exemption rules foresee that banks would then face a higher minimum requirement to compensate for the loss of resilience arising from exempting reserves that they already held at the beginning of exceptional circumstances (March 2020), reducing somewhat the incentives to opt for the exemption.

before (column 5) but not in the period after (column 6) the announcement of the exemptions, which can be interpreted as suggestive evidence that the exemptions eased regulatory constraints and thus the incentives to window dress for the set of more affected banks.

[Table 7 about here]

In Table 7, we approach the effects of the exemptions from a different angle and test whether window dressing by banks that are more constrained by the leverage ratio becomes relatively less pronounced after the implementation of the policy. Column 1 shows that general window dressing patterns persist also after the exemptions are implemented, since both of the interaction terms are statistically insignificant and close to zero. However, the estimates in column 2 indicate that quarter-end window dressing is more pronounced for banks with relatively low leverage ratios before but not after the implementation of the policy (since the coefficient for the triple interaction term more than offsets the one for the double interaction), which indicates again that the exemptions eased regulatory constraints and thus the incentives to window dress. Interestingly, the coefficient for the triple interaction term at year-end has a negative sign and is statistically insignificant, and also the triple interaction terms for the G-SIB dummy in column 3 are statistically insignificant. A possible interpretation for this findings is that the G-SIB framework continues to exert window dressing incentives also after implementation of the central bank exemption (which concerned only the calculation of the leverage ratio), where again the fact that G-SIBs tend to have lower leverage ratios may explain why the year-end triple interaction is insignificant also in column 2 (see Section 5.3). While all of the findings are consistent with this interpretation, we note that the period after the exemptions is considerably shorter than the period before the exemptions and includes only one year-end, so that we cannot rule out that statistical power issues also play a role. Overall, the results suggest that the implementation of the central bank reserve exemptions in the pandemic induced a modest reduction in window dressing incentives, in line with our finding of the general relevance of the leverage ratio for window dressing activity.

6.3 Investor Pressure as a Motivation for Window Dressing

Our paper provides compelling evidence that banks contract their balance sheet on financial reporting days to appear more attractive to external parties, for example their supervisors, investors, or market participants more generally. While it is difficult to pin down whom exactly banks are trying to impress with their window dressing behaviour, in this section we briefly examine whether one specific channel – pressure from short-term investors – is playing a role. Existing research documents that short-term investors are less motivated monitors, which usually engage in trading to generate immediate profit and encourage managerial myopia rather than properly incentivising managers to engage in prudent risk taking strategies (Stein (1989); Kahn and Winton (1998); Maug (1998); Bolton et al. (2006)). In the short-term, lower regulatory metrics may imply higher regulatory costs and make the bank less appealing for outside investors. Hence, short-term investors might have an incentive to pressure bank managers to window dress their regulatory metrics in order to reduce overall regulatory costs and make the bank look more attractive. In contrast, long-term shareholders are generally found to be motivated monitors that are able to contain managerial myopia (An and Zhang (2013); Harford et al. (2018); Pathan et al. (2021)), and might therefore refrain from pressuring bank managers to window dress their regulatory metrics in exchange for a more stable business model. We build on this existing research and examine whether banks that have a larger short-term investor base engage more strongly in window dressing behaviour.

Testing this hypothesis crucially requires measuring the degree of short-termism of a bank's investor base. To do so, we follow the classification of bank investors outlined in Véron (2017). Specifically, we define banks as being influenced by short-term investors if they are classified to have a *dispersed* governance base, a *minority influence* governance base, or a *private control* governance base and if their largest shareholders are private firms such as investment funds that are more likely to have short-term profit oriented goals. None of our sample banks is classified as having a *private control* governance base. Five of our sample banks are classified as having a *minority influence* governance base. However, for all five of these banks the largest shareholder is a government-affiliated entity. Given that public institutions likely have an incentive in long-term bank stability we do not classify any of these banks as being subject to short-term investor pressure. Finally, twelve of our sample banks are classified to have a dispersed investor base. We classify ten out of these twelve as being subject to short-term investor pressure given that their four largest shareholders together hold more than 10 percent of the shares outstanding and are investment managers as classified by Véron (2017). Overall, this implies that 10 of the 36 banks in our sample are classified as being subject to short-term investor pressure.

[Table 8 about here]

Applying this classification, we then estimate whether banks with a larger short-term investor base contract their balance sheets repos more strongly around quarter-ends. As can be seen from Table 8 both banks that are subject to the influence of long-term investors (column 1) and those that are subject to the influence of short-term investors (column 2) contract their repo volumes significantly near period-ends. The joint analysis in column 3 illustrates that banks with a more short-term oriented investor base reduce their balance sheet repo volumes relatively more prior to quarter-ends and relatively less prior to year-ends, both compared with banks that have a more long-term oriented investor base. A possible explanation for this could be that indeed investor pressure has an impact at quarter-end periods, while pure regulatory pressure seems to play a larger role at year-end periods when not only the leverage ratio needs to be reported but also G-SIB surcharges are calculated. Given that both coefficients are statistically insignificant (albeit close to significance at the 10 percent level), the results can be interpreted as weak evidence suggesting that investor pressure is playing a role in explaining our findings. Of course, the findings do not exclude that other factors, such as supervisory or more general market pressure, may also be playing a role.

6.4 Magnitude of Repo Exposures

In Section 5, we document that banks with larger regulatory incentives to window dress are also banks that contract their balance sheet repo exposure more strongly at period-ends. We interpret this as evidence of the leverage ratio and G-SIB framework being main drivers for bank window dressing behaviour. However, an alternative explanation could be that banks with ex-ante lower leverage ratios or higher G-SIB scores are also the ones with particularly high repo volumes prior to reporting dates. Thus, besides regulatory incentives also the ability to reduce balance sheet volumes at period-ends could be playing a role in explaining our findings. To examine this possibility, we reiterate our analysis from Section 5.3 while focusing on a sample of banks with larger exposure to repo markets (ratio of repos to total assets above the median in a specific quarter). All of the banks in this subsample have a significant amount of repo exposures and should hence be well positioned to engage in window dressing behaviour. As shown in Table 9, regulatory variables continue to exert a significant impact on window dressing patterns among these banks, indicating that the magnitude of repo market exposures alone does not explain our findings.[34] While it is likely that the ability to window dress also plays a role (on this, see also Behn et al. (2019)), our findings clearly show that regulatory incentives have an impact on observed window dressing patterns.

[Table 9 about here]

7 Conclusion

This paper contributes to the literature on the impact of post-crisis regulation on banks' behaviour and repo market functioning, and provides empirical evidence of active window dressing behaviour by banks in euro area repo markets. We observe sharp quarter- and year-end declines in repo volumes that are driven by both a reduction in overall volumes and an increase in nettable amounts. Contractions start up to seven days prior to the period end date and last up to ten after the reporting date, illustrating the extended period during which repo markets are constrained. Repo rates drop in conjunction with repo volumes, indicating that the observed contractions represent a demand-side effect by which banks are unwilling to enter repo contracts close to period-ends to reduce their balance sheet size, rather than a repo supply-side effect by which liquidity provides are unwilling to enter reverse repo contracts around these dates. This hypothesis is further confirmed by analysis that exploits variation in the balance sheet intensity of different repo contracts at period-ends, and by analysis considering the identity of banks' counterparties in different repo contracts. Our results further suggest that the leverage ratio and the G-SIB framework are the

[34] As shown in Table A8, window dressing patterns are also present in the subsample of banks with low repo market exposure (see column 1). However, the impact of regulatory variables is less pronounced in this subsample, as many of the interaction terms are statistically insignificant. A possible reason for this is that banks in this subsample have generally higher leverage ratios, which reduces the incentives to window dress across the board (the average leverage ratio in the sample of banks with above median repo market exposure is 4.7 percent, while the value is 5.6 in the sample of banks with below median repo market exposure). Moreover, there are fewer G-SIBs in the second subsample, which reduces statistical power to identify the coefficients on the G-SIB interaction terms (44 percent of the observation in the sample with above median repo market exposure are from G-SIBs, while this share is only 10 percent in the sample with below median repo market exposure).

main drivers of bank window dressing.

Overall, our findings highlight the need to thoroughly implement the recent recommendations aimed at reducing window dressing incentives by using quarterly averages for the reporting and disclosure of the leverage ratio (Basel Committee on Banking Supervision (2019)). They also indicate a need for further analysis of the extent to which window dressing incentives in the G-SIB framework may warrant further policy action, e.g. the usage of monthly or daily averages rather than end-of-quarter values for certain G-SIB indicators.

References

Allahrakha, M., J. Cetina, and B. Munyan (2018). Do higher capital standards always reduce bank risk? the impact of the basel leverage ratio on the us triparty repo market. *Journal of Financial Intermediation 34*, 3–16.

Allen, L. and A. Saunders (1992). Bank window dressing: Theory and evidence. *Journal of Banking & Finance 16*(3), 585–623.

An, H. and T. Zhang (2013). Stock price synchronicity, crash risk, and institutional investors. *Journal of Corporate Finance 21*, 1–15.

Anbil, S. and Z. Senyuz (2018). The regulatory and monetary policy nexus in the repo market. *FEDS Working Paper No. 2018-27, Federal Reserve Board*.

Baldo, L., A. Bucalossi, and A. Scalia (2018). Leverage ratio and central bank operations in the euro area. *Economic Notes 47*(1), 21–68.

Banegas, A. and M. Tase (2019). Reserve balances, the federal funds market and arbitrage in the new regulatory framework. *Journal of Banking & Finance 118*, 105893.

Bank for International Settlements (2018). Annual economic report. Technical report, Bank for International Settlements.

Basel Committee on Banking Supervision (2014). Basel III leverage ratio framework and disclosure requirements. *Bank for International Settlements*.

Basel Committee on Banking Supervision (2018a). Global systemically important banks: revised assessment methodology and the higher loss absorbency requirement. *Bank for International Settlements*.

Basel Committee on Banking Supervision (2018b). Statement on leverage ratio window-dressing behaviour. *Bank for International Settlements*.

Basel Committee on Banking Supervision (2019). Revisions to leverage ratio disclosure requirements. *Bank for International Settlements*.

Behn, M., G. Mangiante, L. Parisi, and M. Wedow (2019). Behind the scenes of the beauty contest: window dressing and the g-sib framework. *International Journal of Central Banking forthcoming*.

Bolton, P., J. Scheinkman, and W. Xiong (2006). Executive compensation and short-termist behaviour in speculative markets. *The Review of Economic Studies 73*(3), 577–610.

Brand, C., L. Ferrante, and A. Hubert (2019). From cash-to securities-driven euro area repo markets: the role of financial stress and safe asset scarcity. *ECB Working Paper No. 2232*.

Committee on the Global Financial System (2017). Repo market functioning. Technical report, Bank for International Settlements.

Corradin, S., J. Eisenschmidt, M. Hoerova, T. Linzert, G. Schepens, and J.-D. Sigaux (2020). Money markets, central bank balance sheet and regulation. *ECB Working Paper No. 2483*.

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

Duffie, D. and A. Krishnamurthy (2016). Passthrough efficiency in the fed's new monetary policy setting. In *Designing Resilient Monetary Policy Frameworks for the Future. Federal Reserve Bank of Kansas City, Jackson Hole Symposium*, pp. 1815–1847.

Duquerroy, A., A. Matray, and F. Saidi (2021). The allocative effects of banks' funding costs. *Working Paper, Banque de France, Princeton University, University of Bonn*.

Fritsche, J. P., M. Grill, and C. Lambert (2020). Bond market liquidity and swap market efficiency - what role does the repo market play? *ECB Economic Bulletin No. 1*.

Garcia, L., U. Lewrick, and T. Sečnik (2021). Window dressing systemic importance: evidence from eu banks and the g-sib framework. *European Banking Authority Research Paper No. 12*.

Grill, M., J. Jakovicka, C. Lambert, P. Nicoloso, L. Steininger, M. Wedow, et al. (2017). Recent developments in euro area repo markets, regulatory reforms and their impact on repo market functioning. *Financial Stability Review, November*.

Harford, J., A. Kecskés, and S. Mansi (2018). Do long-term investors improve corporate decision making? *Journal of Corporate Finance 50*, 424–452.

Hüser, A., C. Lepore, and L. Veraart (2021). How do secured funding markets behave under stress? evidence from the gilt repo market.

Kahn, C. and A. Winton (1998). Ownership structure, speculation, and shareholder intervention. *The Journal of Finance 53*(1), 99–129.

Kotidis, A. and N. van Horen (2018). Repo market functioning: The role of capital regulation. *Staff Working Paper No. 746, Bank of England*.

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

Lakonishok, J., A. Shleifer, R. Thaler, and R. Vishny (1991). Window dressing by pension fund managers. Technical report, National Bureau of Economic Research.

Lakonishok, J. and S. Smidt (1984). Volume and turn-of-the-year behavior. *Journal of Financial Economics 13*(3), 435–455.

Lakonishok, J. and S. Smidt (1988). Are seasonal anomalies real? A ninety-year perspective. *The review of financial studies 1*(4), 403–425.

Maug, E. (1998). Large shareholders as monitors: Is there a trade-off between liquidity and control? *The journal of finance 53*(1), 65–98.

Munyan, B. (2017). Regulatory arbitrage in repo markets. *Office of Financial Research Working Paper* (15-22).

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

Pathan, S., M. Haq, R. Faff, and T. Seymour (2021). Institutional investor horizon and bank risk-taking. *Journal of Corporate Finance 66*, 101794.

Ranaldo, A., P. Schaffner, and M. Vasios (2021). Regulatory effects on short-term interest rates. *Journal of Financial Economics 141*, 750–770.

Reghezza, A., A. Jaafar, and S. Polizzi (2022). Persistency of window dressing practices in the u.s. repo markets after the gfc: the unexplored role of the deposit insurance premium. *European Financial Management forthcoming*.

Stein, J. C. (1989). Efficient capital markets, inefficient firms: A model of myopic corporate behavior. *The quarterly journal of economics 104*(4), 655–669.

Véron, N. (2017). The governance and ownership of significant euro-area banks. Technical report, Bruegel Policy Contribution.

Figures and Tables

Figure 1: **Evolution of balance sheet repos over time**

This figure displays the evolution of gross repos outstanding and balance sheet repos volumes (left scale) as well as the evolution of nettable repo amounts (right scale) over time. All volumes are expressed in EUR billion and at daily frequency. The computation of balance sheet repo volumes is as outlined in Section 3. The dashed red lines indicate the last trading day in each quarter, i.e. the regulatory reporting date. The sample period is from 1 September 2016 to 30 June 2021. For details regarding the computation of the balance repo volumes refer to Table A9.

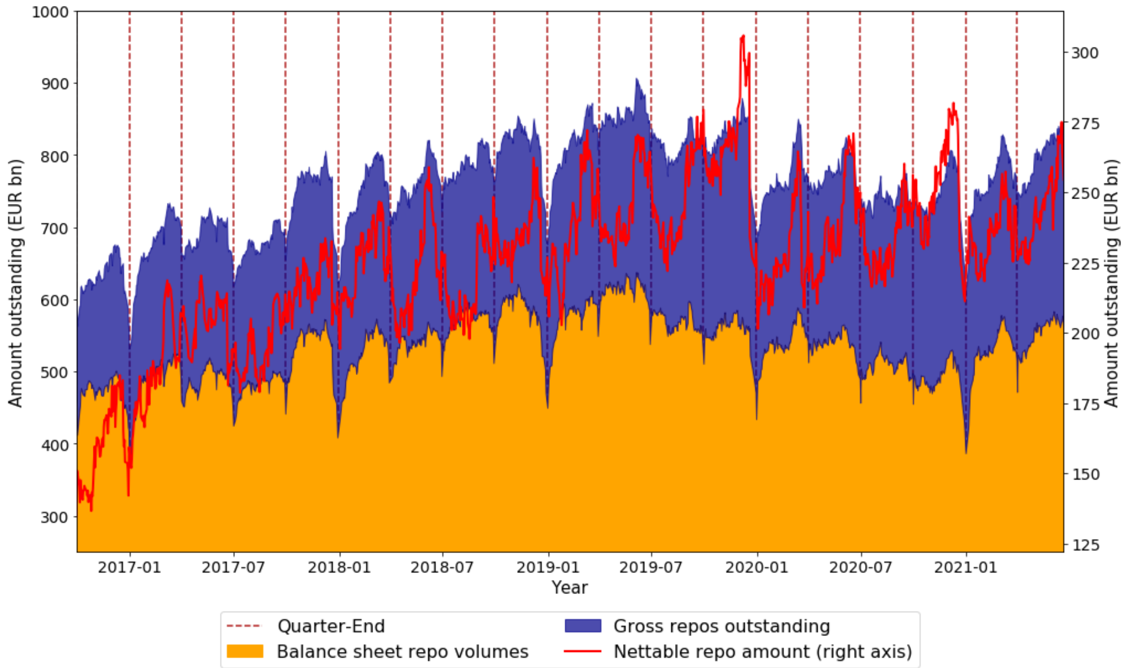


Figure 2: **Causal identification design**

This figure schematizes the identification design used to causally attribute quarter-end contractions to banks window dressing their balance sheets. The horizontal axis displays event dates where event date T refers to the last trading day of the quarter, i.e. the reporting date. The colored bars refer to the period (in trading dates) during which a specific contract remains on a bank's balance sheet. The upper four bars refer to overnight repos, the middle three bars to one-week repo contracts and the lowest two bars to two-week repo contracts. Red colour indicates that a given repo remains on the bank's balance sheet on the reporting date (and thus increases the bank's regulatory costs), while green indicates that the repo contract is not balance sheet intensive as it either matures prior to the reporting date or is settled only after the reporting date.

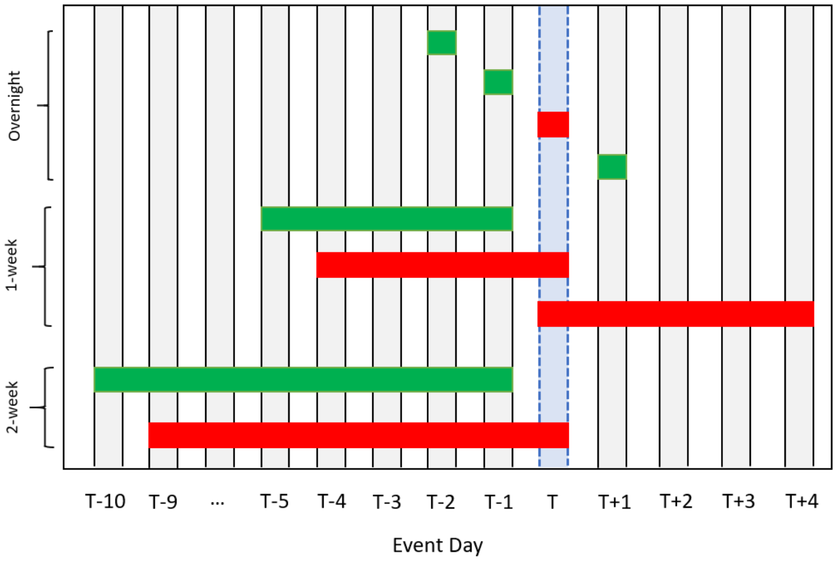
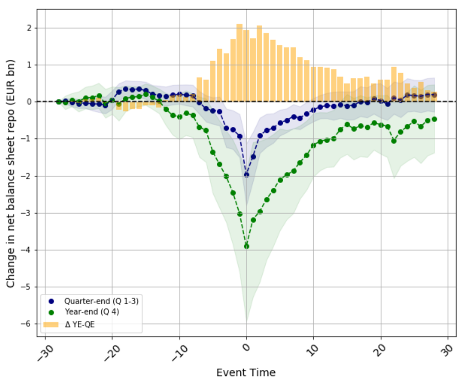
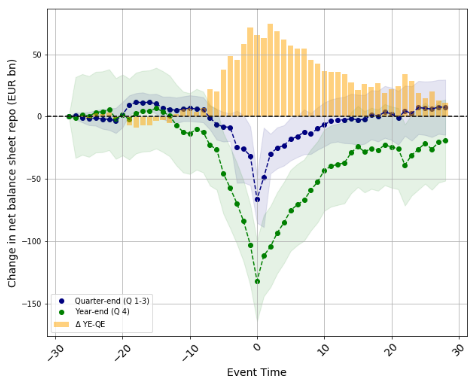


Figure 3: **Period-end window dressing**

These figures display event study coefficients from the regressions shown in Table A2. The left figure displays bank-level event study coefficients. The right graph displays aggregate event study coefficients. Blue lines indicate coefficient estimates around quarter-ends (Q1-Q3) while the green lines indicate coefficient estimates around year-ends (Q4). The shaded areas represent the 95% confidence intervals. Yellow bars display the absolute daily difference between the quarter-end and year-end adjustments. All coefficients are expressed relative to the base period at $d = T - 28$. The sample period is from 1 September 2016 to 30 June 2021.



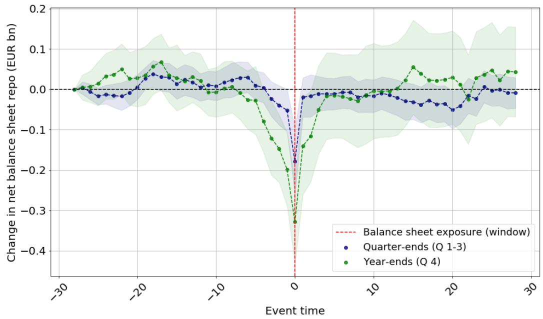
a) Bank level



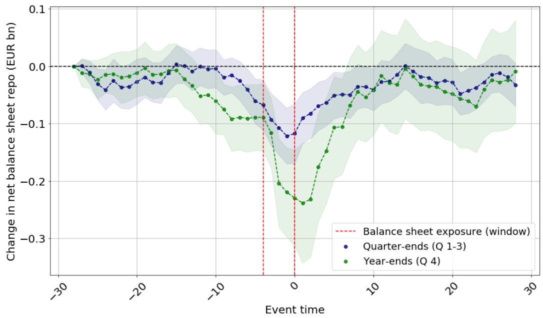
b) Aggregate level

Figure 4: **Period-end window dressing – by tenor**

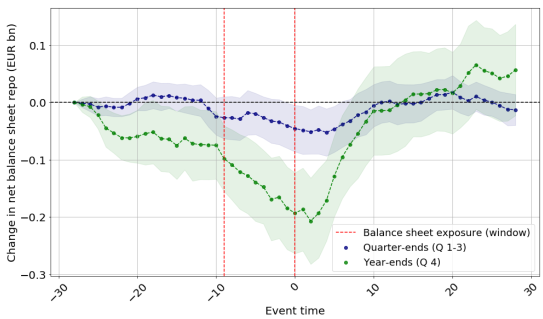
These figures display the event study coefficients in Table A3. The top left figure displays event study regressions for repo contracts with overnight tenors. The top right figure displays event study regressions for repo contracts with one-week tenors. The bottom left figure displays event study regressions for repo contracts with two-week tenors. The bottom right figure displays event study regressions for repo contracts for multiple different tenor specifications. Blue lines indicate coefficient estimates around quarter-ends (Q1-Q3) while the green lines indicate coefficient estimates around year-ends (Q4). The shaded areas indicate 95% confidence intervals. The dashed vertical lines indicate the period during which the respective repo contract ends up on a bank's balance sheet on the reporting date. All coefficients are expressed relative to the base period at $d = T - 28$. The sample period is from 1 September 2016 to 30 June 2021.



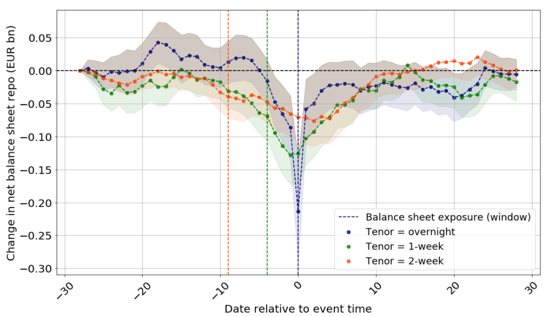
a) Overnight tenor



b) 1-week tenor



c) 2-week tenor



d) Different tenors

Figure 5: **Evolution of repo rates over time**

This figure displays the evolution of the volume-weighted repo rate for all collateral issuer locations. The dashed red lines indicate the last trading day in each quarter, i.e. the regulatory reporting date. The sample period is from 1 September 2016 to 30 June 2021.

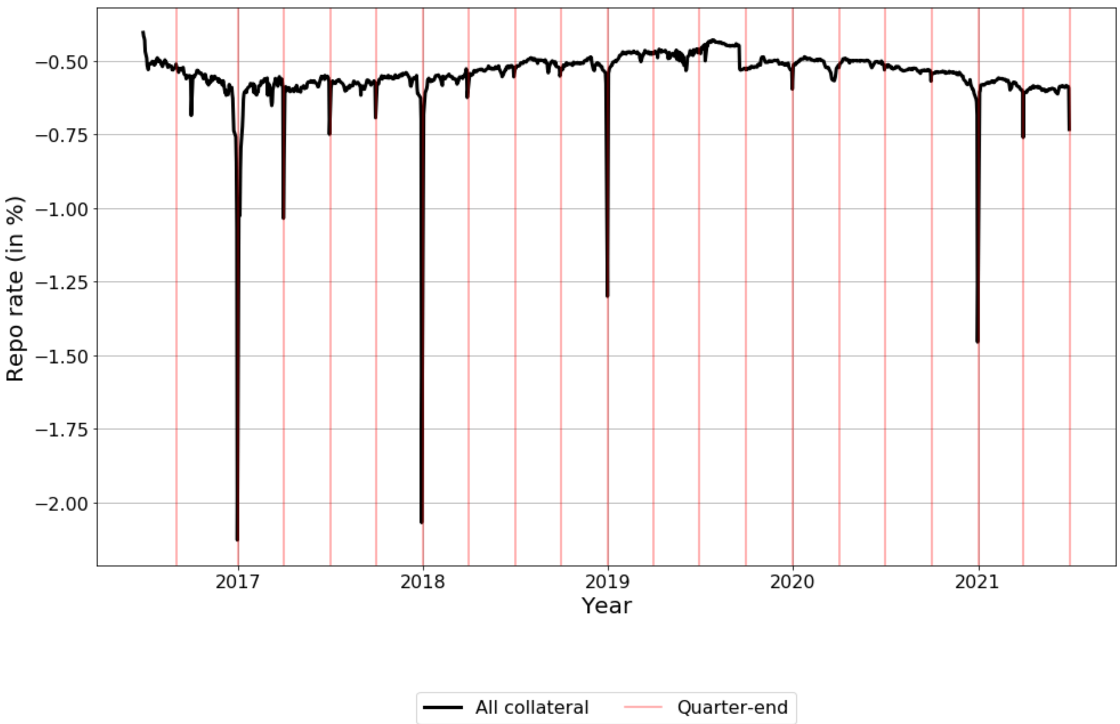
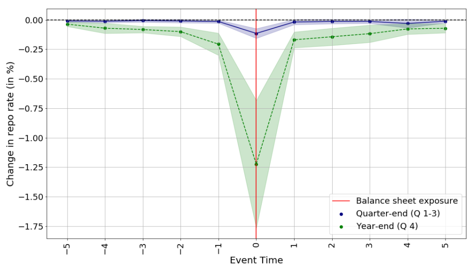
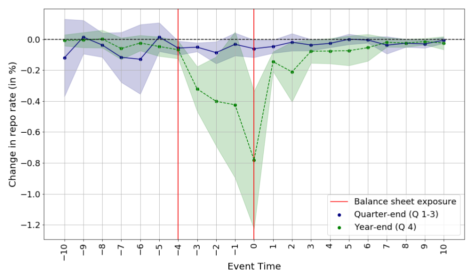


Figure 6: **Period-end changes in repo rates – by tenor**

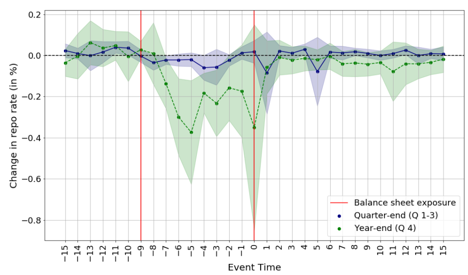
These figures display the event study coefficients of the event study regression described in Section 4. The dependent variable is the volume-weighted repo rate, separately for repo tenors. The top left figure displays event study regressions for repo contracts with overnight tenors. The top right figure displays event study regressions for repo contracts with one week tenors. The bottom left figure displays event study regressions for repo contracts with two week tenors. Blue lines indicate coefficient estimates around quarter-ends (Q1-Q3) while the green lines indicate coefficient estimates around year-ends (Q4). The shaded areas indicate 95% confidence intervals. The dashed vertical lines indicate the period during which the respective repo contract ends up on the bank's balance sheet on the reporting date. All coefficients are expressed relative to the base period at $d = T - 28$. The sample period is from 1 September 2016 to 30 June 2021. For better readability, only the relevant subsection of event days are displayed.



a) Overnight tenor



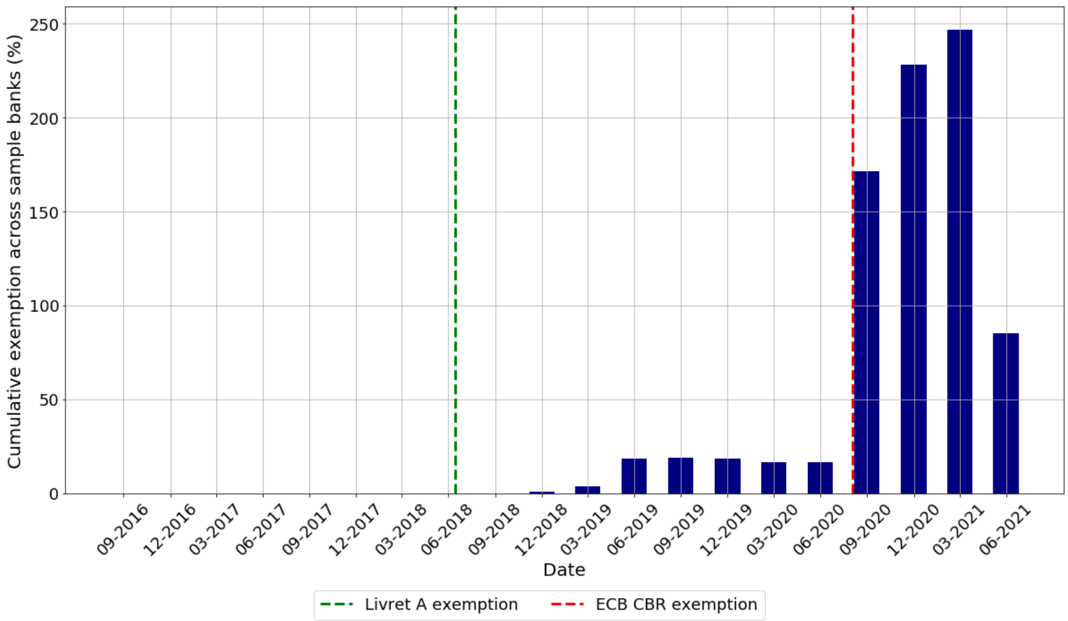
b) 1-week tenor



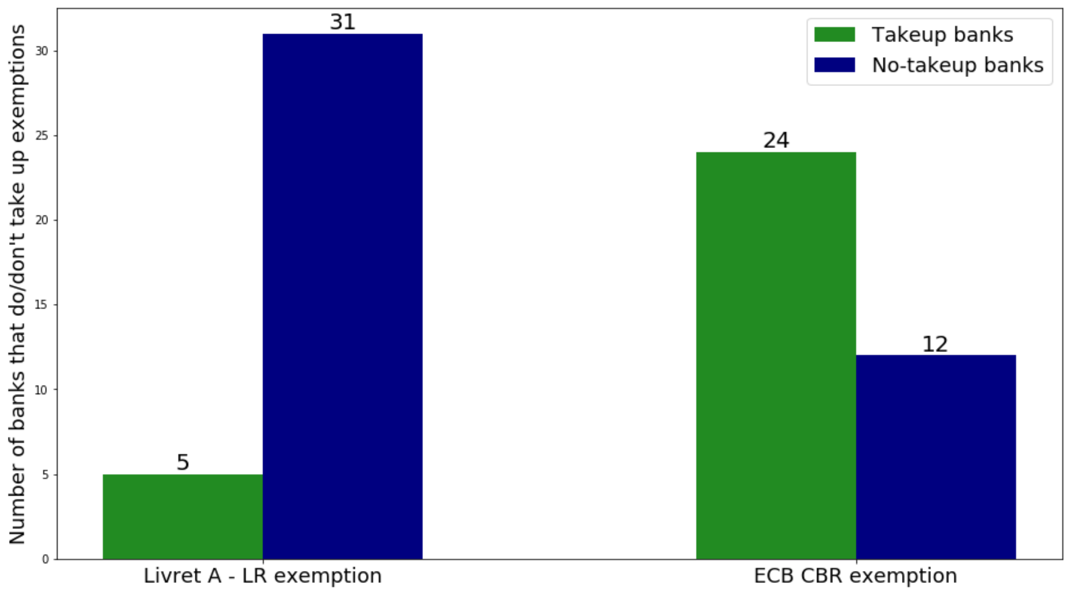
c) 2-week tenor

Figure 7: **Take-up of leverage ratio exemptions**

These figures display the take-up of leverage ratio exemptions by our sample banks. Figure 7a displays the aggregate usage of cumulative leverage ratio exemptions as a percentage of banks' total exposure measure. In a first step, for each reporting date and each bank we compute the exemption ratio as a bank's total exemptions from the leverage ratio calculation over the bank's total exposure measure for the calculation of the leverage ratio. In a second step, we aggregate the ratios (in %) over all banks to get the cumulative take-up across all banks. The green dashed line indicates the date of the livret A court ruling (13 July 2018) and the blue dashed line the date of the ECB CBR exemption (17 October 2020). Figure 7b displays the number of sample banks that report a positive exemption from the leverage ratio calculation. The left two bars correspond to the livret A exemption while the right two bars correspond to the ECB CBR exemption. Blue indicates the number of no-takeup banks and green indicates the number of exemption take-up banks.



a) Cumulative LR exemption ratio



b) Number of sample banks that take up LR exemptions

Table 1: **Summary statistics**

This table reports summary statistics for both the balance sheet repo volumes and selected balance sheet variables. Panel A reports daily balance sheet repo volumes, differentiated by the country in which the sample bank is incorporated. The computation of balance sheet repo volumes is as outlined in Section 3 and in Table A9. The G-SIB identifier indicates if a given bank is classified at least once as a G-SIB during the sample period. *Other European* includes two banks from Belgium and one bank from Greece, Ireland and Finland, respectively. The sample period is from 1 September 2016 to 30 June 2021. Panel B reports summary statistics for regulatory metrics, balance sheet and income statement variables of the 36 banks in our sample. The data is reported as quarter-end snapshots. The sample period is the same as for the repo data.

Panel A: Balance sheet repos

Country	Banks		Daily balance sheet repo per bank (EUR billion)					
	#	o/w GSIB	Mean	Std	25%	50%	75%	# Observations
DE	10	1	7.61	7.70	1.55	4.96	11.12	12,733
ES	5	1	10.75	7.47	5.48	8.29	14.39	6,415
FR	8	4	37.44	23.30	21.74	29.25	48.84	9,174
IT	4	1	16.29	13.29	4.60	9.08	27.20	2,628
NL	4	1	15.18	17.66	2.27	5.58	25.11	5,102
Other European	5	1	5.39	4.67	1.59	3.40	9.23	5,669
Total Sample	36	9	15.82	18.45	3.38	9.08	22.51	41,721

Panel B: Balance sheet variables

	Mean	Std	25%	50%	75%	# Observations
Leverage Ratio (%)	5.27	2.01	4.11	4.70	5.78	641
LCR (%)	155.11	35.88	133.40	147.66	167.43	545
CET1 Ratio (%)	15.53	5.96	12.48	13.95	15.85	715
SRF Contribution (% op. income)	2.53	0.56	0.86	1.08	1.58	678
Total assets (bn)	520.88	502.11	163.85	268.46	677.01	702
Repo to total assets (%)	5.46	3.95	2.12	5.24	7.57	598
NPE Ratio (%)	6.11	11.96	1.70	2.91	4.94	680
RoRWA (%)	0.80	2.27	0.29	0.96	1.49	696

Table 2: **Differences in balance sheet intensity at period-ends**

This table reports regression results for the regression:

$$\begin{aligned} Y_{i,c,m,d} &= \beta_1 \mathbb{1}\left[m = 1\,week\right] + \beta_2 \mathbb{1}\left[d \in \{T-4, T-1\}\right] \\ &+ \beta_3 \mathbb{1}\left[d \in \{T-4, T-1\}\right] \times \mathbb{1}\left[m = 1\,week\right] + \gamma' \mathbf{X_{m,d}} \\ &+ \alpha_c + \alpha_{i,q,y} + \epsilon_{i,c,m,d}, \end{aligned}$$

where $Y_{i,c,m,d}$ represents the balance sheet repo volume of bank i secured with collateral from issuer location country c, with tenor m at trading day d. $\mathbb{1}\left[m = 1\,week\right]$ is an indicator variable that takes the value one if the underlying repo contract has a one-week tenor and zero else. $\mathbb{1}\left[d \in \{T-4, T-1\}\right]$ is a dummy variable that takes the value one if the trading day is among the last four trading days prior to the reporting date. $\mathbf{X_{m,d}}$ is a vector of tenor-specific daily control variables that includes the CIP basis and the the VSTOXX index. For a detailed description of the control variables refer to Table A9. α_c denotes a collateral issuer location fixed effect. $\alpha_{i,q,y}$ represents bank × year × quarter fixed effects. For each specification only the two respective tenor groups are included in the regression. Standard errors are clustered by bank (B) × year (Y) × quarter (Q). The sample period is from 1 September 2016 to 30 June 2021. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	Balance Sheet Repo (EUR bn)					
	Treatment Status by Repo Tenor				Placebo Treatment	
Tenor Specification	Overnight vs. 1-week	Overnight vs. 1-week	Overnight vs. 2-week	Overnight vs. 2-week	Overnight vs. 1-week	Overnight vs. 2-week
$\mathbb{1}\left[\mathrm{m} = 1 \ \ \mathrm{week}\right]$	-0.479	-0.901***			-0.480	
	(0.170)	(0.000)			(0.169)	
$\mathbb{1}[d \in [T-4, T-1]]$	-0.008	-0.009			0.026**	
	(0.565)	(0.479)			(0.049)	
$\mathbb{1}\left[\mathrm{m} = 1 \ \ \mathrm{week}\right] \times \mathbb{1}[d \in [T-4, T-1]]$	-0.056**	-0.041**			-0.035	
	(0.02)	(0.048)			(0.133)	
$\mathbb{1}[\mathrm{m} = 2 \ \ \mathrm{week}]]$			-0.542	-0.952**		-0.858***
			(0.174)	(0.048)		(0.000)
$\mathbb{1}[d \in [T-9, T-1]]$			0.011	0.009		0.036**
			(0.174)	(0.516)		(0.036)
$\mathbb{1}[\mathrm{m} = 2 \ \ \mathrm{week}]] \times \mathbb{1}[d \in [T-9, T-1]]$			-0.052*	-0.039*		-0.030
			(0.089)	(0.066)		(0.135)
Constant	✓	✓	✓	✓	✓	✓
R-Squared	0.084	0.291	0.091	0.294	0.085	0.091
Observations	272,968	272,968	260,003	260,003	308,888	293,646
Daily Market Controls	✓	✓	✓	✓	✓	✓
Collateral FE	✓	✓	✓	✓	✓	✓
Year x Quarter FE	✓		✓		✓	✓
Bank x Year x Quarter FE		✓		✓		
Cluster level	B x Y x Q	B x Y x Q	B x Y x Q	B x Y x Q	B x Y x Q	B x Y x Q

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: **Drivers of window dressing**

This table displays regression results for the regression:

$$Y_{i,d} = \beta_1 \mathbb{1}[QE = 1] + \beta_2 \mathbb{1}[YE = 1] + \beta_3 \mathbb{1}[Reg_{i,q} \leq Q^{50}_{Reg_{i,q}}] \times \mathbb{1}[QE = 1] + \beta_4 \mathbb{1}[Reg_{i,q} \leq Q^{50}_{Reg_{i,q}}] \times \mathbb{1}[YE = 1] + \alpha_i + \alpha_{q,y} + \varepsilon_{i,d}$$

The dependent variable, $Y_{i,d}$, represents the daily balance sheet repo volume at the bank level. We define dummy variables based on the following variables: i) the leverage ratio, ii) the G-SIB status, iii) the CET1 ratio, iv) the liquidity coverage ratio (LCR), and v) the contribution of a bank to the single resolution fund (SRF contributions). For most variables, the respective dummy is one if the bank's regulatory metric is below the sample median and zero otherwise. Differently from this, for the liquidity coverage ratio the dummy is one if the bank's LCR is among the lowest 25% and zero otherwise, and for the SRF contributions the dummy is one if the bank is in the top 25% in terms of its SRF contributions and zero otherwise. α_i represents bank fixed effects and $\alpha_{q,y}$ represents year × quarter fixed effects. The sample period is from 1 September 2016 to 30 June 2021. Standard errors are clustered at the bank (B) × year (Y) level. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels.

Dependent Variable	Balance Sheet Repo (EUR bn)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}$[Quarter-end]	-1.813***	-1.064***	-1.112***	-1.384***	-1.041***	-2.257***	-0.170	-0.588
	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.793)	(0.456)
$\mathbb{1}$[Year-end]	-2.480***	-0.728**	-1.212***	-1.639***	-1.413***	-2.670***	0.394	0.463
	(0.000)	(0.050)	(0.000)	(0.000)	(0.002)	(0.000)	(0.642)	(0.702)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[Leverage Ratio$_{d-1}$ < 50%]		-1.708***					-1.280**	-1.743**
		(0.007)					(0.042)	(0.010)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[Leverage Ratio$_{d-1}$ < 50%]		-2.311***					-2.373***	-2.974***
		(0.000)					(0.002)	(0.008)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[G-SIB]			-2.713***				-2.658**	-2.445**
			(0.005)				(0.012)	(0.023)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[G-SIB]			-4.871***				-4.536***	-3.509**
			(0.000)				(0.001)	(0.024)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[CET1 Ratio$_{d-1}$ < 50%]				-1.054*			-0.200	0.262
				(0.086)			(0.773)	(0.746)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[CET1 Ratio$_{d-1}$ < 50%]				-1.673**			-0.285	-0.568
				(0.047)			(0.721)	(0.596)
$\mathbb{1}$[Quarter-end]× $\mathbb{1}$[Liquidity Coverage Ratio$_{d-1}$ < 25%]					-1.694		-1.334	-1.624
					(0.122)		(0.179)	(0.106)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[Liquidity Coverage Ratio$_{d-1}$ < 25%]					-2.872*		-2.084*	-2.661*
					(0.057)		(0.084)	(0.067)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[SRF Contribution $_{d-1}$ > 75%]						1.090**		1.314*
						(0.834)		(0.038)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[SRF Contribution $_{d-1}$ > 75%]						0.601		1.159
						(0.473)		(0.430)
R-Squared	0.976	0.977	0.977	0.977	0.976	0.977	0.977	0.917
Observations	40233	36869	40233	37865	31449	35871	31449	30299
Constant	✓	✓	✓	✓	✓	✓	✓	✓
Bank Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Year x Quarter Fixed Effect	✓	✓	✓	✓	✓	✓	✓	✓
Cluster level	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: **Drivers of window dressing – sample split**

This table displays regression results for the regression:

$$
\begin{aligned}
Y_{i,c,m,d} = \beta_0 &+ \beta_1 \mathbb{1}\,[m = 1\,week] + \beta_2 \mathbb{1}\,[d \in \{T-4, T-1\}] \\
&+ \beta_3 \mathbb{1}\,[d \in \{T-4, T-1\}] \times \mathbb{1}\,[m = 1\,week] + \gamma' \mathbf{X_{m,d}} \\
&+ \eta_c + \alpha_{i,q,y} + \epsilon_{i,c,m,d}
\end{aligned}
$$

where $Y_{i,c,m,d}$ represents the balance sheet repo volume of bank i secured with collateral from country c, with tenor m at trading day d. For column one and two the sample is split into banks with above and below median leverage ratio, respectively. For column three to six, the sample is restricted to G-SIBs and further split into banks with above and below median distance to the next G-SIB bucket. $\mathbb{1}\,[m = 1\,week]$ is an indicator variable that takes the value one if the underlying repo contract has a one-week tenor and zero otherwise. $\mathbb{1}\,[d \in \{T-4, T-1\}]$ is a dummy variable that takes the value one if the trading day is among the last four trading days prior to the reporting date. $\mathbf{X_{m,d}}$ is a vector of tenor-specific daily control variables and contains the CIP basis and the the VSTOXX index. For a detailed description of the control variables refer to Table A9. α_c denotes collateral fixed effects. $\alpha_{i,q,y}$ represents bank times year times quarter fixed effects. For each specification only overnight and one week repo contracts are retained. The sample period is from 1 September 2016 to 30 June 2021. Standard errors are clustered by bank (B) $\times$ year (Y) $\times$ quarter (Q). p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	Balance Sheet Repo$_{i,c,m,d}$ (EUR bn)					
Regulatory Constraint	Leverage Ratio		G-SIB surcharge			
Sample Split	Leverage Ratio $\leq$ 50%	Leverage Ratio $>$ 50%	Δ G-SIB Bucket $\leq$ 50%	Δ G-SIB Bucket $>$ 50%	Δ G-SIB Bucket $\leq$ 50%	Δ G-SIB Bucket $>$ 50%
Quarter	All		Year-end (Q4)		Quarter-end (Q1-Q3)	
$\mathbb{1}[\mathrm{m} = 1 \quad \mathrm{week}]$	-1.091***	-0.675*	-1.645***	-2.22	-1.527**	-1.535**
	(0.002)	(0.071)	(0.000)	(0.137)	(0.027)	(0.017)
$\mathbb{1}[d \in [T-4, T-1]]$	-0.013	-0.004	-0.122	-0.257**	0.005	-0.044
	(0.489)	(0.883)	(0.203)	(0.016)	(0.897)	(0.355)
$\mathbb{1}[\mathrm{m} = 1 \quad \mathrm{week}] \times \mathbb{1}[d \in [T-4, T-1]]$	-0.059**	-0.006	-0.257*	0.147	-0.076	-0.036
	(0.028)	(0.867)	(0.090)	(0.175)	(0.182)	(0.489)
R-Squared	0.358	0.077	0.405	0.36	0.384	0.347
Observations	169,459	139,429	12,687	9,316	41,020	29,997
Daily Market Control	✓	✓	✓	✓	✓	✓
Collateral FE	✓	✓	✓	✓	✓	✓
Bank x Year FE			✓	✓		
Bank x Year x Quarter FE	✓	✓			✓	✓
Cluster level	B x Y x Q	B x Y x Q	B x Y x Q	B x Y x Q	B x Y x Q	B x Y x Q

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: **Window dressing – by counterparty**

This table displays regression results for the regression:

$$Y^j_{i,d} = \beta^j_1 \mathbb{1}\,[ME = 1] + \beta^j_2 \mathbb{1}\,[QE = 1] + \beta^j_3 \mathbb{1}\,[YE = 1] + \alpha_{i,y,q} + \varepsilon^j_{i,d}$$

$Y^j_{i,d}$ refers to the daily counterparty type-specific bank balance sheet repo volumes expressed in billions of euro. $\mathbb{1}\,[ME = 1]$, $\mathbb{1}\,[QE = 1]$ and $\mathbb{1}\,[YE = 1]$ are dummy variables equal to one for all observations at the end of a month (1-day window), quarter (1-day window) or at the end of a year (3-day window), respectively. $\alpha_{i,y,q}$ represent bank $\times$ quarter $\times$ year fixed effects. j refers to the counterparty sector where $j \in \{\text{central banks}, \text{banks}, \text{CCPs}, \text{investment firms}, \text{other}\}$. The sample period is from 1 September 2016 to 30 June 2021. Standard errors are clustered at the bank level. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	Balance Sheet Repo (EUR bn)				
Counterparty Sector	Central Banks	Banks	CCPs	Investment Firms	Other
$\mathbb{1}$[Month-end]	-0.098	0.031	-0.218	0.105	-0.032
	(0.454)	(0.379)	(0.227)	(0.315)	(0.619)
$\mathbb{1}$[Quarter-end]	-0.495*	-0.265***	-1.108***	-0.308	-0.126
	(0.093)	(0.006)	(0.004)	(0.383)	(0.148)
$\mathbb{1}$[Year-end]	-1.015***	-0.477***	-0.536*	0.041	-0.433*
	(0.009)	(0.001)	(0.075)	(0.824)	(0.051)
Observations	22,280	38,533	36,805	19,691	33,714
R-squared	0.900	0.959	0.931	0.954	0.955
Constant	✓	✓	✓	✓	✓
Bank x Year x Quarter FE	✓	✓	✓	✓	✓
Cluster level	Bank	Bank	Bank	Bank	Bank

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: **Leverage ratio exemptions**

This table reports in column 1 and 2 baseline results for the regression:

$$\begin{aligned} Y_{i,c,m,d} &= \beta_1 \, \mathbb{1}\,[CBR\ exmpt\ takeup] + \beta_2 \mathbb{1}\,[Post\ CBR\ exmpt] \\ &+ \beta_3 \, \mathbb{1}\,[CBR\ exmpt\ takeup] \times \mathbb{1}\,[Post\ CBR\ exmpt] + \gamma' \, \mathbf{X_{m,d}} \\ &+ \alpha_{c,m} + \alpha_{q,y} + \epsilon_{i,c,m,d} \end{aligned}$$

where $Y_{i,c,m,d}$ represents the balance sheet repo volume of bank i secured with collateral from country c, with tenor m at trading day d. In column one and two we analyse the effect of the General Court ruling allowing French banks to exempt livret A deposits from the calculation of the leverage ratio in July 2018. $\mathbb{1}\,[Livret\ A\ exmpt]$ is an indicator variable that takes the value one if the respective bank exempted exposures from the calculation of the leverage ratio after the livret A exemption came into place (but before the ECB CBR exemption was enacted). $\mathbb{1}\,[Quarter-end]$ is an indicator variable that takes the value one if the respective trading day is the last day in the quarter, i.e. the regulatory reporting day. Column three to six extend the analysis to the ECB central bank reserve exemption. $\mathbb{1}\,[CBR\ exmpt\ takeup]$ is an indicator variable that takes the value one if the respective bank reports that it exempts specific exposures from the calculation of the leverage ratio. $\mathbb{1}\,[Post\ CBR\ exmpt]$ is an indicator variable that takes the value one if the trading day is after the CBR exemption on 17 September, 2020. $\alpha_{c,m}$ denotes segment-specific (tenor $\times$ collateral) fixed effects. $\alpha_{q,y}$ represents year $\times$ quarter fixed effects. $\mathbf{X_{m,d}}$ is a vector of tenor-specific daily control variables and contains the CIP basis and the VSTOXX index. For a detailed description of the control variables refer to Table A9. Standard errors are clustered by collateral country (C) $\times$ Tenor (M) and by bank (B) $\times$ year (Y). p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	Balance Sheet Repo (EUR bn)					
LR Exemption Type	Livret A Exemption		CB Reserve Exemption			
Sample Period	Pre Livret A exemption	Post Livret A & Pre CBR exemption	Post Livret A exemption - Sample End	Post Livret A exemption - Sample End	Post Livret A & Pre CBR exemption	Post CBR exemption - Sample End
Sample Banks	All banks	All banks	All banks	CBR exemption takeup banks	CBR exemption takeup banks	CBR exemption takeup banks
$\mathbb{1}$[Livret A exemption]	0.782** (0.024)	1.118*** (0.008)				
$\mathbb{1}$[Quarter-end]	-0.061** (0.026)	-0.053 (0.220)			0.049 (0.170)	0.046 (0.122)
$\mathbb{1}$[Livret A exemption] $\times$ $\mathbb{1}$[Quarter-end]	-0.070 (0.193)	-0.091 (0.352)				
$\mathbb{1}$[CBR exemption]			0.534*** (0.004)			
$\mathbb{1}$[Post CBR exemption]			-0.075 (0.178)	-0.208** (0.015)		
$\mathbb{1}$[CBR exemption] $\times$ $\mathbb{1}$[Post CBR exemption]			0.043 (0.623)			
$\mathbb{1}$[CB exposure $\geq$ 50%] $\times$ $\mathbb{1}$[Quarter-end]					-0.149*** (0.009)	-0.139 (0.181)
$\mathbb{1}$[CB exposure $\geq$ 50%]				0.335** (0.019)	0.323* (0.064)	0.540** (0.036)
$\mathbb{1}$[CB exposure $\geq$ 50%] $\times$ $\mathbb{1}$[Post CBR exemption]				0.194* (0.083)		
Constant	✓	✓	✓	✓	✓	✓
R-Squared	0.228	0.248	0.250	0.271	0.261	0.251
Observations	295,062	413,931	547,731	400,755	512,995	98,917
Daily Market Control	✓	✓	✓	✓	✓	✓
Collateral x Tenor FE	✓	✓	✓	✓	✓	✓
Quarter x Year FE			✓	✓	✓	✓
Cluster level	Segment & B x Y	Segment & B x Y	Segment & B x Y	Segment & B x Y	Segment & B x Y	Segment & B x Y

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: **Drivers of window dressing – pre- vs. post-COVID-19 period**

This table displays regression results for the regression:

$$Y_{i,d} = \beta_1 \mathbb{1}[QE=1] + \beta_2 \mathbb{1}[Reg_{i,q} \le Q^{50}_{Reg_{i,q}}] + \beta_3 \mathbb{1}[Post-COVID=1] + \beta_4 \mathbb{1}[Reg_{i,q} \le Q^{50}_{Reg_{i,q}}] \times \mathbb{1}[QE=1]$$
$$+ \beta_5 \mathbb{1}[Reg_{i,q} \le Q^{50}_{Reg_{i,q}}] \times \mathbb{1}[Post-COVID=1] + \beta_6 \mathbb{1}[QE=1] \times \mathbb{1}[Post-COVID=1]$$
$$+ \beta_7 \mathbb{1}[Reg_{i,q} \le Q^{50}_{Reg_{i,q}}] \times \mathbb{1}[QE=1] \times \mathbb{1}[Post-COVID=1] + \alpha_i + \alpha_{q,y} + \varepsilon_{i,d}$$

The dependent variable, $Y_{i,d}$, represents the daily balance sheet repo volume at the bank level. $\mathbb{1}[Reg_{i,q} \le Q^{50}_{Reg_{i,q}}]$ indicates a dummy variable that is one in case the leverage ratio of a respective bank is below the median and zero else. Alternatively, the indicator is one in case the bank is classified as a G-SIB and zero else. $\mathbb{1}[Post-COVID=1]$ is an indicator variable that takes the value one after the immediate COVID-19 period (from August 1 2020 onwards). α_i represents bank fixed effects and $\alpha_{q,y}$ represents year × quarter fixed effects. The sample period is from September 2016 to June 2021. We exclude the immediate COVID-19 period between 15 January 2020 and 1 September 2020. Standard errors are clustered at the bank (B) × year (Y) level. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels. For better visibility we omit some of the interaction terms that we do not directly interpret.

Dependent Variable	Balance Sheet Repo (EUR bn)			
	(1)	(2)	(3)	(4)
$\mathbb{1}$[Quarter-end]	-2.004***	-0.975***	-1.107***	-0.201
	(0.000)	(0.005)	(0.000)	(0.618)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[Post-COVID]	0.421	-1.830	-0.272	-2.095
	(0.651)	(0.234)	(0.774)	(0.190)
$\mathbb{1}$[Year-end]	-2.032***	-1.131***	-0.936***	-0.631
	(0.000)	(0.006)	(0.001)	(0.163)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[Post-COVID]	-0.233	1.816	-0.605	1.652
	(0.871)	(0.297)	(0.248)	(0.322)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[Leverage Ratio$_{d-1}$ < 50%]		-3.028***		-2.221***
		(0.000)		(0.001)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[Leverage Ratio$_{d-1}$ < 50%] × $\mathbb{1}$[Post-COVID]		4.446**		3.978**
		(0.025)		(0.022)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[Leverage Ratio$_{d-1}$ < 50%]		-1.694*		-0.619
		(0.094)		(0.464)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[Leverage Ratio$_{d-1}$ < 50%] × $\mathbb{1}$[Post-COVID]		-3.896		-4.870
		(0.225)		(0.106)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[G-SIB]			-3.497***	-3.221***
			(0.002)	(0.006)
$\mathbb{1}$[Quarter-end] × $\mathbb{1}$[G-SIB] × $\mathbb{1}$[Post-COVID]			2.726	2.001
			(0.272)	(0.392)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[G-SIB]			-4.199***	-4.088***
			(0.003)	(0.006)
$\mathbb{1}$[Year-end] × $\mathbb{1}$[G-SIB] × $\mathbb{1}$[Post-COVID]			1.463	2.644
			(0.777)	(0.587)
Constant	13.944***	14.368***	13.944***	14.368***
	(0.000)	(0.000)	(0.000)	(0.000)
R-Squared	0.977	0.978	0.978	0.978
Observations	34,790	31,744	34,790	31,744
Bank x Quarter Fixed Effect	✓	✓	✓	✓
Cluster level	B x Y	B x Y	B x Y	B x Y

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: **Investor pressure**

This table provides regression results for the regression:

$$
\begin{aligned}
Y_{i,d} = {} & \beta_0 + \beta_1 \mathbb{1}\,[Quarter - end] + \beta_2 \mathbb{1}\,[Year - end] + \beta_3 \mathbb{1}\,[Short - term\,investor] \\
& + \beta_4 \mathbb{1}\,[Short - term\,investor] \times \mathbb{1}\,[Quarter - end] + \beta_5 \mathbb{1}\,[Short - term\,investor] \times \mathbb{1}\,[Year - end] \\
& + \alpha_{i,q,y} + \epsilon_{i,d}
\end{aligned} \tag{5}
$$

$Y_{i,d}$ represents the daily balance sheet repo volume on the bank level. $\mathbb{1}\,[Quarter - end]$ is an indicator variable that is one during the last day prior to non year-end quarter-ends. $\mathbb{1}\,[Year - end]$ is an indicator variable that is one during the last three days prior to year-ends. $\mathbb{1}\,[Short - term\,investor]$ is an indicator variable that is one if the bank is classified as being subject to short-term investor pressure. $\alpha_{i,y,q}$ refers to bank $\times$ year $\times$ quarter fixed effects. The sample period is from 1 September 2016 to 30 June 2021. p-values are presented in brackets. Standard errors are clustered by bank (B) $\times$ year (Y) $\times$ quarter (Q). *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	Net Balance Sheet Repo (EUR bn)		
Investor Focus	Long-term	Short-term	All
$\mathbb{1}$[Quarter-end]	-1.501***	-2.886***	-1.501***
	(0.000)	(0.000)	(0.000)
$\mathbb{1}$[Year-end]	-2.528***	-1.035	-2.528***
	(0.000)	(0.215)	(0.000)
$\mathbb{1}$[Quarter-end] $\times$ $\mathbb{1}$[Short-term investor]			-1.384
			(0.115)
$\mathbb{1}$[Year-end] $\times$ $\mathbb{1}$[Short-term investor]			1.493
			(0.139)
Constant	11.849***	18.352***	13.708***
	(0.000)	(0.000)	(0.000)
R-Squared	0.980	0.956	0.977
Observations	28,736	11,497	40,233
Bank x Quarter FE	✓	✓	✓
Cluster level	B x Y x Q	B x Y x Q	B x Y x Q

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: **Drivers of window dressing – above median repo/assets**

This table displays regression results for the regression:

$$Y_{i,d} = \beta_1 \, \mathbb{1}\,[QE = 1] + \beta_2 \, \mathbb{1}\,[YE = 1] + \beta_3 \, \mathbb{1}\,[Reg_{i,q} \le Q^{50}_{Reg_{i,q}}] \times \mathbb{1}\,[QE = 1])$$
$$+ \beta_4 \, \mathbb{1}\,[Reg_{i,q} \le Q^{50}_{Reg_{i,q}}] \times \mathbb{1}\,[YE = 1] + \alpha_i + \alpha_{q,y} + \varepsilon_{i,d}$$

The dependent variable, $Y_{i,d}$, represents the daily balance sheet repo volume at the bank level. We define dummy variables based on the following variables: i) the leverage ratio, ii) the G-SIB status, iii) the CET1 ratio, iv) the liquidity coverage ratio (LCR), and v) the contribution of a bank to the single resolution fund (SRF contributions). For most variables, the respective dummy is one if the bank's regulatory metric is below the sample median and zero otherwise. Differently from this, for the liquidity coverage ratio the dummy is one if the bank's LCR is among the lowest 25% and zero otherwise, and for the SRF contributions the dummy is one if the bank is in the top 25% in terms of its SRF contributions and zero otherwise. α_i represents bank fixed effects and $\alpha_{q,y}$ represents year $\times$ quarter fixed effects. The sample period is from 1 September 2016 to 30 June 2021. Standard errors are clustered at the bank (B) $\times$ year (Y) level. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels.

Dependent Variable	Balance Sheet Repo (EUR bn)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{1}$[Quarter-end]	-2.786*** (0.000)	-0.915 (0.138)	-1.598** (0.022)	-2.289* (0.050)	-2.117*** (0.001)	-2.793*** (0.000)	0.011 (0.993)
$\mathbb{1}$[Year-end]	-2.166** (0.047)	0.729 (0.397)	0.643 (0.413)	-1.297 (0.206)	-0.933 (0.355)	-2.252* (0.062)	2.394*** (0.001)
$\mathbb{1}$[Quarter-end] $\times$ $\mathbb{1}$[Leverage Ratio$_{d-1}$ $<$ 50%]		-3.344*** (0.005)					-3.030*** (0.005)
$\mathbb{1}$[Year-end] $\times$ $\mathbb{1}$[Leverage Ratio$_{d-1}$ $<$ 50%]		-5.280*** (0.006)					-3.417** (0.035)
$\mathbb{1}$[Quarter-end] $\times$ $\mathbb{1}$[G-SIB]			-2.689* (0.066)				-1.628 (0.209)
$\mathbb{1}$[Year-end] $\times$ $\mathbb{1}$[G-SIB]			-6.245*** (0.007)				-4.660** (0.019)
$\mathbb{1}$[Quarter-end] $\times$ $\mathbb{1}$[CET1 Ratio$_{d-1}$ $<$ 50%]				-0.715 (0.612)			0.136 (0.920)
$\mathbb{1}$[Year-end] $\times$ $\mathbb{1}$[CET1 Ratio$_{d-1}$ $<$ 50%]				-1.244 (0.480)			0.249 (0.847)
$\mathbb{1}$[Quarter-end] $\times$ $\mathbb{1}$[Liquidity Coverage Ratio$_{d-1}$ $<$ 25%]					-3.559* (0.092)		-2.943* (0.076)
$\mathbb{1}$[Year-end] $\times$ $\mathbb{1}$[Liquidity Coverage Ratio$_{d-1}$ $<$ 25%]					-6.170 (0.113)		-5.168** (0.048)
$\mathbb{1}$[Quarter-end] $\times$ $\mathbb{1}$[SRF Contribution$_{d-1}$ $>$ 75%]						-1.063 (0.432)	0.155 (0.896)
$\mathbb{1}$[Year-end] $\times$ $\mathbb{1}$[SRF Contribution$_{d-1}$ $>$ 75%]						1.249 (0.499)	3.101 (0.163)
Constant	23.108*** (0.000)	23.132*** (0.000)	23.108*** (0.000)	23.108*** (0.000)	24.807*** (0.000)	23.537*** (0.000)	25.273*** (0.000)
R-Squared	0.969	0.969	0.969	0.969	0.968	0.968	0.890
Observations	18,128	17,984	18,128	18,128	15,436	17,619	15,054
Bank x Quarter Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Cluster level	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A Appendix

Figure A1: **Correlation matrix of regulatory metrics and balance sheet variables**

This figure displays the correlation matrix between the regulatory metrics and the balance sheet variables. All variable definitions are as described in Table A9.

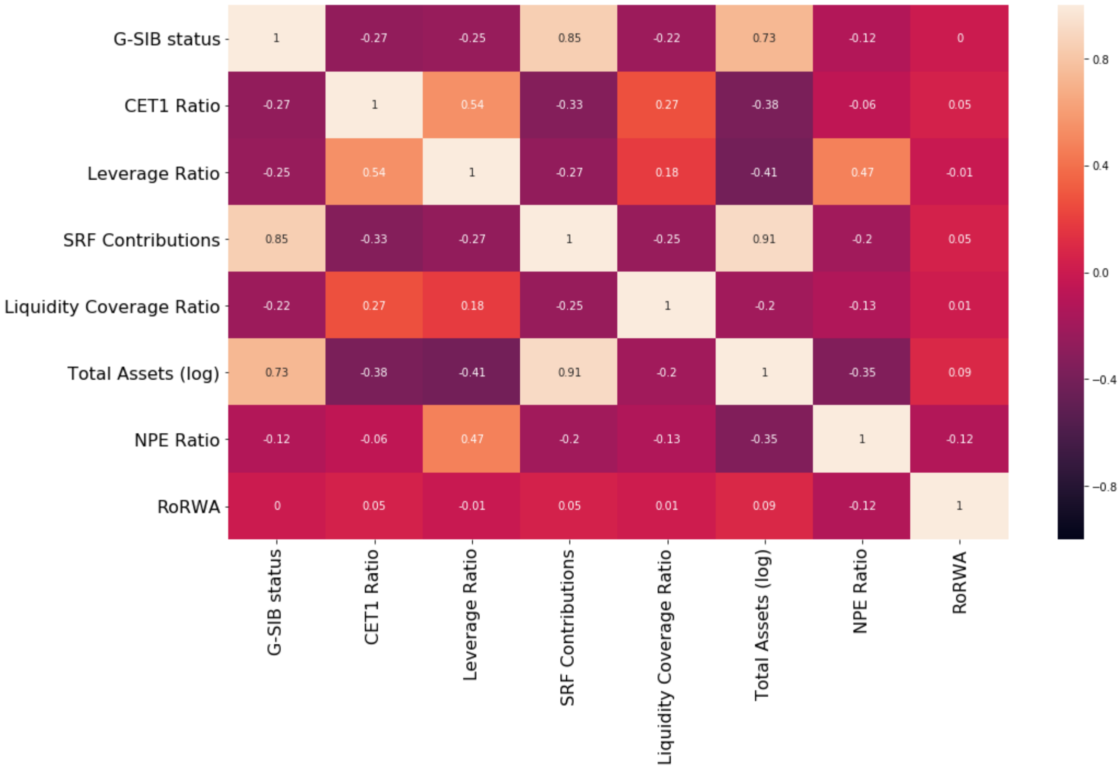


Figure A2: **Evolution of balance sheet repos over time – by country**

This figure displays the evolution of the balance sheet repo volumes separately for the country of bank incorporation. Countries are divided into *Germany, France, Italy, Spain, Netherlands* and *Other countries*. *Other countries* includes Belgium, Ireland, Greece and Finland. All volumes are in EUR billion and at daily frequency. The computation of balance sheet repo volumes is as outlined in Table A9. The dashed red lines indicate the last trading day in each quarter, i.e. the regulatory reporting date. The sample period is from 1 September 2016 to 30 June 2021.

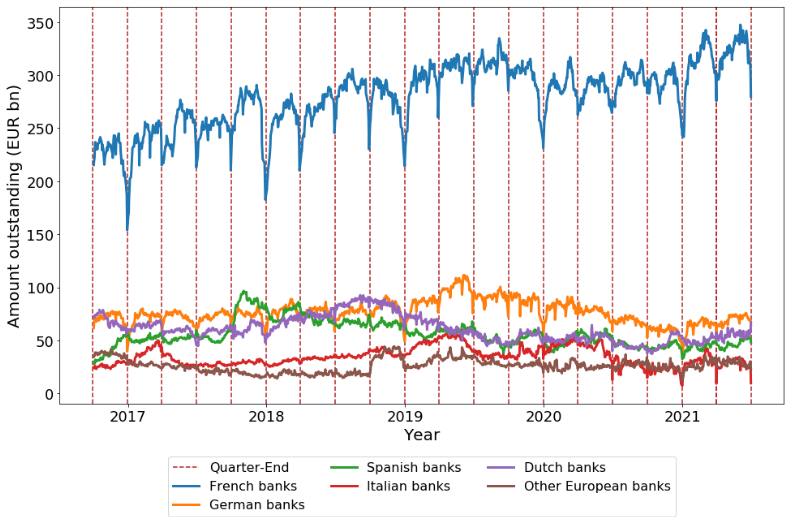


Figure A3: **Evolution of balance sheet repos over time – by counterparty**

This figure displays the evolution of the balance sheet repo volumes separately for the counterparty sector. Counterparty types are divided into i) central banks, ii) banks, iii) CCPs, iv) investment funds and v) othercounterparties. All volumes are in EUR billion and at daily frequency. The computation of balance sheet repo volumes is as outlined in Table A9. The dashed red lines indicate the last trading day in each quarter, i.e. the regulatory reporting date. The sample period is from 1 September 2016 to 30 June 2021.

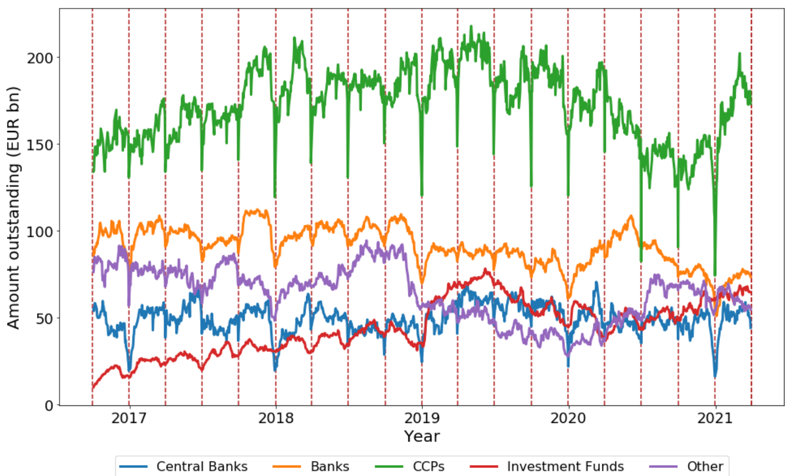
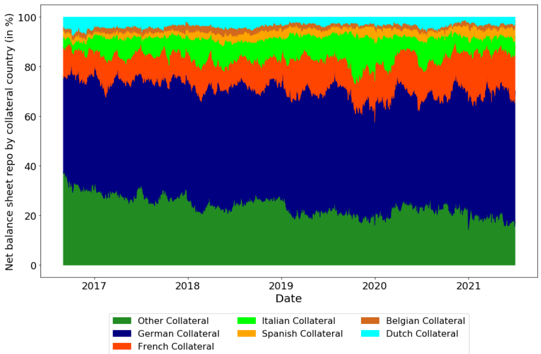
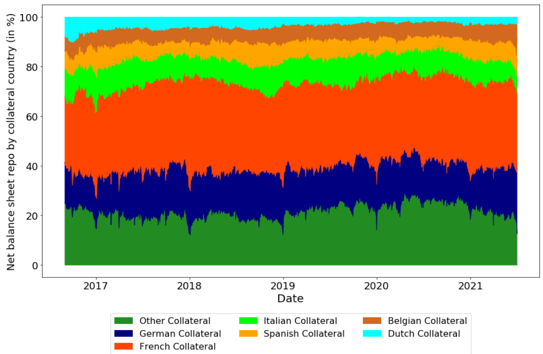


Figure A4: **Composition of repo collateral across countries**

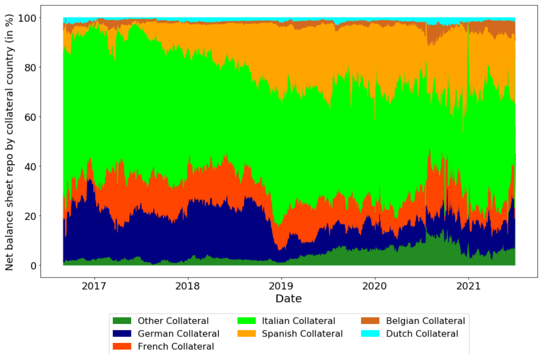
This figure displays the evolution of the share of repo collateral across collateral issuer countries and the country of bank incorporation. The vertical axis displays the share of total balance sheet repos that is secured by collateral issued in a specific country. *Other banks* include Belgian, Irish, Greek and Finish banks. The sample period is from 1 September 2016 to 30 June 2021.



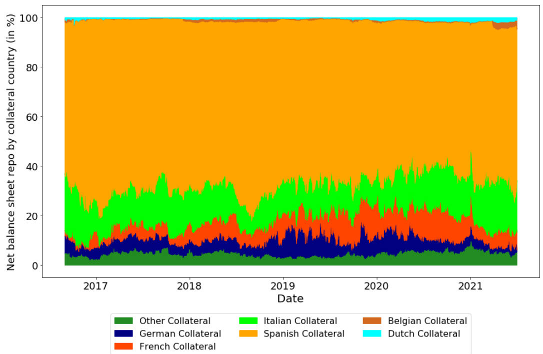
a) German banks



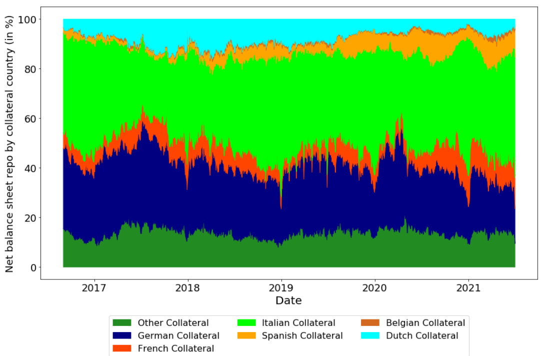
b) French banks



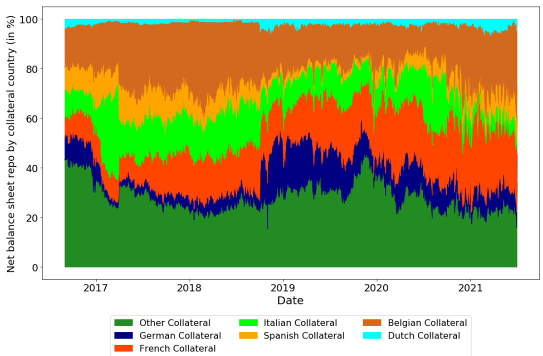
c) Italian banks



d) Spanish banks



e) Dutch banks



f) Other banks

Table A1: **Summary statistics – balance sheet repos by tenor and issuer location**

This table reports summary statistics for the balance sheet repo volumes, separately for repo tenors (Panel A) and collateral issuer location (Panel B). Repo volumes are in EUR billion. For each bank balance sheet repo volumes are aggregated by tenor and collateral issuer location segment. Tenor segments are i) overnight, ii) one-week, iii) two-weeks, iv) one-month, v) two-months, vi) three-months and vii) between three-months and one-year. Collateral issuer location is separately for i) German collateral (DE), ii) French collateral (FR), iii) Italian collateral (IT), iv) Spanish collateral (ES), v) Belgian collateral (BE), vi) Dutch collateral (NL) and vii) Other European collateral where *Other European* includes collateral from Greece, Ireland and Finland. For each category we report the mean, the standard deviation, the 25^{th}, 50^{th} and 75^{th} percentile and the total number of observations. The computation of balance sheet repo volumes is as outlined in Section 3 and in Table A9. The sample period is from 1 September 2016 to 30 June 2021.

Panel A: By Tenor

Tenor	Mean	SD	25%	50%	75%	# Observations
Overnight	0.99	1.70	0.03	0.28	1.18	213,856
1-week	0.32	0.64	0.00	0.05	0.31	95,853
2-week	0.24	0.48	0.00	0.05	0.25	80,706
1-month	0.23	0.42	0.00	0.06	0.26	130,699
2-month	0.12	0.26	0.00	0.02	0.15	64,604
3-month	0.17	0.37	0.00	0.03	0.20	116,520
3 month - 1 year	1.43	2.96	0.02	0.31	1.49	248,839

Panel B: By Collateral Issuer Location

Collateral Issuer Location	Mean	SD	25 %	50 %	75 %	# Observations
DE	0.86	1.69	0.01	0.19	0.84	164,924
FR	1.03	2.59	0.00	0.16	0.76	149,141
IT	0.82	2.36	0.00	0.12	0.58	130,020
ES	0.68	1.68	0.00	0.10	0.51	128,069
BE	0.33	0.73	0.00	0.05	0.26	101,747
NL	0.23	0.53	0.00	0.05	0.23	103,636
Other European	0.74	1.64	0.00	0.15	0.80	173,540

Table A2: **Window dressing at the period-end**

This table provides regression results for the regression:

$$Y^Q_{i,d} = \sum_{k=\underline{L}}^{k=\overline{L}} \beta^Q_k D_k + \alpha_{i,y,q} + \epsilon^Q_{i,d}$$

$Y^Q_{i,d}$ represents the daily balance sheet repo volume, either on the bank or on the aggregate (across all banks) level for a given set of quarters. Q denotes the quarter period under study (year-end (Q4) vs. quarter-end (Q1-Q3)). D_k is an indicator variable that is one during event day k for $k \in \{-27, 28\}$. $\alpha_{i,y,q}$ refers to bank × year × quarter fixed effects. All coefficients are expressed relative to event day $T-28$. Coefficient estimates are in EUR billions. The first two columns refer to the bank-level event study. Column three and four refer to the aggregate daily balance sheet repo volumes. Standard errors are clustered at the bank-year level for the bank-level analysis and at the year level for quarter one to three of the daily event study analysis. For quarter four of the daily event study analysis standard errors are not clustered to account for the overlap of years. The sample period is from 1 September 2016 to 30 June 2021. For better visualization, we display only the coefficients in a 10 day event window around the reporting date. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	Balance sheet repo (EUR bn)			
Aggregation	Bank level		Aggregate level	
Period	Quarter-end (Q 1-3)	Year-end (Q 4)	Quarter-end (Q 1-3)	Year-end (Q 4)
D[T-5]	-0.242	-1.349**	-8.183*	-45.613***
	(0.176)	(0.022)	(0.095)	(0.005)
D[T-4]	-0.255	-1.691***	-8.583**	-57.158***
	(0.192)	(0.007)	(0.033)	(0.001)
D[T-3]	-0.709***	-2.018***	-24.240*	-69.549***
	(0.008)	(0.003)	(0.071)	(0.000)
D[T-2]	-0.756***	-2.450***	-25.887**	-83.880***
	(0.005)	(0.001)	(0.035)	(0.000)
D[T-1]	-0.921***	-3.022***	-31.466***	-102.861***
	(0.002)	(0.001)	(0.004)	(0.000)
D[T]	-1.964***	-3.905***	-66.264***	-131.660***
	(0.000)	(0.000)	(0.000)	(0.000)
D[T+1]	-1.475***	-3.179***	-48.757**	-111.604***
	(0.000)	(0.004)	(0.044)	(0.000)
D[T+2]	-0.913***	-2.963***	-29.754***	-104.272***
	(0.000)	(0.004)	(0.002)	(0.000)
D[T+3]	-0.776***	-2.638***	-25.114***	-93.284***
	(0.001)	(0.003)	(0.007)	(0.000)
D[T+4]	-0.717***	-2.394***	-23.126**	-85.018***
	(0.000)	(0.003)	(0.019)	(0.000)
D[T+5]	-0.568***	-2.105***	-18.099*	-75.239***
	(0.001)	(0.004)	(0.065)	(0.000)
R-Squared	0.982	0.963	0.882	0.774
Observations	29,047	9,644	860	285
Bank x Quarter x Year FE	✓			
Bank x Year FE		✓		
Year x Quarter FE			✓	
Year FE				✓
Cluster level	B x Y	B x Y	Y	-

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3: **Window dressing at the period-end – by tenor**

This table provides regression results for the regression:

$$Y_{i,d}^{Q,m} = \sum_{k=\underline{L}}^{k=\overline{L}} \beta_k^{Q,m} D_k + \lambda_c + \alpha_{i,y,q} + \epsilon_{i,d}^{Q,m}$$

$Y_{i,t}^{Q,m}$ represents the daily balance sheet repo volume for tenor category m while Q denotes the quarter period under study (year-end vs. quarter-end). D_k is an indicator variable that is one during event day k for $k \in \{-28, 28\} \notin \{-28\}$. λ_c indicates a collateral issuer location fixed effect. $\alpha_{i,y,q}$ refers to bank $\times$ year $\times$ quarter fixed effects. All coefficients are expressed relative to event day $T-28$. Coefficient estimates are in EUR billions. The first two columns refer to overnight repo contracts. Column three and four refer to one week repo contracts. Standard errors are clustered at the collateral (C) and the dealer (D) $\times$ year level. The sample period is from 1 September 2016 to 30 June 2021. For better visualization, we display only the coefficients between $T-10$ and $T+3$ around the reporting date. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	Balance sheet repo (EUR bn)			
Tenor Specification	Overnight		1-week	
Quarter	Quarter-end (Q 1-3)	Year-end (Q 4)	Quarter-end (Q 1-3)	Year-end (Q 4)
D[T-10]	0.005	-0.027*	-0.008	-0.062**
	(0.747)	(0.050)	(0.803)	(0.025)
D[T-9]	0.015	-0.042***	0.001	-0.078***
	(0.378)	(0.002)	(0.969)	(0.000)
D[T-8]	0.018	-0.043***	0.005	-0.094***
	(0.334)	(0.003)	(0.875)	(0.001)
D[T-7]	0.019	-0.047***	-0.009	-0.089***
	(0.279)	(0.002)	(0.773)	(0.001)
D[T-6]	0.016	-0.059***	-0.027	-0.092***
	(0.340)	(0.000)	(0.452)	(0.002)
D[T-5]	0.001	-0.073***	-0.028	-0.090***
	(0.975)	(0.000)	(0.513)	(0.002)
D[T-4]	-0.010	-0.076***	-0.086**	-0.082***
	(0.547)	(0.000)	(0.029)	(0.007)
D[T-3]	0.001	-0.094***	-0.047	-0.145***
	(0.954)	(0.000)	(0.387)	(0.002)
D[T-2]	-0.060***	-0.123***	-0.149***	-0.201***
	(0.006)	(0.000)	(0.000)	(0.000)
D[T-1]	-0.085***	-0.141***	-0.200***	-0.217***
	(0.001)	(0.000)	(0.000)	(0.000)
D[T]	-0.174***	-0.126***	-0.317***	-0.192***
	(0.000)	(0.000)	(0.001)	(0.000)
D[T+1]	-0.039	-0.118***	-0.136**	-0.241***
	(0.100)	(0.000)	(0.031)	(0.000)
D[T+2]	-0.045*	-0.112***	-0.114**	-0.234***
	(0.054)	(0.000)	(0.046)	(0.000)
D[T+3]	-0.035	-0.095***	-0.048	-0.180***
	(0.112)	(0.000)	(0.394)	(0.000)
R-Squared	0.307	0.245	0.299	0.254
Observations	190,766	85,346	47,329	20,104
Collateral FE	✓	✓	✓	✓
Bank x Year x Quarter FE	✓	✓	✓	✓
Cluster level	C & B x Y	C & B x Y	C & B x Y	C & B x Y

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A4: **Window dressing at the period-end – by collateral issuer location**

This table provides regression results for the regression:

$$Y_{i,d}^{Q,c} = \sum_{k=\underline{L}}^{k=\overline{L}} \beta_k^{Q,c} D_k + \lambda_m + \alpha_{i,y,q} + \epsilon_{i,d}^{Q,c}$$

All coefficients are expressed relative to event day $T-28$. $Y_{i,d}^{Q,c}$ represents the daily balance sheet repo volume by bank i in repo transactions with collateral issuer country c. Q denotes the quarter period under study (year-end vs. quarter-end). D_k is an indicator variable that is one during event day k for $k \in \{-27, 28\}$. λ_m indicates a tenor fixed effect. $\alpha_{i,y,q}$ refers to bank × year × quarter fixed effects. Standard errors are clustered at the tenor level (m) and at the bank × year level. The sample period is from 1 September 2016 to 30 June 2021. For better visualization, we display only the coefficients in a 10 day event window around the reporting date. All coefficients are expressed relative to the base period at $d = T-28$. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Dependent Variable	Balance sheet repo (EUR bn)									
Quarter	Quarter-End (Q 1-3)					Year-End (Q 4)				
Collateral Country	Other	German	French	Italian	Spanish	Other	German	French	Italian	Spanish
D[T-5]	-0.011	-0.035	-0.027	-0.030*	-0.014	-0.056**	-0.124**	-0.093	-0.042	0.029
	(0.366)	(0.583)	(0.290)	(0.091)	(0.542)	(0.017)	(0.030)	(0.149)	(0.107)	(0.480)
D[T-4]	-0.015	-0.043	-0.022	-0.050**	-0.002	-0.068**	-0.137**	-0.118	-0.029	0.046
	(0.122)	(0.406)	(0.408)	(0.043)	(0.903)	(0.011)	(0.047)	(0.104)	(0.310)	(0.423)
D[T-3]	-0.016	-0.048	-0.030	-0.040**	0.004	-0.105**	-0.113**	-0.082	-0.130	-0.071
	(0.133)	(0.362)	(0.145)	(0.048)	(0.817)	(0.011)	(0.012)	(0.411)	(0.155)	(0.533)
D[T-2]	-0.016	-0.057	-0.033*	-0.054*	0.010	-0.104***	-0.185**	-0.105	-0.059	-0.010
	(0.209)	(0.129)	(0.052)	(0.056)	(0.680)	(0.009)	(0.040)	(0.107)	(0.143)	(0.849)
D[T-1]	-0.028*	-0.065*	-0.042**	-0.055*	-0.002	-0.139***	-0.230*	-0.123*	-0.067	-0.038
	(0.075)	(0.091)	(0.029)	(0.051)	(0.941)	(0.008)	(0.067)	(0.080)	(0.103)	(0.469)
D[T]	-0.089**	-0.130*	-0.044*	-0.101*	-0.014	-0.212**	-0.216	-0.200*	-0.123**	0.019
	(0.040)	(0.051)	(0.066)	(0.064)	(0.549)	(0.049)	(0.149)	(0.087)	(0.041)	(0.749)
D[T+1]	-0.038	-0.084	-0.052	-0.070*	-0.037*	-0.125**	-0.216**	-0.152	-0.023	-0.092
	(0.194)	(0.273)	(0.113)	(0.098)	(0.097)	(0.024)	(0.027)	(0.115)	(0.727)	(0.328)
D[T+2]	-0.025	-0.078	-0.026	-0.059*	-0.031	-0.098*	-0.208*	-0.159	-0.096	-0.096
	(0.309)	(0.225)	(0.546)	(0.077)	(0.184)	(0.058)	(0.056)	(0.134)	(0.171)	(0.404)
D[T+3]	-0.029	-0.060	-0.017	-0.071**	-0.030	-0.078	-0.175	-0.169	-0.086	-0.093
	(0.118)	(0.401)	(0.578)	(0.044)	(0.208)	(0.126)	(0.161)	(0.142)	(0.254)	(0.293)
D[T+4]	-0.032*	-0.061	-0.044	-0.049	-0.040	-0.071*	-0.142	-0.162	-0.062	-0.102
	(0.078)	(0.441)	(0.258)	(0.155)	(0.196)	(0.093)	(0.294)	(0.128)	(0.444)	(0.120)
D[T+5]	-0.021*	-0.051	-0.058	-0.046	-0.035	-0.075**	-0.120	-0.167	-0.059	-0.055
	(0.094)	(0.485)	(0.172)	(0.144)	(0.254)	(0.034)	(0.393)	(0.115)	(0.349)	(0.308)
R-Squared	0.226	0.418	0.400	0.328	0.341	0.232	0.426	0.417	0.296	0.344
Observations	223,752	96,326	88,410	75,774	75,102	76,648	33,869	30,238	27,065	26,200
Tenor FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bank x Year x Quarter FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cluster level	T & B × Y	T & B × Y	T & B × Y	T & B × Y	T & B × Y	T & B × Y	T & B × Y	T & B × Y	T & B × Y	T & B × Y

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: **Drivers of window dressing – with balance sheet controls**

This table displays regression results for a variation of the model specified in Equation 3. The dependent variable is the daily balance sheet volume on the bank level. We include the following regressors: i) the leverage ratio, ii) the G-SIB status, iii) the CET1 ratio, iv) the Liquidity Coverage Ratio, and v) the contribution of a bank to the single resolution fund. All regressors are interacted with an indicator variable that is one if the bank's regulatory metric is in the upper part of the distribution. We include the bank size, the non-performing exposure ratio, as well as the return on risk-weighted assets as control variables. All controls are lagged by one quarter to avoid endogeneity concerns. For a specific definition of the variables, refer to Table A9. Estimation is based on OLS regressions with bank and year times quarter fixed effects to control for any observed and unobserved time-varying heterogeneity across banks. The sample period is from 1 September 2016 to 30 June 2021. Standard errors are clustered at the bank (B) times year (Y) level to control for within bank autocorrelation of residuals. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels.

Dependent Variable	Balance Sheet Repo (EUR bn)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
D[Quarter-end]	-1.983***	-1.170***	-1.209***	-1.401***	-1.734***	-2.248***	-0.575
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.478)
D[Year-end]	-2.545***	-0.873*	-1.307***	-1.703***	-2.142***	-2.717***	0.459
	(0.000)	(0.065)	(0.000)	(0.000)	(0.000)	(0.000)	(0.708)
D[Quarter-end] × D[Leverage Ratio$_{d-1}$ < 50%]		-1.592**					-1.770**
		(0.014)					(0.013)
D[Year-end] × D[Leverage Ratio$_{d-1}$ < 50%]		-3.212***					-3.038***
		(0.002)					(0.010)
D[Quarter-end] × D[G-SIB]			-2.888***				-2.450**
			(0.004)				(0.023)
D[Year-end] × D[G-SIB]			-4.593***				-3.395**
			(0.005)				(0.026)
D[Quarter-end] × D[CET1 Ratio$_{d-1}$ < 50%]				-1.017*			0.269
				(0.097)			(0.743)
D[Year-end] × D[CET1 Ratio$_{d-1}$ < 50%]				-1.553			-0.571
				(0.106)			(0.595)
D[Quarter-end]× D[Liquidity Coverage Ratio$_{d-1}$ < 25%]					-1.586		-1.590
					(0.145)		(0.117)
D[Year-end] × D[Liquidity Coverage Ratio$_{d-1}$ < 25%]					-2.873		-2.704*
					(0.105)		(0.064)
D[Quarter-end] × D[SRF Contribution$_{d-1}$ > 75%]						0.949*	1.293*
						(0.081)	(0.075)
D[Year-end] × D[SRF Contribution$_{d-1}$ > 75%]						0.753	1.408
						(0.374)	(0.162)
R-Squared	0.919	0.919	0.919	0.918	0.918	0.919	0.918
Observations	36,127	35,848	36,127	37,865	30,555	35,363	29,791
Constant	✓	✓	✓	✓	✓	✓	✓
Bank Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓
Year x Quarter Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Cluster level	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6: **Drivers of window dressing – with balance sheet controls and continuous variables**

This table displays regression results variation of the model specified in Equation 3. The dependent variable is the daily balance sheet volume on the bank level. We include the following regressors: i) the leverage ratio, ii) the G-SIB status, iii) the CET1 ratio, iv) the Liquidity Coverage Ratio, and v) the contribution of a bank to the single resolution fund. All regressors are included as a continuous regulatory metric. We include the bank size, the non-performing exposure ratio, the ratio of trading income to total assets, as well as the return on risk-weighted assets as control variables. All controls are lagged by one quarter to avoid endogeneity concerns. For a specific definition of the variables, refer to Table A9. Estimation is based on OLS regressions with bank and year times quarter fixed effects to control for any observed and unobserved time-varying heterogeneity across banks. Standard errors are clustered at the bank (B) times year (Y) level to control for within bank autocorrelation of residuals. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels.

Dependent Variable	Balance Sheet Repo (EUR bn)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
D[Quarter-end]	-1.985***	-4.269***	-1.196***	-3.954***	-7.361***	-2.656***	-8.144***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.004)
D[Year-end]	-2.547***	-6.101***	-1.309***	-4.479***	-9.518***	-2.531***	-11.102**
	(0.000)	(0.000)	(0.000)	(0.010)	(0.004)	(0.004)	(0.022)
D[Quarter-end] × Leverage Ratio$_{d-1}$		0.457***					0.772**
		(0.000)					(0.010)
D[Year-end] × Leverage Ratio$_{d-1}$		0.704***					0.988**
		(0.001)					(0.040)
D[Quarter-end] × D[G-SIB]			-2.919***				-2.364**
			(0.004)				(0.045)
D[Year-end] × D[G-SIB]			-4.535***				-3.756**
			(0.005)				(0.028)
D[Quarter-end] × CET1 Ratio$_{d-1}$				0.135***			-0.110
				(0.003)			(0.304)
D[Year-end] × CET1 Ratio$_{d-1}$				0.128			-0.102
				(0.186)			(0.497)
D[Quarter-end] × Liquidity Coverage Ratio$_{d-1}$					0.035***		0.021*
					(0.007)		(0.052)
D[Year-end] × Liquidity Coverage Ratio$_{d-1}$					0.044**		0.031*
					(0.030)		(0.086)
D[Quarter-end] × SRF Contribution$_{d-1}$						0.462**	1.088*
						(0.036)	(0.092)
D[Year-end] × SRF Contribution$_{d-1}$						0.020	0.874
						(0.960)	(0.363)
R-Squared	0.976	0.977	0.977	0.977	0.976	0.977	0.963
Observations	40,233	36,869	40,233	37,865	31,449	35,871	29,791
Constant	✓	✓	✓	✓	✓	✓	✓
Bank FE	✓	✓	✓	✓	✓	✓	✓
Year x Quarter FE	✓	✓	✓	✓	✓	✓	✓
Balance Sheet Controls	✓	✓	✓	✓	✓	✓	✓
Cluster level	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7: **Drivers of window dressing – excluding the COVID-19 period**

This table displays regression results of the model specified in Equation 3. The total sample period is from 1 September 2016 to 15 January 2020, i.e. excluding the immediate COVID-19 period as well as the post COVID-19 period. The dependent variable is the daily balance sheet volume on the bank level. We include the following regressors: i) the leverage ratio, ii) the G-SIB status, iii) the CET1 ratio, iv) the Liquidity Coverage Ratio, and v) the contribution of a bank to the single resolution fund. All regressors are included as a continuous regulatory metric. We include the bank size, the non-performing exposure ratio, the ratio of trading income to total assets, as well as the return on risk-weighted assets as control variables. All controls are lagged by one quarter to avoid endogeneity concerns. For a specific definition of the variables, refer to Table A9. Estimation is based on OLS regressions with bank and year times quarter fixed effects to control for any observed and unobserved time-varying heterogeneity across banks. Standard errors are clustered at the bank (B) times year (Y) level to control for within bank autocorrelation of residuals. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels.

Dependent Variable	Balance Sheet Repo (EUR bn)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
𝟙[Quarter-end]	-2.004***	-0.629*	-1.107***	-1.421***	-1.738***	-2.394***	-0.647
	(0.000)	(0.060)	(0.000)	(0.003)	(0.000)	(0.000)	(0.349)
𝟙[Year-end]	-2.032***	-1.131***	-0.936***	-1.659***	-1.676***	-2.259***	0.742
	(0.000)	(0.006)	(0.001)	(0.000)	(0.008)	(0.000)	(0.103)
𝟙[Quarter-end] × 𝟙[Leverage Ratio$_{d-1}$ < 50%]		-3.028***					-2.103***
		(0.000)					(0.004)
𝟙[Year-end] × 𝟙[Leverage Ratio$_{d-1}$ < 50%]		-1.694*					-2.054**
		(0.094)					(0.045)
𝟙[Quarter-end] × 𝟙[G-SIB]			-3.497***				-3.136***
			(0.002)				(0.006)
𝟙[Year-end] × 𝟙[G-SIB]			-4.199***				-4.780***
			(0.003)				(0.003)
𝟙[Quarter-end] × 𝟙[CET1 Ratio$_{d-1}$ < 50%]				-1.385*			0.488
				(0.067)			(0.580)
𝟙[Year-end] × 𝟙[CET1 Ratio$_{d-1}$ < 50%]				-0.689			-0.128
				(0.463)			(0.883)
𝟙[Quarter-end] × 𝟙[Liquidity Coverage Ratio$_{d-1}$ < 25%]					-2.634**		-1.738**
					(0.046)		(0.038)
𝟙[Year-end] × 𝟙[Liquidity Coverage Ratio$_{d-1}$ < 25%]					-2.042		-2.108
					(0.277)		(0.116)
𝟙[Quarter-end] × 𝟙[SRF Contribution$_{d-1}$ > 75%]						0.837	1.320*
						(0.211)	(0.078)
𝟙[Year-end] × 𝟙[SRF Contribution$_{d-1}$ > 75%]						0.933	0.248
						(0.290)	(0.814)
Constant	14.247***	14.659***	14.247***	14.533***	15.847***	14.894***	16.217***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R-Squared	0.980	0.980	0.980	0.980	0.980	0.980	0.931
Observations	29,683	26,908	29,683	27,904	22,789	26,400	22,002
Bank x Quarter Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Cluster level	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A8: **Drivers of window dressing – below median repo/assets**

This table displays regression results for the regression:

$$Y_{i,d} = \beta_1 \mathbb{1}\,[QE = 1] + \beta_2 \mathbb{1}\,[YE = 1] + \beta_3 \mathbb{1}\,[Reg_{i,q} \leq Q^{50}_{Reg_{i,q}}] \times \mathbb{1}\,[QE = 1])$$
$$+ \beta_4 \mathbb{1}\,[Reg_{i,q} \leq Q^{50}_{Reg_{i,q}}] \times \mathbb{1}\,[YE = 1] + \alpha_i + \alpha_{q,y} + \varepsilon_{i,d}$$

The dependent variable, $Y_{i,d}$, represents the daily balance sheet repo volume at the bank level. We define dummy variables based on the following variables: i) the leverage ratio, ii) the G-SIB status, iii) the CET1 ratio, iv) the liquidity coverage ratio (LCR), and v) the contribution of a bank to the single resolution fund (SRF contributions). For most variables, the respective dummy is one if the bank's regulatory metric is below the sample median and zero otherwise. Differently from this, for the liquidity coverage ratio the dummy is one if the bank's LCR is among the lowest 25% and zero otherwise, and for the SRF contributions the dummy is one if the bank is in the top 25% in terms of its SRF contributions and zero otherwise. α_i represents bank fixed effects and $\alpha_{q,y}$ represents year × quarter fixed effects. The sample period is from 1 September 2016 to 30 June 2021. Standard errors are clustered at the bank (B) × year (Y) level. p-values are presented in brackets. *, **, and *** indicate statistical significance at the 10%, 5% and 1% levels.

Dependent Variable	Balance Sheet Repo (EUR bn)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
𝟙[Quarter-end]	-1.241***	-1.180**	-0.872***	-0.921**	-1.508***	-1.652***	-1.348
	(0.000)	(0.018)	(0.004)	(0.012)	(0.002)	(0.001)	(0.286)
𝟙[Year-end]	-2.286***	-1.834***	-2.163***	-1.574***	-2.180***	-2.490***	-0.824*
	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.059)
𝟙[Quarter-end] × 𝟙[Leverage Ratio$_{d-1}$ < 50%]		-0.105					0.326
		(0.877)					(0.614)
𝟙[Year-end] × 𝟙[Leverage Ratio$_{d-1}$ < 50%]		-1.099					-0.669
		(0.292)					(0.592)
𝟙[Quarter-end] × 𝟙[G-SIB]			-4.036***				-3.909***
			(0.003)				(0.007)
𝟙[Year-end] × 𝟙[G-SIB]			-0.581				-0.017
			(0.810)				(0.994)
𝟙[Quarter-end] × 𝟙[CET1 Ratio$_{d-1}$ < 50%]				-0.868			-0.015
				(0.169)			(0.987)
𝟙[Year-end] × 𝟙[CET1 Ratio$_{d-1}$ < 50%]				-1.630			-2.563**
				(0.165)			(0.010)
𝟙[Quarter-end] × 𝟙[Liquidity Coverage Ratio$_{d-1}$ < 25%]					1.296**		0.412
					(0.028)		(0.571)
𝟙[Year-end] × 𝟙[Liquidity Coverage Ratio$_{d-1}$ < 25%]					-2.000		-0.907
					(0.168)		(0.323)
𝟙[Quarter-end] × 𝟙[SRF Contribution$_{d-1}$ > 75%]						1.033*	0.616
						(0.080)	(0.517)
𝟙[Year-end] × 𝟙[SRF Contribution$_{d-1}$ > 75%]						0.845	-0.329
						(0.377)	(0.793)
Constant	5.751***	5.736***	5.751***	5.751***	6.071***	5.759***	6.128***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R-Squared	0.962	0.962	0.963	0.962	0.965	0.963	0.915
Observations	18,125	17,919	18,125	18,125	15,047	17,286	14,279
Bank x Quarter Fixed Effect	✓	✓	✓	✓	✓	✓	✓
Cluster level	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y	B x Y

p-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A9: **Variable definitions and data sources**

This table defines the variables used in the analyses and lists the data sources of the input data.

Variable	Description
Dependent Variables	
Balance sheet repo volume	The daily balance sheet repo volume is computed by aggregating all of a bank's daily repo and reverse repo volumes outstanding, i.e. all repo market transactions that have settled but not yet matured. To account for reductions in reported repo volumes stemming from master netting agreements, we net repo and reverse repo transaction volumes provided that they were executed with the same counterparty and with matching maturity dates. For the purpose of our analysis, all volumes are aggregated to the highest level of consolidation. Source: MMSR
Repo rate	The repo rate is computed as the volume-weighted borrowing rate that is reported for a specific transaction. Specifically, for the security-level analysis repo rates are weighted by the ratio of the specific transaction volume relative to the total transaction volume of the reporting agent in the repo segment with identical maturity, tenor and collateral location. In a second step, aggregation to the highest level of consolidation is then performed by building the volume-weighted average of the weighted repo rates by consolidation status. Source: MMSR
Daily Controls	
Covered interest rate parity (CIP)	Following Ranaldo et al. (2021), we construct the CIP basis as: $$CIP_{c,m,d} = r^{USD}_{d,d+m} - r^{€}_{d,d+m} + \frac{252}{m}(f^{USD,€}_{d,d+m} - s^{USD,€}_{d})$$ where d dentotes the trading day, c denotes the collateral country and m denotes the tenor of the repo contract in trading days. r refers to the LIBOR interest rate in the respective currency and is sourced from the Federal Reserve Economic Data (FRED). s refers to the (logged) spot exchange rate between USD and € and f refers to the forward exchange rate between the two currencies. Both rates were sourced from Bloomberg. Source: Bloomberg, FRED

Table A9: [continued]

Variable	Description
Daily Controls [continued]	
EURO STOXX 50 implied vol.	The VSTOXX is sourced from Bloomberg. Source: Bloomberg
Quarterly Balance Sheet Controls	
$Size_{q-1}$	Size is computed as the log of a bank's total assets and lagged by one quarter ($q-1$). Source: COREP, FINREP, own calculations
$NPE-Ratio_{q-1}$	The non-performing exposure ratio (NPE ratio) is computed as the sum of a bank's non-performing exposures over total loans and is lagged by one quarter ($q-1$) (in %). Source: COREP, FINREP, own calculations
$RORWA_{q-1}$	The annualized quarterly return on risk-weighted assets is sourced from COREP/FINREP and is lagged by one quarter ($q-1$) (in %). Source: COREP, FINREP, own calculations
Regulatory Metrics	
$Leverage\ Ratio_q$	The fully-loaded leverage ratio is sourced from COREP/FINREP (in %). Source: COREP, FINREP
$G-SIB\ status_q$	The G-SIB status is an indicator variable that is one if the respective bank was ever declared as a G-SIB in the annual G-SIB assessment exercise during our sample period. Source: BIS
$\Delta\ next\ G-SIB\ bucket_q$	The distance to the next G-SIB bucket is computed as the absolute difference in G-SIB score points to the next G-SIB threshold (both above and below). Source: BIS, own calculations
$CET1\ Ratio_q$	The CET1 Ratio is sourced from COREP/FINREP (in %). Source: COREP, FINREP
$LCR\ Ratio_q$	The LCR Ratio is sourced from COREP/FINREP (in %). Source: COREP, FINREP

Table A9: [continued]

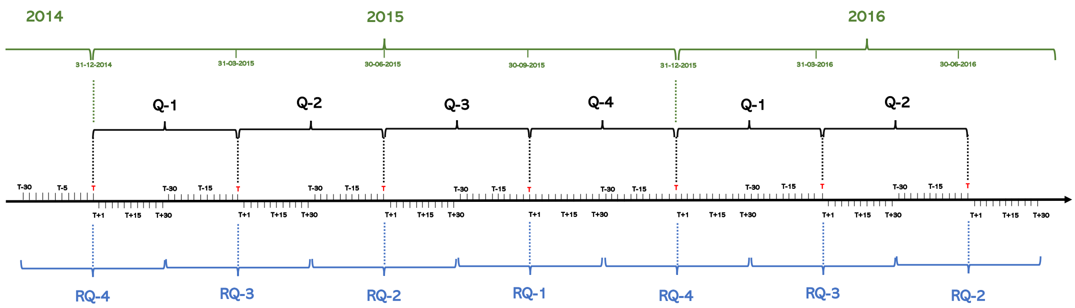
Variable	Description
Regulatory Metrics [continued]	
$SFR\ Contribution_q$	The individual contributions of banks to the single resolution fund cannot be sourced directly from COREP/FINREP. Therefore, we resort to proxy the contributions as 0.02% of a bank's previous year total assets over the present year operating income (i.e. $SRFcntr_q = \frac{0.0002 * TotalAssets_{q-1}}{OperatingIncome_q}$). The intuition behind normalizing by operating income is that less profitable banks have a greater incentive to window dress their year-end regulatory metrics. Source: COREP/FINREP, own calculations

A.1 Event day construction

Given that the primary goal of this study is to analyze bank behavior around reporting dates, we map trading days to quarter event time as schematised in Figure A5. In particular, for a given quarter, event days are increasing from the first day of the quarter up to the 15$^{\text{th}}$ calendar day of the second month in the quarter. From the 16$^{\text{th}}$ day in the second month onwards, event days decrease until the last day of the quarter. To capture adjustments in dealer behavior both before and after the reporting date, we perform all analyses in Reporting date-Quarter (RQ) periods rather than actual quarter periods (Q). This guarantees that event day 1 always refers to the first day after the quarter-end while event day -1 refers to the last trading date before the next quarter. Event days are then increasing up to the middle of the quarter. From the middle of the quarter event days are decreasing towards the end of the quarter. To account for differences in the number of trading days across different quarters, we restrict all analyses to a window of 28 trading days around the quarter-end day. This guarantees that for all quarters we have an equally sized window of 28 trading dates around the regulatory reporting date.

Figure A5: **Event day construction**

This figure displays the event day construction as outlined in Section A.1. Each quarter is divided in two halfs at the 15th day of the second month in the quarter. For the first half of the quarter event days are increasing in trading days from $T + 1$ (representing the first trading day in the quarter) to the trading day representing the 15th calendar day of the second month (depending on the year around $T + 30$). For the second half of the quarter, event days are decreasing from the first trading day after the 15th calendar day of the second month (depending on the year around $T - 30$) to the last trading day of the quarter, i.e. $T - 0$



Acknowledgements

We are grateful to seminar participants at the European Central Bank and an anonymous referee for helpful comments and suggestions. The views expressed in this paper are those of the authors and do not necessarily reflect the views of the European Central Bank, the Eurosystem, or its staff.

Claudio Bassi
European Central Bank, Frankfurt am Main, Germany; email: claudio.bassi@ecb.europa.eu

Markus Behn
European Central Bank, Frankfurt am Main, Germany; email: markus.behn@ecb.europa.eu

Michael Grill
European Central Bank, Frankfurt am Main, Germany; email: michael.grill@ecb.europa.eu

Martin Waibel
Swedish House of Finance, Stockholm, Sweden; email: martin.waibel@phdstudent.hhs.se

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

This paper can be downloaded without charge from www.ecb.europa.eu, from the Social Science Research Network electronic library or from RePEc: Research Papers in Economics. Information on all of the papers published in the ECB Working Paper Series can be found on the ECB's website.

PDF ISBN 978-92-899-5513-3 ISSN 1725-2806 doi:10.2866/79000 QB-AR-23-008-EN-N