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Haircuts and borrower concentration: evidence from EU repo markets

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Financial Stability/Orderly markets

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Abstract

Despite their importance for financial stability, information on repo haircuts and their determinants in bilateral markets has been scarce. Using comprehensive transaction-level data covering European bilateral repo markets, this paper examines how borrower bargaining power affects haircut determination. The analysis finds that haircut levels increase on average by 44-80 basis points with borrower concentration, while decreasing with lender diversification. The inverse relationship between repo haircuts and borrower bargaining power varies substantially across counterparty types, with non-bank financial institutions exhibiting particularly strong sensitivity to diversification of funding sources. The study identifies a trade-off: while lower borrower concentration generally reduces haircuts, concentrated funding relationships can increase the likelihood of zero haircuts when netting opportunities arise, as concentrated bilateral relationships maximise the potential for netting. These findings contribute to the policy discussion on repo market stability by highlighting how bargaining power and netting practices drive haircut variations in the bilateral segment.

JEL Classifications: D40, G10, G14, G23, L14

Keywords: repurchase agreements, haircut, bargaining power, borrowing concentration, bilateral markets

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Non-technical Summary

Repurchase agreements (“repos”) involve the sale of assets with a commitment to repurchase them at a predetermined price on a specified future date. Repos play a critical role in the financial system, providing secured funding to market participants. In addition, they are widely utilized for collateral management, market-making, addressing settlement fails and short sales, hedging, and supporting complex financial strategies.

EU repo markets can be broadly categorized into two distinct segments: the centrally cleared market and the bilateral market. The former is predominantly an interbank market, characterised by anonymised, on-exchange trading with the involvement of a Central Counterparty (CCP), which interposes itself between buyers and sellers. The latter segment is an Over-the-Counter (OTC) market, characterised by a variety of market participants, where banks play a key intermediation role.

In bilateral repo markets, counterparties directly negotiate haircuts that are applied to individual trades to protect against potential drops in collateral value. Despite their critical role in risk management, recent evidence highlights consistently low or zero haircut levels in repo markets, raising concerns about potential leverage build-up, particularly among non-bank financial institutions.

Leveraging data on EUR-denominated repos from the Securities Financing Transactions Regulation (SFTR), this study examines haircuts as a key risk management tool, and explores the role of borrower bargaining power and netting practices as determinants of haircut levels in the bilateral segment of EU repo markets. The key findings are as follows. First, funding concentration emerges as a critical determinant: counterparties with more concentrated borrowing structures face higher average haircuts due to reduced bargaining power. Greater lender diversification, reflected in access to multiple lending options, is also linked to lower repo haircuts. This effect is particularly pronounced for non-bank financial institutions (NBFIs), likely reflecting their more constrained access to alternative funding sources. Second, it suggests that netting practices also play a role in haircut determination, underscoring the importance of analysing the complete activity profiles of borrowers when analysing trade-level haircuts. Furthermore, the paper identifies a trade-off: concentrated funding relationships can increase the likelihood of zero haircuts when netting opportunities arise, as bilateral concentration maximises netting potential.

This analysis supports ESMA’s mandate of promoting orderly markets and financial stability by providing new evidence on the factors influencing bilateral repo haircuts, thereby contributing to the policy debate on enhancing the resilience of repo markets.

1. Introduction

A repurchase agreement constitutes a financial transaction whereby securities are sold with a simultaneous agreement to repurchase those same securities on a specified future date at a predetermined price. This structure effectively creates a secured loan, with the securities acting as collateral. Repurchase agreement markets are a fundamental part of the so-called *plumbing* of the financial system; through them, market participants have access to a liquidity pool and can obtain short-term funding in a secure way. Furthermore, repos are also used for a range of reasons related to collateral allocation and operational efficiency, including market-making, collateral transformation and portfolio management, coverage of settlement fails and short sales, hedging and complex strategies¹ (Baklanova et al. (2015)). In addition, central banks use it as a monetary policy transmission tool.

In Europe, following the 2008 financial crisis, the overall size of the repo markets has exceeded the unsecured interbank segment, becoming the largest part of the EU money market (ECB (2022), Armakola et al. (2020)). EU repo markets can be categorized into two distinct segments: the centrally cleared market and the bilateral market.² The centrally cleared segment is characterised by the involvement of a Central Counterparty (CCP), which interposes itself between buyers and sellers - allowing for multilateral netting and facilitating market efficiency. In order to mitigate counterparty risk, CCPs collect margins from their clearing members (i.e. financial institutions that participate in the clearing process and contribute to the CCP's default fund). The centrally cleared repo segment is predominantly an interbank market; it accounts for the majority of trading volumes and for approximately 40% of overall outstanding amounts (ESMA (2024)). Smaller banks and non-bank investors commonly access the repo market through bilateral repo, which is characterised by a variety of market participants. Banks and dealers play a key role also in bilateral repo markets, as they act as intermediaries between the various types of market participants (FSB (2026)). When considering the repo activity of entities domiciled in the European Economic Area (EEA), it is estimated that the bilateral segment accounts for 30% of volumes and more than half of the total outstanding amounts (Bassi et al. (2024)).

The role of collateral is of key importance: it allows to reduce information frictions. Acquiring information on borrowers and monitoring their behaviour is costly: collateralised lending facilitates the provision of funding while relying on haircut and margin for risk mitigation. The repo haircut is a risk control measure, expressed as a percentage, representing the difference between the market value of the collateral and the cash loan amount obtained by pledging the collateral. In case the borrowing counterparty does not repay its obligations, in fact, the lender will have to (i) take care of collateral liquidation and (ii) sell the collateral in potentially suboptimal market conditions, recovering only a part of the loan. For these reasons, the value of the pledged collateral is in principle higher than the amount of the loan. The haircut is defined as follows:

$$Haircut = 1 - \frac{L}{C} \tag{1}$$

where C is the collateral value and L is the principal amount of the loan.

This research examines haircuts as a critical risk management tool in repurchase agreement markets, where they serve different functions across market segments. In the bilateral, non-centrally cleared repo market, counterparties directly negotiate haircuts that are applied to individual trades to protect against potential drops in collateral value. Conversely, in cen-

¹Cf. ICMA FAQ - *What is the role of repo in the financial markets?*

²Tri-party repo, in which collateral selection, custody, collateral management and other operations are outsourced by the parties to a third-party agent, is very common in the US repo market but marginal in Europe (ESMA (2024)).

trally cleared markets, central clearing counterparties (CCPs) manage risks by adopting a portfolio-level approach, collecting margins from both parties involved in transactions. When these margins are posted as securities rather than cash, CCPs apply haircuts to account for variation in the securities' price. Given these distinct approaches to risk mitigation, this study specifically concentrates on the bilateral repo segment and its primary risk control mechanism, the repo haircut, as the focal point for analysis.

The functioning of repo markets under stress, particularly the role of haircuts, has attracted significant research attention since the 2008 financial crisis (Gorton and Metrick (2012), Krishnamurthy et al. (2014), Copeland et al. (2014)). Two critical concerns have emerged: whether these markets can continue providing essential funding during periods of distress, and the potential for procyclical risk management practices that may amplify stress precisely when market stability is most crucial. More recently, market turmoil episodes affected the functioning of repo markets (and, relatedly, government bond markets) in multiple instances, including the September 2019 volatility episode in US Treasuries, the March 2020 dash-for-cash in the EU and globally, and the 2022 Gilt market stress.³

Recognising the critical role of repurchase agreements in the financial system, in recent years regulatory authorities and international organisations established comprehensive reporting frameworks to obtain reliable data, and have been analysing this information to detect and assess potential systemic risks and weaknesses (ESMA (2024), Bassi et al. (2024), Cenicola et al. (2025)). From a policy perspective, the Financial Stability Board (FSB) proposed a Minimum Haircut Framework (FSB (2015)), covering the non-bank financial sector and non-government securities. The framework has not been implemented, yet concerns remain about potential vulnerabilities affecting this market, including the growing presence of non-bank financial institutions (NBFIs) and the large presence of zero haircuts (O'Donnell and Tamburrini (2024), Hempel et al. (2023)). In 2025, the FSB issued guidance aimed at reducing leverage-related risks within the non-bank financial sector, with particular attention to government bond markets. Among other proposals, the recommendations urged regulatory authorities to consider the implementation of minimum haircut requirements in bilateral repo transactions (including those backed by government bonds) and to mandate or expand the use of central clearing (FSB (2025)). Furthermore, in September 2025, the Bank of England published a Discussion Paper, seeking feedback from market participants precisely on the two measures mentioned above - i.e. minimum haircuts or margins and central clearing (Bank of England (2025)). Finally, in the US, the SEC decided in December 2023 on a clearing obligation for US Treasury repo. As of 2025, the implementation date of the rule has been delayed, with expected compliance for eligible repo transactions currently set for June 30, 2027.⁴

In this setting, characterised by an active policy discussion, detailed information on European and global repo markets has been scarce, in particular on the Over-the-Counter (OTC), non-centrally cleared segment (mainly due to limited data availability). In the EU, most of the information so far comes from the ECB Money Market Statistical Reporting, a subset that covers short-term euro-denominated activity by the most relevant banks.⁵ In the US, the Department of the Treasury has proposed, in January 2023, a regular data collection on bilateral repos.⁶

³Cf. ESRB (2024), Chapter 4, for a complete review of recent stress episodes in repo and government bond markets.

⁴Cf. SEC Press Release, 2023 and SEC Press Release, 2025.

⁵To note that the usage of the more comprehensive Securities Financing Transactions Regulation (SFTR) dataset in analytical and research publications has recently started to develop; relevant examples include Grill et al. (2025) and Hermes et al. (2025).

⁶See <https://www.federalregister.gov/documents/2023/01/09/2022-28615/collection-of-non-centrally-cleared-bilateral-transactions-in-the-us-repurchase-agreement-market> for further details on the data collection.

Moreover, this research contributes to the growing body of literature on bargaining power and borrower lock-in within relationship lending (e.g. Santos and Winton (2008), Bird et al. (2018), Cahn et al. (2024), among others). While numerous studies have found evidence of borrowers facing penalizing collateral requirements from incumbent lenders (e.g. Degryse and Van Cayseele (2000) and Elsas and Krahnen (2002), among others), there is limited research on how these dynamics play out in bilateral repo markets - an exception being Bittner and Jank (2025). In the context of this paper, borrower concentration refers to the degree of concentration of repo funding activity for a given borrower, as measured by the Herfindahl–Hirschman Index (HHI). As an alternative to the HHI borrower concentration metric, lender diversification measures the number of distinct active lenders a borrower engages with, reflecting the breadth of funding sources available to a given borrower.

Using the most comprehensive repo dataset currently available for the EEA, this study provides novel empirical evidence on two key determinants of haircut levels in European bilateral repo markets. First, it shows that concentration in repo borrowing structures exerts upward pressure on haircut levels, suggesting that bargaining power dynamics influence risk management practices. Second, it identifies evidence of a potential trade-off: while lower borrower concentration tends to lower haircuts via greater bargaining power, highly concentrated funding relationships can increase the likelihood of zero haircuts when netting opportunities are present. This finding highlights the interplay between market power dynamics and risk management practices, offering new insights into how haircut determination is shaped by the strategic considerations of both borrowers and lenders. Furthermore, the analysis explores the role of counterparty heterogeneity, documenting variation in the role of bargaining power between different types of financial institutions, which points to the importance of institutional characteristics in bilateral repo trading. To our knowledge, this paper is the first to comprehensively study the dynamics between borrower bargaining power and haircuts across multiple counterparty types, relying on comprehensive regulatory data on European repo markets. Furthermore, the analysis is extended to empirically investigate potential interactions between borrower concentration and netting patterns.

The remainder of the paper is structured as follows. Section 2 covers the literature review. Section 3 introduces the data and methodology, including the hypotheses and metrics used, and presents summary statistics. Section 4 discusses the main results. Finally, Section 5 concludes.

2. Literature review

This research contributes to two primary literatures. First, it relates to studies on repo haircuts, including their dynamics under market stress, and to recent empirical studies that investigate the factors driving zero or low haircuts in repo transactions. Second, the analysis connects with the broader literature on bargaining power in lender-borrower relationships, emphasizing its influence in determining collateral requirements.

The repo haircut limits the amount of borrowing an institution can do with a given amount of collateral: therefore, it represents an implicit limit on leverage. Following the 2008 financial crisis, academics and regulators engaged in theoretical and empirical analyses to investigate whether this market was a source or a conduit of vulnerabilities for the wider financial system. In this context, several influential papers studied the role of haircuts in the context of coordination failures and leverage spirals. In particular, Gorton and Metrick (2012) find large increases in bilateral haircuts for structured securities in 2007-2008 and first introduce the term *run on repo*. They focus on the procyclical movements of haircuts, which may increase during stressed times and result in either liquidity demands in the form of margin calls or in reduced credit access (if not in the complete exclusion of certain asset classes from access to collateralised lending). In turn, this may imply the impossibility for some cash borrowers to roll over their debt, likely resulting in defaults due to illiquidity. Other analyses look at triparty repo and find lower increases in haircuts for securitised assets (Krishnamurthy et al. (2014), Copeland et al. (2014)). On the same topic, Martin

et al. (2014) formally represent repo runs as a coordination problem and show how, even though in principle the existence of collateral should rule out runs, nevertheless lenders may have the incentive to withdraw funding to avoid being left with securities they would need to liquidate. In addition, they argue that since triparty haircuts are generally not negotiated by the counterparties (rather, they are set by the triparty agent), they did not move significantly during the financial crisis, implying that sizeable portions of liquidity from triparty repo completely dried up. On the other hand, haircuts in bilateral repos varied greatly, but this variation allowed the bilateral repo segment to continue to provide some liquidity, albeit at tougher financing conditions.

Notwithstanding their essential function in risk management, the available data highlight consistently low haircut levels in repo markets, with zero haircuts representing a particularly common occurrence (ESMA (2024), Hempel et al. (2023), Cenicola et al. (2025)). The academic literature has yet to establish a definitive consensus on the drivers of zero haircuts. Explanations considered so far include relationship lending (Julliard et al. (2025)), competition between cash lenders (Bittner and Jank (2025)), netting practices and cross-margining (Hempel et al. (2023), Kahn and McCormick (2025), FSB (2026)), among others.

Recent studies highlight also the presence of negative haircuts, which generally represent collateral-driven trades (Infante (2019), ICMA (2025b)). In such a setting, the haircut does not protect the cash lender, but rather the collateral provider. Hermes et al. (2025) also associate negative haircuts with collateral demand; additionally, they find an association with intragroup transactions attributed to liquidity management within banking groups.

This analysis contributes to the literature examining bargaining power in bank-firm relationships, which shows how relationship lending can limit competition through various channels. Central to this literature is the lender hold-up problem: bilateral lending relationships enable lenders to acquire private information about borrowers that remains unavailable to outside competitors. This informational asymmetry creates adverse selection for potential entrants - outside lenders are aware that they are most likely to successfully poach a borrower exactly when the incumbent holds negative private information on the borrower. Anticipating this winner's curse, outside lenders either withdraw from competition or demand stricter conditions (e.g. higher interest rates) as compensation. The resulting switching cost, though not contractually imposed, arises endogenously from the information structure and allows incumbent lenders to offer less competitive terms than would prevail in a frictionless market (Santos and Winton (2008), Schenone (2004) and Bird et al. (2018)).

This paper adapts the lender hold-up setting to the repo market context by investigating the role of borrower concentration and how this may lead to worse contractual outcomes - in terms of repo haircuts - for "locked in" borrowers. In particular, it bridges prior research that documents the penalizing collateral requirements faced by locked-in borrowers as a consequence of lender hold-up. For example, Machauer and Weber (1998), Degryse and Van Cayseele (2000) and Lehmann and Neuberger (2001) study loan provision to firms and provide evidence that incumbent banks obtain more collateral from locked-in borrowers (i.e. over-collateralisation). Elsas and Krahnen (2002) supports these findings and also shows that incumbent banks obtain collateral of better quality, that is, more senior tranches, due to their higher bargaining power. Although this research does not analyse the collateral allocation between cash lenders, it explores the potential role of bargaining power in explaining differences in haircuts for identical collateral assets, which represent the degree of collateralisation obtained by lenders. Similarly, the role of multiple banking relationships is explored, to assess whether they mitigate lender hold-up by providing greater bargaining power to the borrower, as theorised by Detragiache et al. (2000). Various studies have empirically explored the role of multiple relationship lenders in reducing the incumbent's information monopoly (e.g. Bird et al. (2018), who focus on syndicated loans, and Cahn et al. (2024), who study the French loan market). This work provides further evidence of the importance of a borrower's outside options in a novel setting - the bilateral repo market. In addition, it argues that monitoring borrower concentration metrics, alongside repo haircuts and rates,

could be a useful tool for supervisors to identify potential distress situations.

This research is closest to Bittner and Jank (2025), who find that competition between cash lenders reduces the level of haircuts in bilateral repo markets. However, their analysis uses a different dataset and is specifically focused on hedge fund repo borrowing, whereas this study leverages on the wider scope and granularity of the Securities Financing Transactions Regulation (SFTR) data and encompasses a wider range of counterparty types. Because of this, it can expand the analysis to multiple counterparties across different sectors. Moreover, by including also repo lending activity, the paper explores a potential trade-off between competition and netting opportunity. Finally, there is limited empirical evidence on how haircut dynamics vary between different types of financial institutions and market segments.

3. Data and Methodology

3.1. The SFTR database

The possibility of employing data from the novel Securities Financing Transactions Regulation (SFTR) database, which holds information at transaction level on Securities Financing Transactions (SFTs) in the EEA, is advantageous to pursuing this research agenda. The dataset, managed by ESMA, contains daily reports from European market participants, as well as non-European ones trading with a European counterparty, engaging in transactions such as repos, securities lending and margin lending⁷. The reporting began with a staggered inception for different kinds of market participant and contains information from the second half of 2020 onward.

Due to its size and complexity, leveraging the SFTR database to produce research-oriented work requires a thorough understanding of the reporting, as well as the development of various processing and cleaning steps. SFTR collects more than 40 million records per month⁸. The data collection provides granular information on single transactions between counterparties, including the identities of the two sides, the volumes exchanged, the specific instruments employed as collateral, the economic terms of the transaction (e.g. the haircut and the rate applied), the venue where the transaction took place, and many other details. The data set is enriched using reference information at the instrument level⁹ and 5-year CDS sovereign spreads from Refinitiv Datastream.

For a detailed description of the SFTR dataset and its main features, see ESMA (2024) and Bassi et al. (2024). The database is characterised by a double-reporting regime: a trade between two EEA financial entities will be reported twice (once by each entity). While this structure enables data validation and cross-verification, it requires reconciliation procedures, to address potential reporting discrepancies, and the implementation of a deduplication methodology, particularly when analysing trading volumes. The approach employed in this analysis is described in Section B of the Annex.

3.2. Hypotheses

This section lists the testable hypotheses to be examined through empirical analysis. The theoretical framework underlying these hypotheses is derived from the literature reviewed in Section 2. First, the paper discusses haircut determination as the result of bargaining between the repo lender and the repo borrower. In particular, building on the bank-firm literature discussed earlier (e.g. Detragiache et al. (2000), Santos and Winton (2008) and Bird et al. (2018)), the research focuses on the role of relationship lending and its influence on bargaining power to explain haircut outcomes. Second, drawing on the reasoning on portfolio-level netting outlined in Hempel et al. (2023) and subsequently developed by Kahn and McCormick (2025), the relevance of netting considerations in zero haircut determination

⁷See <https://www.esma.europa.eu/data-reporting/sftr-reporting> for further details on SFTR.

⁸See ESMA's EMIR and SFTR data quality report 2021.

⁹See Financial Instruments Reference Data System register.

is explored. Finally, the analysis investigates potential interactions between the two channels (i.e. bargaining power and portfolio-level netting).

Hypothesis 1 *Repo haircuts are inversely related to borrower bargaining power, which decreases with the concentration of borrowing activity and increases with the number of relationship lenders.*

The concentration of borrowing activity is measured using the Herfindahl-Hirschman index (HHI), which in this context also represents the degree to which a borrower is “locked-in”. As the concentration of the borrower increases, so does the bargaining power of the lending counterparty (i.e. lender hold-up). The underlying mechanism at play relies on the informational advantage gained by an incumbent lender through repeated bilateral relationships, which leads to an adverse selection problem for potential competitors (i.e. winner’s curse). The higher compensation required by outside lenders to resolve the adverse selection problem results in a switching cost for the borrower, and allows incumbent lenders to extract more favourable and less competitive terms. In the repo context, the expectation is that as the dependence on a limited number of relationships becomes stronger, this translates into higher haircuts for repo borrowers. To complement the concentration analysis, an alternative metric is used: the number of active lender counterparties to every borrower. Although this measure does not actually capture the degree of activity that passes through each link, it is relevant insofar as it is a proxy for access to multiple funding sources. Given that establishing a repo relationship entails fixed costs (e.g. administrative expenses, minimum trading volume, etc.), the existence of a link measures the ability to access multiple lenders. As the number of outside options increases, so does the borrower bargaining power. Thus, we expect that the larger the number of competitive lending alternatives, the lower the repo haircuts for a given borrower.

Hypothesis 2 *Heightened concentration effects for non-bank financial institutions (NBFIs): bargaining power - captured through both borrower concentration and lender diversification - will have a stronger influence on haircuts for NBFIs, given their more limited funding options and typically smaller scale, relative to banking institutions.*

Non-bank financial institutions generally face more constrained funding access compared to banks, with notable operational and regulatory limitations. In Europe, most NBFIs have limited access to centrally cleared repo markets, as sponsored repo is currently a developing product (Eurex (2025)). NBFIs lack access to public safety nets, such as central bank liquidity facilities, which distinguishes them fundamentally from banks in terms of funding backstops.

In the research sample, four broad categories of NBFI borrowers are identified: Insurance Corporations and Pension Funds (ICPFs), EEA investment funds¹⁰, foreign investment funds (i.e., investment funds not domiciled in the European Economic Area), and Other Financial Institutions (OFIs). Although a detailed classification of Foreign investment funds in the sample is not available, this category also includes market participants based in off-shore financial centers that pursue hedge fund strategies and are active players in repo markets (ESRB (2025)). Relative to other NBFI categories, it is anticipated that entities in this category possess greater bargaining power and are less susceptible to the effects of concentration. This is largely due to their sophistication, size, and the presence of diverse and multifaceted relationships with their banking counterparts. These relationships often extend beyond repo markets and may not be fully observable within the scope of this analysis.

¹⁰Money Market Funds (MMFs) are excluded from this analysis, as they operate almost exclusively as net lenders in repo markets.

Hypothesis 3 *When netting opportunities exist, borrower concentration increases the likelihood of zero haircuts.*

As discussed previously, netting practices have been proposed as a potential driver of zero haircuts (Hempel et al. (2023), FSB (2026)). Bilateral master agreements, such as the Global Master Repurchase Agreement (GMRA), are legal frameworks developed to facilitate transactions in repurchase agreements; they specify the contractual terms and conditions of repo transactions between two parties. Master agreements generally include close-out netting provisions, activated in the event of a default, which allow the consolidation into a single net amount of all outstanding transactions under the same master agreement. This also includes the valuation of the collateral held by both parties.¹¹ Such arrangements have been standardised across the bilateral repo market, providing a common legal and operational foundation for participants. Specific terms, such as collateral eligibility and margining requirements, are typically negotiated bilaterally to reflect the needs and preferences of the counterparties involved.

Where master agreements allow for portfolio margining, the haircut setting process can reflect the existence of offsetting exposures (at portfolio level or even across products). For example, Hempel et al. (2023) report that netted packages involving US Treasuries - where opposing positions of identical size are held between the same counterparties on two different securities - are common examples of zero-haircut trades in US bilateral repo markets, owing to their perceived low risk and short tenor. The matched structure of these trades, whether complete or partial, helps mitigate counterparty credit risk. In principle, cross-product margining - where netting considerations include not only repo and reverse repo, but also other types of financial transactions - may influence haircut dynamics in a similar way. This research does not explore the role of cross-product margining, focusing on the repo market.¹² Moreover, in bilateral repo markets, haircuts inherently operate in an asymmetrical manner - i.e. when applied, they serve to protect one counterparty at the expense of the other (ICMA (2025b), Kahn and McCormick (2025)). This suggests that zero haircut could be more likely when repo and reverse repo between the same counterparties offset each other.

Starting from these considerations, the paper examines whether there is a trade-off between increasing borrower bargaining power and maintaining a less concentrated borrowing structure in the presence of netting opportunities. Borrowers would ideally prefer greater bargaining power and a diversified lender base to improve their negotiating position. However, conducting more business with fewer counterparties increases the likelihood of generating offsetting exposures that can be netted (e.g. as is the case with Central Clearing Counterparties). This dynamic creates a tension between spreading borrowing activity across multiple counterparties and relying on a more concentrated funding structure, both of which influence borrowers' ability to secure optimal repo terms. In this setting, since concentrated bilateral relationships maximise the potential for netting, concentration in repo borrowing relationships may increase the likelihood of zero haircuts.

Hypothesis 4 *The likelihood of zero haircuts increases with bidirectional activity: the more NBFIs borrowers maintain bidirectional repo relationships with the same counterparties, the greater the potential for position netting and risk offset.*

By construction, netting is only feasible for players who are active on both sides of the

¹¹For more details, see ICMA (2025a).

¹²This would require, for a given pair of counterparties, a comprehensive overview of securities financing transactions, derivatives exposures, and related margins, which is beyond the scope of this paper. In addition, ECB (2025) highlights that in the EU the majority of banks permit margin offsets between repo and reverse repo transactions that are collateralised by euro area government bonds. However, margin offsets across different product types are less prevalent and are typically offered only to a select group of clients.

market. To test the hypothesis, we verify whether increased activity on the lending side is correlated with zero haircut likelihood in repo borrowing.

Hypotheses 3 and 4 will be tested on a specific subsample, which selects repos with non-bank financial institutions (NBFIs) as cash borrowers. This choice is due to a number of reasons. First, this setting is of particular interest, due to the generally riskier profile of NBFIs compared to banks, to their increasing footprint in the repo market (O'Donnell and Tamburrini (2024)) and the active policy discussion centered around them (see Section 1). For example, the proposed Minimum Haircut Framework is specifically targeted at non-bank borrowers, with the stated objective of curbing the potential build-up of leverage outside the banking system (FSB (2015)). Similarly, recent recommendations by the Financial Stability Board to encourage central clearing and consider minimum haircuts or initial margin requirements in repo markets aim to address the potential financial stability risks posed by NBFI leverage (FSB (2025)). Second, a detailed analysis of interbank repo dynamics must account for the centrally cleared segment; however, such an analysis is beyond the scope of this paper. On the other hand, given the limited adoption of sponsored repo arrangements within the EU, concentrating on the bilateral segment allows for a coherent assessment of NBFI repo activity patterns. Third, banks' intragroup transactions constitute a large share of non-centrally cleared activity (Hermes et al. (2025)). It is likely that haircut dynamics in such settings are influenced by factors beyond standard risk practices - these dynamics may warrant separate study and are not included in the current scope of the work.

Within NBFI borrowers, the mechanisms described in Hypotheses 3 and 4 should be more relevant when entities are active on both sides of the repo market. In particular, we expect foreign investment funds to be active participants in both repo lending and borrowing, in the pursuit of various trading strategies (FSB (2026)). Conversely, ICPFs predominantly utilise the euro (bilateral) repo market for funding purposes, positioning them as overall net cash borrowers (Hermes et al. (2025)). Moreover, only a minority of investment funds domiciled in the EEA¹³ actively borrows in the repo market (IMF (2025)) - among them are open-ended mutual funds such as UCITS, whose borrowing activity is constrained by regulatory limits.¹⁴ Considering the above, the expectation is that the trade-off between increased borrower bargaining power and concentrated borrowing structure in the presence of netting opportunities (Hypothesis 3) is less relevant for ICPFs and for EEA investment funds, compared with active two-way market participants - such as foreign investment funds. Similar considerations hold for Hypothesis 4: we expect the likelihood of zero haircuts to increase with bidirectional activity for those NBFI categories typically characterised by two-way relationships with bank counterparts. On the other hand, we expect this mechanism to be less valid, if at all, when focussing on unidirectional borrowers - such as ICPFs and EEA investment funds.

3.3. Sample and metrics

This work relies on transaction-level data from trade activity reports. A detailed description of the cleaning and filtering steps is provided in Section B of the Annex. The paper focuses on non-centrally cleared trades collateralised with EEA-issued fixed income instruments. In order to analyse meaningful haircut setting practices and relationship patterns, it focuses on *Specific Collateral* repos executed Over-the-Counter (OTC), which represent the vast majority of bilateral repos in Europe.¹⁵ The sample construction steps include ad-hoc filtering steps, deduplication of double-reported trades, and extensive data cleaning.

¹³The classification employed in this work groups various types of EEA investment funds. A comprehensive examination of repo activity patterns by type and regulatory framework of EEA investment funds is beyond the scope of this work and is left to future research endeavours.

¹⁴Undertakings for the Collective Investment in Transferable Securities (UCITS) are generally restricted from borrowing more than 10% of their net asset value, as per Art. 83 of Directive 2009/65/EC.

¹⁵Specific Collateral refers to the setting where the seller and buyer in a repo agree in advance on a specific instrument to be delivered as collateral, as opposed to Generic Collateral. Restricting the analysis to

In addition, negative haircuts are excluded from the analysis.¹⁶ Negative haircut values are generally present when the repo is primarily motivated by collateral demand, rather than funding reasons (Infante (2019), ICMA (2025b)). In such a setting, the cash lender is particularly interested in securing a pre-determined collateral from its counterparty - for example, to cover a short sale or to address a settlement fail. In these instances, the demand for specific securities may be so high that the party in need of obtaining it might be willing to forgo protection on its cash loan, and effectively pay a haircut to the cash borrower. In practice, this implies that the party seeking to receive the security will provide more cash than the market value of the collateral assets, resulting in a negative haircut level. It is clear that in these instances the haircut no longer serves as a risk-mitigation tool for cash lenders, covering for potential price declines in collateral, but rather as a pricing mechanism for acquiring a specific security. Correspondingly, the cash borrower in such settings is likely not motivated by funding needs, but rather looking to earn a return on its security holdings. On this basis, the inclusion of these observations in this analysis would not be informative for the paper’s objective of investigating the role of borrower bargaining power - on the contrary, they may bias results due to the intrinsically different role that haircuts play in such setting.¹⁷

The analysis covers the period between 1 February 2022 and 1 August 2024. Two samples are used in the empirical setup:

1. **Complete sample:** includes all repo borrowing activity where banks are cash lenders, capturing substantial borrower heterogeneity across both banking and non-banking institutions;
2. **NBFI-focused subsample:** restricts the analysis to transactions with banks serving as cash lenders and only NBFIs as cash borrowers.

For each borrowing entity in the sample and for each counterparty pair, the following concentration and two-way activity measures are calculated, to test the hypotheses outlined in Section 3.2.

Concentration measures To capture borrower concentration, daily HHI is calculated for each borrower i , considering its borrowing volumes of the previous 30 days. Specifically, for every date t , the Herfindahl-Hirschman index is computed as:

$$HHI_{it} = \sum_{\forall j} \left(\frac{\sum_{\tau \in [t-30, t-1]} Vol_{ij\tau}}{\sum_{\tau \in [t-30, t-1]} Vol_{i\tau}} \right)^2 \quad (2)$$

where Vol_{ij} is the repo amount borrowed by the borrower i from the lender j . Moreover, in order to proxy lender diversification, the number of active lending relationships for each borrower is calculated, considering the same time window¹⁸. The choice of these metrics is consistent with prior research on relationship lending and market power, both in traditional

Specific Collateral repos allows to study differences in haircut setting practices while effectively controlling for collateral characteristics through instrument-level fixed effects.

¹⁶In terms of representativeness, negative haircuts account for roughly one-third of overall volumes in euro-denominated bilateral repo markets; relatedly, considering a stock perspective, Hermes et al. (2025) report that negative haircuts represent 9% of outstanding repo amounts in euro-denominated trades.

¹⁷Hermes et al. (2025) also associate negative haircuts with intragroup transactions. Although such activity represents a meaningful component of repo markets, it is not the focus of this analysis and, notably, it is virtually absent in the second analytical sample employed - that is, the NBFI-focused subsample.

¹⁸Alternative definitions of these variables, based on different time windows (e.g. 60 days), have been used, yielding similar conceptual results.

banking markets and in OTC markets (Hau et al. (2021), Bittner and Jank (2025) and Gomez-Gonzalez et al. (2023)).

Two-way activity measures To investigate empirically whether being active on the opposite side (i.e. repo lending) affects the probability of zero haircuts, three main variables are considered. The first is an indicator variable equal to 1 if the counterparty pair exhibits meaningful activity in the opposing direction, suggesting the potential for offsetting exposures. It is computed daily at pair level, for each borrower i and lender j , in the following way:

$$NettingOpportunity_{ijt} = \mathbf{1} \left(\frac{\sum_{\tau \in [t-30, t-1]} Vol_{ij\tau}}{\sum_{\tau \in [t-30, t-1]} Vol_{ji\tau}} < 2 \right) \quad (3)$$

where Vol_{ij} is the repo amount borrowed by the borrower i from the lender j (as above), and Vol_{ji} is the repo amount lent by i to j over the same period. The indicator is equal to zero when there is no or (relatively) limited activity in the opposing direction¹⁹. The second and third measures represent repo borrowers' activity as lenders in the same period, with the same counterparty. Specifically, we include the lending amount, calculated as the reverse repo between borrower i and lender j (in logs) in the previous 30 days, and the number of opposing reverse repo trades between the same pair of entities during the same period. Overall, these metrics are proxies intended to capture the strength of two-activity between counterparty pairs, even though they do not exactly quantify their net exposures. Taking into account the short-term nature of repo transactions (see also Table 1), these metrics effectively capture how much and how often repo borrowers interact on both sides of the market with their counterparties.

3.4. Descriptive statistics

Summary statistics reveal several key characteristics of the complete sample. The maturity structure shows that approximately half of all repo transactions are overnight, indicating a preference for short-term arrangements (Table 1).

Table 1: Distribution by maturity

Maturity	Num. of trades (%)	Princ amount (%)
<i>Overnight</i>	75.74	74.37
$[T + 2, 1W)$	4.71	6.39
$[1W, 1M)$	3.83	6.45
$[1M, 1Q)$	2.69	5.42
$1Q+$	1.9	2.99
<i>Open</i>	11.12	4.38

Note: Sample distribution by maturity at inception. "Overnight": all trades in the one-day maturity bucket, including tomorrow/next (T/N) and spot/next (S/N).
Data source: SFTF.

In terms of collateral, sovereign bonds emerge as the predominant security type used in these transactions (Table 2), with activity highly concentrated among the largest EEA issuers (Figure A.1).

¹⁹The choice of the threshold value was informed by a sensitivity analysis, that demonstrated no meaningful variation in results across alternative specifications within the $\{1, 2.5\}$ range.

Table 2: Distribution by collateral

Collateral type	Num. of trades (%)	Princ amount (%)	Haircut (wa)	Haircut Std	Zero haircut share
Govt Bond	78.04	93.37	0.7	1.89	0.49
Corp Bond	13.92	2.66	1.74	3.26	0.81
Other Bond	5.74	2.99	0.54	1.57	0.43
Securitized	2.3	0.98	4.63	10.22	0.35

Note: Sample distribution by collateral asset class. Haircut weighted by principal amounts. Data source: SFTR.

Finally, the analysis of haircuts reveals that clustering occurs around zero²⁰, with values above 5% being relatively uncommon (Table 3). A graphical visualisation of haircut levels over time highlights significant heterogeneity between counterparty types, suggesting different risk practices and market power considerations (Figure A.2).

Table 3: Distribution by haircut level

HC bucket	Num. of trades	Princ. amount (EUR mn)	Num. of trades (%)	Princ amount (%)
0%	1599	46960	51.62	62.31
0% to 2%	1313	26042	42.39	34.56
2% to 5%	80	968	2.58	1.28
> 5%	106	1389	3.41	1.84

Note: Average daily distribution of bilateral repo volumes, by haircut bucket. Data source: SFTR.

Turning to concentration measures, the summary statistics are available in Table 4. The complete sample covers a total of more than 1400 entities acting as borrowers in bilateral repo markets, displaying significant differences in activity patterns, as described by the average borrowed amounts and number of trades. With regard to concentration levels, the interbank segment displays substantial concentration, despite its higher mean number of connections. This pattern reflects the intermediation role of G-SIBs and a limited set of dealers that conduct most transactions. As regards non-bank institutions, foreign investment funds (i.e. investment funds not domiciled in the EEA) show the highest levels of concentration, both in terms of HHI index and number of links, while pension funds and insurance corporations (ICPFs) appear as the most diversified.

Table 4: Summary statistics by entity type

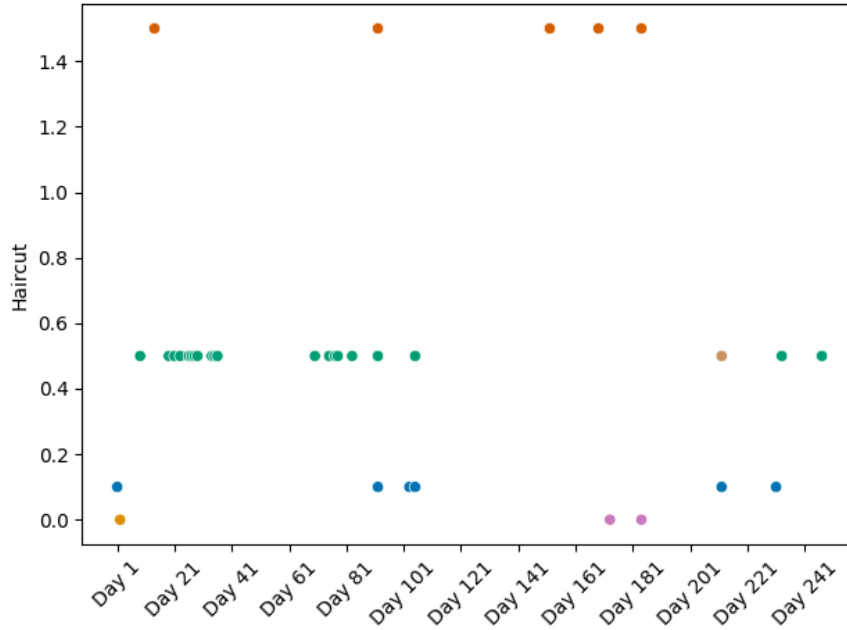
Type	Num. of borrowers	Princ. amount (EUR mn)	Num. of trades	Zero haircut share	Borrower HHI	Avg Num. lenders
Banks	530	319755	13800	0.5	0.92	9
ICPF	177	8577	177	0.93	0.45	3.4
EEA Inv. Fund	295	2047	182	0.58	0.64	2.6
Foreign Inv. Fund	384	26405	744	0.53	0.68	2.2
OFI	63	7981	388	0.79	0.6	3
Total	1449	364765	15291	0.52	0.88	6.7

Note: Weekly averages of principal amounts, number of trades, zero haircut share, borrower HHI and number of lenders, by type of borrowing institution. *ICPF* = 'Insurance Corporations & Pension Funds', *OFI* = 'Other Financial Institutions'. Number of distinct borrowers is the total calculated over the whole time period. Data source: SFTR.

Before introducing the empirical approach, the sample of analysis is further characterised by inspecting whether any patterns in the data suggest meaningful economic relations between haircuts and borrower identity. Figure 1 illustrates anecdotal evidence of haircut dispersion under essentially identical conditions, with borrower identity serving as the primary distinguishing variable. This heterogeneity is consistent with explanations that likely go beyond collateral-specific features, for example, due to bargaining power or relationship effects.

²⁰The summary statistics in this sample of interest are partially skewed towards zero and positive outcomes, given the exclusion of negative haircuts.

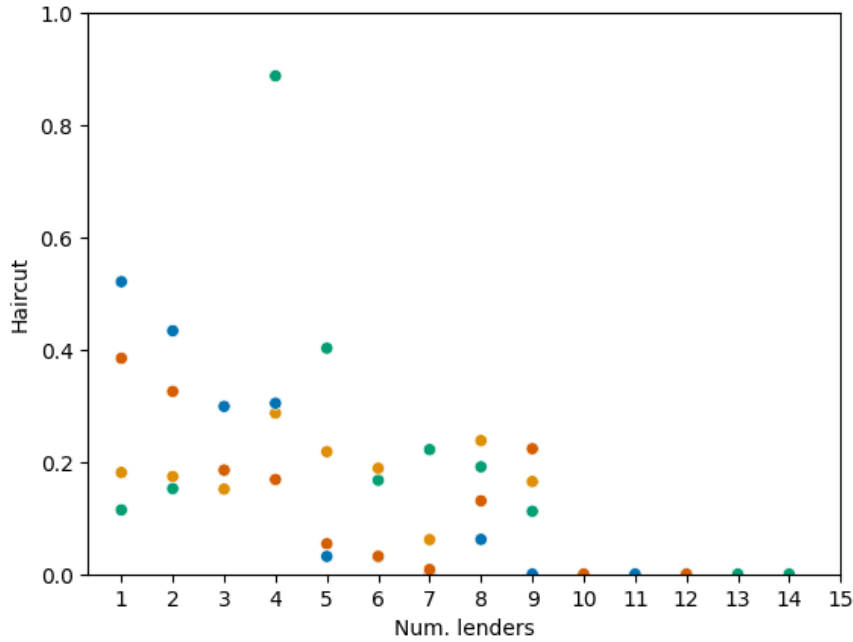
Figure 1: Average haircut for a selected ISIN



Note: Haircut, weighted by principal amount, for overnight repos with one selected lender, backed by the same selected ISIN. Colours represent different borrowers. Only trades with rate within 1bp of the median rate included. Dates omitted for confidentiality.
Source: SFTR.

Turning to the role of bargaining power, Figure 2 depicts an inverse relationship between haircut levels and lender diversification in the NBFIs subsample.

Figure 2: Average haircut paid by NBFIs borrowers by number of lenders



Note: Haircut (weighted by principal amount) by number of cash lenders, for overnight repos with NBFIs borrowers backed by selected collateral (IT, DE, FR and ES government bonds). Only trades with repo rate within 1bp of the median rate included. Colours represent different countries (legend omitted for confidentiality).
Source: SFTR, authors' calculations.

As discussed in Section 3.2, this suggests that access to multiple funding sources may play a role in the determination of the haircut, regardless of absolute concentration levels. Figure A.3 provides additional support for the inverse relationship identified between haircuts and borrower bargaining power, showing that haircuts reach their minimum when borrower concentration is lowest.

Finally, it is worth noting the heterogeneity in bidirectional repo relationships between types of financial institution (Table 5). Focusing in particular on the NBFI subsample, distinct patterns in repo market participation can be identified. To clarify, this analysis does not characterise the overall net positioning of NBFI participants; rather, it describes the activity patterns for those nonbank institutions that are active as borrowers in the sample during the period of analysis²¹. First, the analysis shows varying propensities to engage in both borrowing and lending activities in the same period. In addition, considering aggregate patterns of the borrowers under analysis, it is possible to broadly distinguish two groups of participants in the sample:

- **Directional participants:** When ICPFs and EEA investment funds act as repo borrowers, they primarily use repo for funding needs. Typically, they do not participate simultaneously to both sides of the market;
- **Two-way participants:** Foreign investment funds and OFI actively operate on both sides of the market at the same time.

Table 5: Two-way activity by entity type

Type	Num. of two way borrowers (%)	Borrow/lend ratio (p25)	Borrow/lend ratio (p50)	Borrow/lend ratio (p75)
Banks	0.58	1.10	1.13	1.16
ICPF	0.39	8.82	16.65	41.23
EEA Inv. Fund	0.35	1.81	2.48	3.14
Foreign Inv. Fund	0.52	1.02	1.13	1.30
OFI	0.51	0.82	0.95	1.20
Total	0.49	1.12	1.16	1.17

Note: Number of two-way borrowers, in absolute terms and in percentage of the total, by type. *ICPF* = 'Insurance Corporations & Pension Funds', *OFI* = 'Other Financial Institutions'. "Borrow/lend ratio": weekly average of repo over reverse repo by sector. Data source: SFTR.

The fundamental differences between these NBFI categories are also visible in Figure A.4, although with patterns that change over time. The different propensity to engage in bidirectional activity will be further discussed when testing Hypothesis 3 and Hypothesis 4.

4. Findings

Empirically, the analysis builds on the results of Bittner and Jank (2025), who study concentration in hedge funds repo borrowing, by extending their analytical framework to leverage the advantages of novel, more granular data. The baseline regression exploits a panel fixed effect framework and examines the relationship of haircuts with borrower concentration. For an individual repo contract k , the empirical specification takes the following form:

$$Haircut_k = \alpha_B + \delta_T + \lambda_L + \beta Concentration_{it} + \zeta controls_k + \epsilon_k \quad (4)$$

where:

- $Concentration_{it}$ includes, for every borrower i , the concentration metrics introduced in Section 3.3, namely HHI_{it} and $Num. lenders_{it}$;

²¹Some sectors generally operate as net cash lenders in the repo market - for example, UCITs funds, due to regulatory constraints on borrowing. In this analysis, the focus is on NBFI borrowing activity, where present.

- Fixed Effects: bond FE (α_B), time FE (δ_T) and lender FE (λ_L). We employ weekly fixed effects and, in the most stringent specification, adopt security-level fixed effects, controlling for individual securities pledged as collateral;
- *controls* includes a list of exogenous characteristics that influence haircuts. They contain information at trade level (e.g. contract maturity, principal amount), at collateral level (e.g. residual maturity of the security, CDS spread of the issuer country) and at entity level (e.g. sector of borrower).

To identify variation in haircuts, a comprehensive fixed effects strategy in the panel regressions is employed. Specifically, bank-date-collateral fixed effects are included, comparing haircuts across different repo borrowers who transact with the same bank lender, on the same trading period, while pledging identical collateral types. This identification strategy effectively controls for time-varying bank-specific characteristics and lending policies, daily market conditions, and collateral-specific features.

In addition, an alternative specification relying on a Linear Probability Model (or Logit) was estimated, in order to explore if the variables of interest influence the probability of zero haircuts, rather than the level. The empirical analysis was performed on both samples described in Section 3.3.

While the analysis employs a robust fixed effects framework, it is important to recognise that unobserved, counterparty-specific risk factors remain partially unaddressed. For instance, variations in the concentration of a borrower’s funding structure may reflect differences in bargaining power as well as the underlying risk of the borrower, which is not fully captured by the model. Furthermore, counterparty risk may exhibit time-varying dynamics, introducing additional complexity that is outside the scope of the current framework. These limitations constrain the causal interpretation of the findings presented in this study.

The next section focuses on the role of borrower concentration and tests Hypotheses 1 to 2. Next, in Section 4.2, we focus on Hypothesis 3 and Hypothesis 4, exploring how bidirectional activity influences the haircut for borrowers.

4.1. Borrower concentration

First, the regression introduced in Eq. (4) is estimated for the complete sample and subsequently for the non-bank subsample. The results of the complete sample estimation are shown in Table 6. The magnitude of repo haircuts correlates positively with borrower concentration, as measured by HHI, and negatively with the number of lending counterparts, supporting the inverse relationship between haircuts and borrower bargaining power. A one-unit increase in borrower HHI - representing a change from diversified funding to complete concentration - corresponds to an average haircut increase of 0.8 percentage points (80 basis points) as shown in column (2). This effect decreases to 44 basis points when security-level fixed effects are applied (column (3)). The results of columns (4) through (6) demonstrate that greater lender diversification is correlated with reduced haircuts, although the coefficients show statistical significance with economically small effects. Additionally, the sectoral dummy variables presented in Table 6 reveal that haircuts are typically higher for non-bank financial institutions relative to banks - with ICPFs being the sole exception to this pattern.

Table 6: Panel FE - Complete sample

Dependent variable: Haircut	(1)	(2)	(3)	(4)	(5)	(6)
HHI borrower	0.705*** (0.061)	0.794*** (0.051)	0.436*** (0.018)			
Num. lenders				-0.019*** (0.001)	-0.021*** (0.001)	-0.014*** (0.000)
ICPF	-1.195*** (0.088)	-0.780*** (0.068)	-0.063** (0.030)	-1.944*** (0.125)	-1.378*** (0.099)	-0.297*** (0.033)
EEA Inv. Fund	2.931*** (0.194)	2.588*** (0.157)	1.844*** (0.084)	2.640*** (0.193)	2.032*** (0.142)	1.339*** (0.075)
Foreign Inv. Fund	1.345*** (0.083)	1.380*** (0.067)	0.577*** (0.020)	1.604*** (0.115)	1.474*** (0.084)	0.425*** (0.024)
OFI	1.204*** (0.108)	1.351*** (0.101)	0.710*** (0.047)	1.192*** (0.104)	1.271*** (0.094)	0.572*** (0.047)
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No	Yes	No
Asset Class FE	No	Yes	No	No	Yes	No
Bond FE	No	No	Yes	No	No	Yes
Observations	1839187	1839187	1838067	1861935	1861935	1860790
Adjusted R^2	0.34	0.43	0.79	0.33	0.44	0.83

Note: The dependent variable is the haircut, reported at transaction level. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sectors included refer to the borrowing counterparty (*ICPF* = 'Insurance Corporations & Pension Funds', *OFI* = 'Other Financial Institutions'). Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

In order to test Hypothesis 2, the same regression framework is applied to the NBFIs subsample. The results, described in Table 7, confirm the patterns identified in the complete sample, showing a significant and negative correlation between concentration and haircut levels. Furthermore, distinguishing between the two measures of borrower concentration adopted in this work, the HHI coefficient is significant and yet not larger in size compared to the whole sample (columns (1) to (3)).

Conversely, an increase in the number of active lenders corresponds to a statistically significant and economically meaningful reduction in haircuts (columns (3) to (6)). The coefficient magnitudes are considerably larger in this sub-sample, and remain at least double the size observed in the complete sample, even under the most restrictive specification (column (6)). To contextualise these results, adding three additional lenders, which would roughly double the current NBFIs average, as shown in Table 4 - translates into an average haircut reduction of 9 to 42 basis points, depending on the specification used. These coefficient magnitudes are economically significant, given the low baseline haircut levels observed in the sample.

Table 7: Panel FE - NBFIs subsample

Dependent variable: Haircut	(1)	(2)	(3)	(4)	(5)	(6)
HHI borrower	0.560*** (0.173)	0.474*** (0.105)	0.159*** (0.024)			
Num. lenders				-0.142*** (0.015)	-0.103*** (0.007)	-0.029*** (0.002)
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	No	No	Yes	No
Asset Class FE	No	Yes	No	No	Yes	No
Bond FE	No	No	Yes	No	No	Yes
Observations	196906	196906	195794	208251	208251	207113
Adjusted R^2	0.37	0.64	0.94	0.40	0.68	0.94

Note: The dependent variable is the repo haircut, reported at transaction level. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sample: only non-banks (NBFIs) as borrowers. Control variables include the log of the trade principal amount, a set of maturity fixed effects, the log of the collateral outstanding maturity and the log of the collateral CDS spread. CDS data come from Refinitiv Datastream. All other data come from the SFTR database. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table 8 examines how the relationship between borrower concentration and haircuts varies between different NBFI categories, revealing important heterogeneity. The number of relationship lenders (Specification B) maintains a consistent sign and statistical significance in almost all specifications. The statistical and economic significance of lender diversification is further confirmed in Specification C, which employs an alternative proxy - a dummy variable indicating whether a borrower transacts with four or more lenders.²²

Table 8: Panel FE - NBFI type

Dependent variable: Haircut	(1) ICPF	(2) ICPF	(3) EEA Inv. Fund	(4) EEA Inv. Fund	(5) Foreign Inv. Fund	(6) Foreign Inv. Fund	(7) OFI	(8) OFI
Specification A: Borrower HHI as a measure of concentration								
HHI borrower	0.45*** (0.07)	0.29*** (0.04)	2.39*** (0.43)	0.07 (0.16)	0.55*** (0.10)	0.06** (0.03)	-0.28 (0.18)	0.42*** (0.09)
Adj. R ²	0.71	0.90	0.74	0.94	0.74	0.95	0.81	0.97
Observations	19019	18606	40485	39955	88536	87976	48862	48530
Specification B: Number of lenders as a measure of concentration								
Num. lenders	-0.03*** (0.00)	-0.02*** (0.00)	-0.21*** (0.02)	0.00 (0.01)	-0.09*** (0.01)	-0.04*** (0.00)	-0.09*** (0.02)	-0.06*** (0.01)
Adj. R ²	0.58	0.91	0.74	0.95	0.76	0.96	0.79	0.98
Observations	22272	21827	43415	42802	93176	92615	49381	49037
Specification C: high borrowing power as a measure of concentration								
1(Num. lenders ≥ 4)	-0.44*** (0.04)	-0.25*** (0.03)	-1.91*** (0.22)	0.02 (0.09)	-0.24*** (0.03)	-0.10*** (0.01)	-0.52*** (0.18)	-0.20*** (0.06)
Adj. R ²	0.59	0.91	0.74	0.95	0.76	0.96	0.79	0.98
Observations	22272	21827	43415	42802	93176	92615	49381	49037
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No
Asset Class FE	Yes	No	Yes	No	Yes	No	Yes	No
Bond FE	No	Yes	No	Yes	No	Yes	No	Yes

Note: The dependent variable is the haircut, reported at transaction level. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sectors in columns (1)–(8) refer to the borrowing counterparty (*ICPF* = 'Insurance Corporations & Pension Funds', *OFI* = 'Other Financial Institutions'). Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

However, the HHI coefficient exhibits considerably more variation in both magnitude and statistical significance across borrower types (Specification A). ICPFs demonstrate robust correlations with concentration measures across specifications, while foreign funds show a notably smaller HHI coefficient under the most restrictive specification. This weaker correlation with borrower concentration may align with the premise of greater bargaining power for foreign funds relative to other NBFI categories, as outlined in Hypothesis 2. In addition, robustness checks for foreign funds reveal that higher HHI levels are positively correlated with the probability of zero haircuts, as detailed in Table A.6. This potentially counter-intuitive result is further discussed in Section 4.2, which explores the interaction between concentration and netting opportunities. Overall, the analysis shows that there is clear evidence of heterogeneous effects of concentration across different borrower categories, suggesting that the relationship between bargaining power and repo haircuts varies depending on the type of non-bank financial institution involved.

The findings presented in this section provide empirical support for Hypothesis 1. Specifically, the results confirm that (i) higher borrower concentration in bilateral repo markets leads to increased haircut levels, and (ii) greater availability of funding sources through an expanded lender base corresponds to lower haircuts. Furthermore, Hypothesis 2, which predicted a larger impact of concentration for NBFIs, is only partially confirmed. In fact,

²²The dummy variable definition follows the approach by Bittner and Jank (2025).

while the number of relationship lenders is associated with sizeable haircut reductions for non-banks, the HHI coefficient, though statistically significant, does not exceed the magnitude observed in the full sample. This pattern is corroborated by an alternative Tobit regression, conducted as a robustness check, which yields broadly consistent results with the panel fixed effects estimation (Table A.2 for the complete sample and Table A.4 for the NBF subsample).

Finally, the results reveal the heterogeneous effects of borrower concentration across NBF types. In light of this variation, the next section conducts a more detailed investigation of the NBF subsample, specifically examining the interaction dynamics proposed in Hypotheses 3 and 4.

4.2. Two-way activity and netting opportunities

This section focuses explicitly on repo trades carried out between an NBF borrower and a bank lender. It empirically investigates whether the amount of bidirectional activity of the borrower (i.e. cash lending in this setting) affects the probability of zero haircuts by including the two-way activity measures introduced in Section 3.3 into a Linear Probability Model regression framework. Specifically, to test Hypothesis 3, we introduce an interaction term that captures how the HHI concentration measure varies between the two scenarios defined by the indicator variable *NettingOpportunity_{ijt}*. The setting, outlined in Eq. (5), is as follows:

$$\mathbf{1}(\text{ZeroHaircut})_k = \alpha_B + \delta_T + \lambda_L + \beta_1 \text{HHI}_{it} + \beta_2 \text{HHI}_{it} \cdot \text{NettingOpportunity}_{ijt} + \zeta \text{controls}_k + \epsilon_k \quad (5)$$

Where $\mathbf{1}(\text{ZeroHaircut})_k$ is an indicator variable equal to 1 if contract k is characterised by a zero haircut. Moreover, to test Hypothesis 4, the lending amount and the number of opposing (reverse repo) trades are added, in logs, to the framework set out in Eq. (5).

The results for the NBF subsample, and for the NBF types identified in Section 3.4 as two-way participants in this sample of analysis, are presented in Table 9. Columns (1) to (3) display the results for the NBF subsample as a whole. In this context, HHI borrower represents the role of concentration in the absence of netting opportunities, whereas the interaction term captures the variation of concentration in the presence of relevant bidirectional activity among pair of counterparties.

First, Hypothesis 3 is examined. In this respect, the key insight from Table 9 is as follows: when interacted with *NettingOpportunity*, the results reveal a positive and significant correlation between the HHI of the borrower and the likelihood of zero haircuts. As shown in column (1), in the presence of netting opportunities, a one-unit increase in the HHI of the borrower - from diversified to concentrated funding structure - corresponds to an average increase of 26% in the probability of zero haircut. However, when the *NettingOpportunity* indicator is equal to zero, the estimates show a negative correlation between concentration and the likelihood of a zero haircut (-12.8%), consistent with the findings of the previous section. This finding is also confirmed when filtering for foreign fund borrowers or OFI borrowers (columns (4) and (7), respectively): the interacted variables display the same pattern in the signs and significance of the coefficients, and the coefficients show similar magnitudes. This result is line with the mechanism discussed in Section 3.2, which hypothesised that the trade-off would be stronger for participants characterised by frequent bi-directional activity patterns - in particular, for foreign investment funds.

The previous analysis is extended by incorporating direct measures of lending activity. This specification tests Hypothesis 4, i.e. that counterparties active on both sides of the repo market - as both borrowers and lenders - exhibit a higher probability of negotiating zero haircuts. The empirical specification includes two complementary measures of lending intensity. Columns (2), (5), and (8) incorporate the logarithm of aggregate lending volumes between counterparty pairs in the previous 30 days, while columns (3), (6), and (9)

include the count of reverse repo transactions executed during the same period. These variables capture both the economic magnitude and operational frequency of bilateral lending relationships. Overall, a positive, significant correlation between lending activity and likelihood of zero haircuts is identified for the whole NBFIs sample, and for two-way borrowers considered separately. For the full NBFIs sample, we document a positive and statistically significant association between lending activity measures and the probability of zero haircut arrangements ($\beta = 0.043$ for lending volumes; $\beta = 0.032$ for transaction frequency). The economic magnitude suggests that a doubling of bilateral lending volume corresponds approximately to a 3 percentage point increase in zero haircut probability. As a robustness check, Eq. (5) is estimated through a Logit regression framework, with similar results.²³

Table 9: Two-way activity - NBFIs subsample

Dep. variable: 1(ZeroHaircut)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	NBFIs	NBFIs	NBFIs	Foreign Inv. Fund	Foreign Inv. Fund	Foreign Inv. Fund	OFI	OFI	OFI
HHI borrower	-0.128*** (0.009)	-0.152*** (0.036)	-0.135*** (0.035)	-0.084*** (0.017)	-0.172*** (0.047)	-0.160*** (0.044)	-0.070*** (0.022)	-0.169*** (0.048)	-0.152*** (0.053)
Netting Opportunity $\times$ HHI borrower	0.260*** (0.014)	0.238*** (0.034)	0.207*** (0.033)	0.268*** (0.022)	0.314*** (0.046)	0.284*** (0.042)	0.137*** (0.041)	0.214*** (0.054)	0.158*** (0.059)
Lending amount (log)		0.043*** (0.003)			0.058*** (0.003)			0.020*** (0.006)	
Num. lending trades (log)			0.032*** (0.003)			0.055*** (0.004)			0.008 (0.009)
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	171243	124752	124783	87976	73719	73751	48530	42143	42143
Adjusted R^2	0.56	0.55	0.54	0.53	0.52	0.51	0.70	0.68	0.68

Note: The table shows the results of a Linear Probability Model regression, where the dependent variable is the likelihood of zero haircuts. HHI Borrower is the Herfindahl-Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sectors in columns (1)-(9) refer to the borrowing counterparty (*OFI* = 'Other Financial Institutions'). Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Additionally, results for the other NBFIs types (i.e. directional participants) are shown in Table A.7 in the Appendix. The findings for directional borrowers reveal markedly different patterns. In particular, the interaction with the *NettingOpportunity* indicator lacks statistical significance across most specifications, and displays an opposite sign for ICPFs. Similarly, both measures of lending activity exhibit either economically negligible or statistically insignificant associations with zero haircut probability. This suggests that, for unidirectional market participants, a more concentrated funding base does not translate into lower haircuts through increased netting efficiencies - as anticipated in the discussion of hypotheses 3 and 4 in Section 3.2.

In summary, the findings presented in both Table 9 and Table A.7 support the predictions set out in Hypotheses 3 and 4. The analysis reveals robust and significant correlations among two-way market participants, reinforcing the validity of Hypothesis 3, which posits a trade-off between a stronger bargaining position and a more concentrated borrowing structure when netting opportunities are present. Furthermore, the observed positive relationship between zero haircut likelihood in repo borrowing and heightened activity on the lending side by the same participants provides support for Hypothesis 4. The absence of significant effects or the inconsistency of the results obtained among directional borrowers confirms the reliability of the hypotheses. Thus, when assessing potential policy measures to enhance the resilience of bilateral repo markets, it is important to consider the two key factors discussed in this study: borrower concentration and netting considerations, given their influence on haircut determination. For instance, the introduction of a minimum haircut floor could have a substantial impact on firms that frequently operate on both sides of the market, potentially impacting their trading strategies and overall levels of activity.

²³A minor difference is that results for OFI borrowers are not significant in the Logit specification. Conversely, results for EEA investment funds are more in line with the whole NBFIs sample, albeit barely significant (see Table A.8).

4.3. Robustness: haircut and repo rate

A potential issue in haircut analysis is the endogeneity concern with repo rates. Since rates and haircuts are determined simultaneously at the transaction level, correlations between them may arise, though the direction remains theoretically ambiguous. Two competing mechanisms could drive this relationship. First, rates and haircuts may act as substitutes for each other: higher rates could compensate for lower haircuts, and vice versa, generating a negative correlation. Alternatively, when risk perceptions are elevated, both rates and haircuts may increase together, producing a positive correlation as lenders demand multiple forms of protection. Special repo transactions illustrate another scenario where positive correlation may emerge. When demand for specific securities is exceptionally strong, cash lenders may accept both below-market repo rates and unusually low (potentially negative) haircuts, as the value of accessing the security outweighs standard risk-return considerations.

Recent analyses tackle the issue either by analysing the empirical correlation between the two measures (Baklanova et al. (2019), Hermes et al. (2025)), or by discussing the economic relevance and statistical significance of the repo rate, when included as an explanatory factor in a regression with the haircut as a dependent variable (Bittner and Jank (2025), Julliard et al. (2025), Hermes et al. (2025)). To examine the relationship between rates and haircuts in the analysis sample, the approach introduced in Baklanova et al. (2019) is followed: after implementing separate fixed effect regressions, estimated on repo rates and on haircuts, we inspect the conditional correlation of residuals. Conditional correlations should be interpreted on the basis of their strength and statistical significance. A positive conditional correlation may indicate the presence of unobserved common risk factors that drive co-movements between the two variables under analysis. In the context of repo markets, this could suggest a relationship between counterparty risk (the credit risk of the borrower) and collateral risk (the risk associated with the pledged asset). Various examples of such common factors may be considered; for instance, when a repo borrower pledges collateral issued by an institution domiciled in the same country as the borrower, this arrangement represents a common exposure to country risk (e.g. sovereign downgrades, macroeconomic instability, etc.), which could simultaneously undermine the borrower’s creditworthiness and the market value of the collateral, leading to elevated levels of both repo rates and haircuts. Another relevant example of positive correlation is the case of special repos: as introduced earlier, unusually low levels of both rates and haircuts may be explained in this setting by the high demand for specific securities. A negative conditional correlation may be interpreted as evidence of substitution effects: as the interest rate paid by cash borrowers increases, they may gain greater flexibility to negotiate lower collateral requirements with cash lenders, resulting in a reduction in haircut levels. Conversely, borrowers willing to accept high haircut levels may bargain for a lower interest rate. Finally, a lack of statistical significance or the presence of weak correlation indicates that, once accounting for control variables, there is limited remaining joint determination of haircuts and rates.

A comparison between simple and conditional correlation is shown in Table A.1. While simple correlation measures reveal a statistically significant inverse relationship, robust conditional correlation estimates show a modest positive correlation, statistically significant in the full sample and in most sub-samples. The direction of the correlation suggests the presence of unobserved risk factors driving the co-movement of haircuts and rates; however, the magnitude of the correlation indicates that, once control variables are included, the strength of this co-movement is relatively weak. An exception is observed in the NBFI borrowers sub-sample, where the correlation is negative - potentially indicative of substitution effects between haircuts and rates. Nonetheless, this correlation coefficient is much smaller than those observed in other sub-samples and only marginally significant, at the 10% level.

In general, the size of the identified correlations does not suggest a meaningful relationship between haircut and rates. The weakly positive relationship identified for the complete sample is represented graphically in the scatterplot in Figure A.5; the relationship shows virtually no linear trend, with high variability in the data around the regression line. In

terms of direction, the generally positive sign of the identified conditional correlation is in line with recent empirical work on European repo markets (Julliard et al. (2025), Hermes et al. (2025)). Overall, the empirical results point to a rather weak relationship between rates and haircuts. This confirms previous findings in the literature²⁴; in particular, Julliard et al. (2025) supports the absence of an empirical relationship between the two, mainly due to the existence of different drivers. These results mitigate concerns about potential endogeneity arising from the joint determination of rates and haircuts.

5. Conclusion

Using a novel and comprehensive regulatory dataset covering all repo transactions in the European Economic Area, this paper contributes to the literature on haircut drivers in bilateral repo markets by examining the puzzle of persistently low or zero haircuts in this segment. It focuses on EUR-denominated repos, backed by fixed-income collateral issued in the European Economic Area, and explores how repo borrowers' bargaining power affects haircuts. Using a panel regression framework with a comprehensive fixed effects strategy, the analysis identifies variation in haircuts across different repo borrowers who transact with the same bank lender, pledging identical collateral types during the same trading period. This identification strategy effectively controls for time-varying bank-specific characteristics and lending policies, daily market conditions, and collateral-specific features.

The analysis demonstrates that funding concentration plays a critical role in haircut determination: counterparties with more concentrated (less diversified) borrowing structures face higher average haircuts due to lower bargaining power. This finding is confirmed across market segments, though with heterogeneous strength depending on counterparty types. First, this analysis documents that haircut levels increase on average by 44-80 basis points with borrower concentration - suggesting that lower borrower bargaining power results in less favourable conditions for repos with identical features. Second, greater lender diversification, reflected in access to multiple lending options, is linked to lower repo haircuts. As borrowers gain bargaining power, they can negotiate more favourable contractual terms, including reduced haircuts. This effect is particularly pronounced for non-bank financial institutions, where the negative correlation between the number of active lenders and haircut levels is stronger. In terms of economic magnitude, adding three additional lenders - which would double the current NBFIs average - translates into an average haircut reduction of 9 to 42 basis points. This likely reflects NBFIs' more limited access to alternative funding sources compared to traditional banks.

In addition, the study confirms that netting practices also play a role in haircut determination, underscoring the importance of analysing the complete activity profiles of borrowers, including their lending activities, even when studying trade-level haircuts. When NBFIs maintain bidirectional repo relationships with the same counterparties - acting as both borrowers and lenders - the potential for position netting and risk offset enhances the probability of zero haircut arrangements.

Furthermore, the paper identifies an important trade-off between concentration and netting for NBFIs borrowers: concentrated funding relationships can paradoxically increase the likelihood of zero haircuts when netting opportunities arise, as bilateral concentration maximises netting potential. Specifically, in the presence of netting opportunities, a one-unit increase in the HHI of the borrower - from diversified to concentrated funding structure - is correlated with an average increase of 26% in the probability of zero haircut. This counter-intuitive result likely stems from the fact that when haircuts are influenced by the overall net position between counterparty pairs, concentrated exposures facilitate more effective netting of offsetting positions.

²⁴Cf. Eisenschmidt et al. (2024) and Julliard et al. (2025).

The analysis provides novel evidence on the determinants of repo haircuts in bilateral repo markets; it contributes to inform the active policy discussion on the topic by discussing the role of borrower concentration and netting practices as possible drivers of low haircuts. It confirms that haircuts in repo markets are influenced by multiple factors beyond collateral characteristics, and stresses the importance of bargaining power and the role of bilateral relationship.

Given the relevance of borrower bargaining power in determining haircut levels, it is worth discussing its implications for financial stability in more detail. First, exploiting the competition between lenders to achieve a more diversified funding structure can increase the resilience of market participants - improving their borrowing capacity even in downturns. From a supervisory perspective, it could be useful to track concentration metrics, alongside corresponding repo haircuts and rates, in particular for those borrowers relying on a single (or limited) number of lenders. These metrics could serve as early-warning indicators, helping to identify potential distress scenarios before they escalate. When integrated with data on firm performance and overall financial health, monitoring borrower-level concentration dynamics can offer valuable supplementary insights, enhancing the ability to proactively address emerging risks. Second, low (or zero) haircut levels arising from lender competition can increase the leverage achieved through repo borrowing - in particular among non-bank financial institutions, potentially increasing systemic risk (Banegas and Monin (2023)).

Similar reasoning holds for netting-driven zero haircuts, reportedly linked to relative value trading strategies based on netted packages (Hempel et al. (2023)). While achieving efficient outcomes from a collateral management perspective, the overall low haircut requirements could lead to heightened systemic risk, unless managed through adequate and complementary safeguards - for example, via portfolio-level margining (Panzarino and Spolaore (2026)).

Further research is needed to disentangle the role and interactions of haircut determinants and their broader connections to margining and pricing practices. Future research could also examine whether the relationships identified in this paper hold during periods of market stress.

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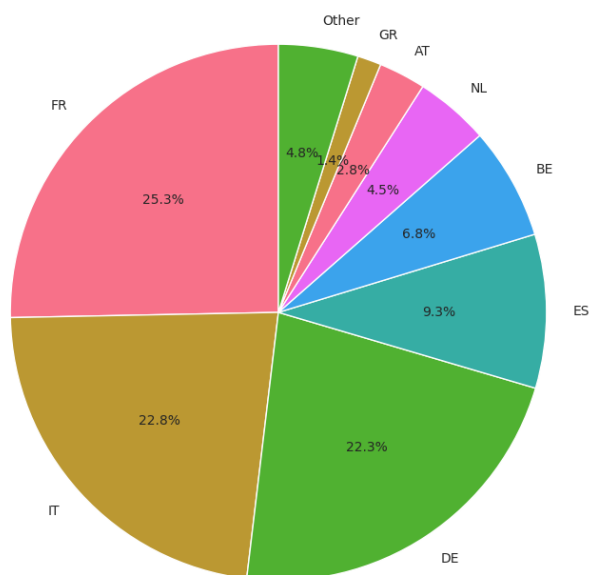
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A. Additional Tables and Figures

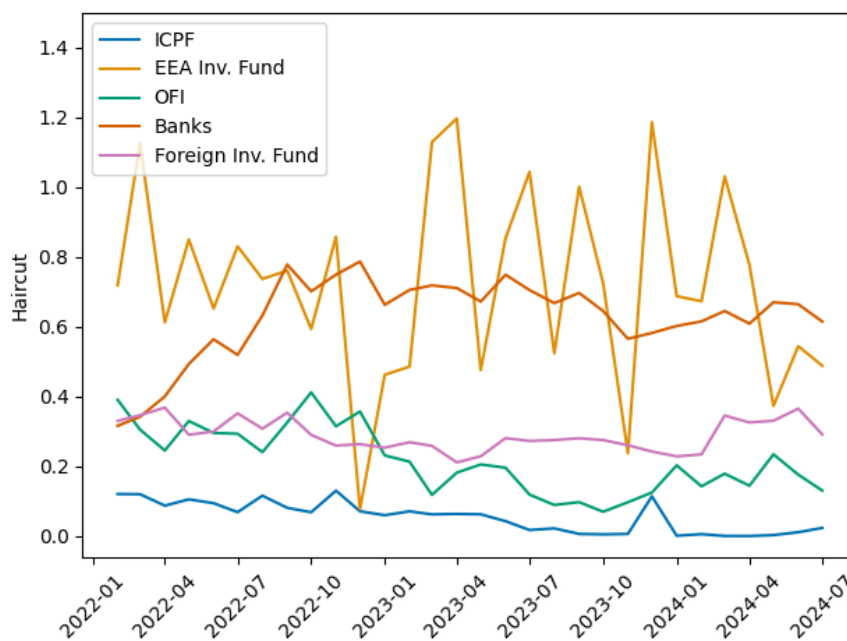
Figure A.1: Collateral composition by issuer country



Note: Repo borrowing volumes, in percentage of the total, by collateral country jurisdiction.

Source: SFTR.

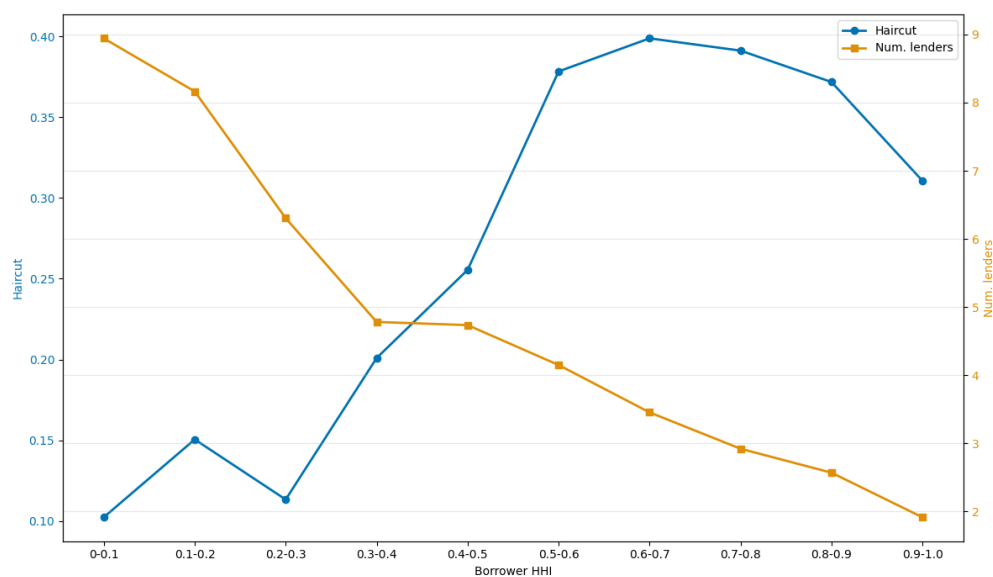
Figure A.2: Average haircut by type of financial institution



Note: Haircut (weighted by principal amount) by type of borrowing institution. Only repos backed by selected collateral (IT, DE, FR and ES government bonds) included.

Source: SFTR.

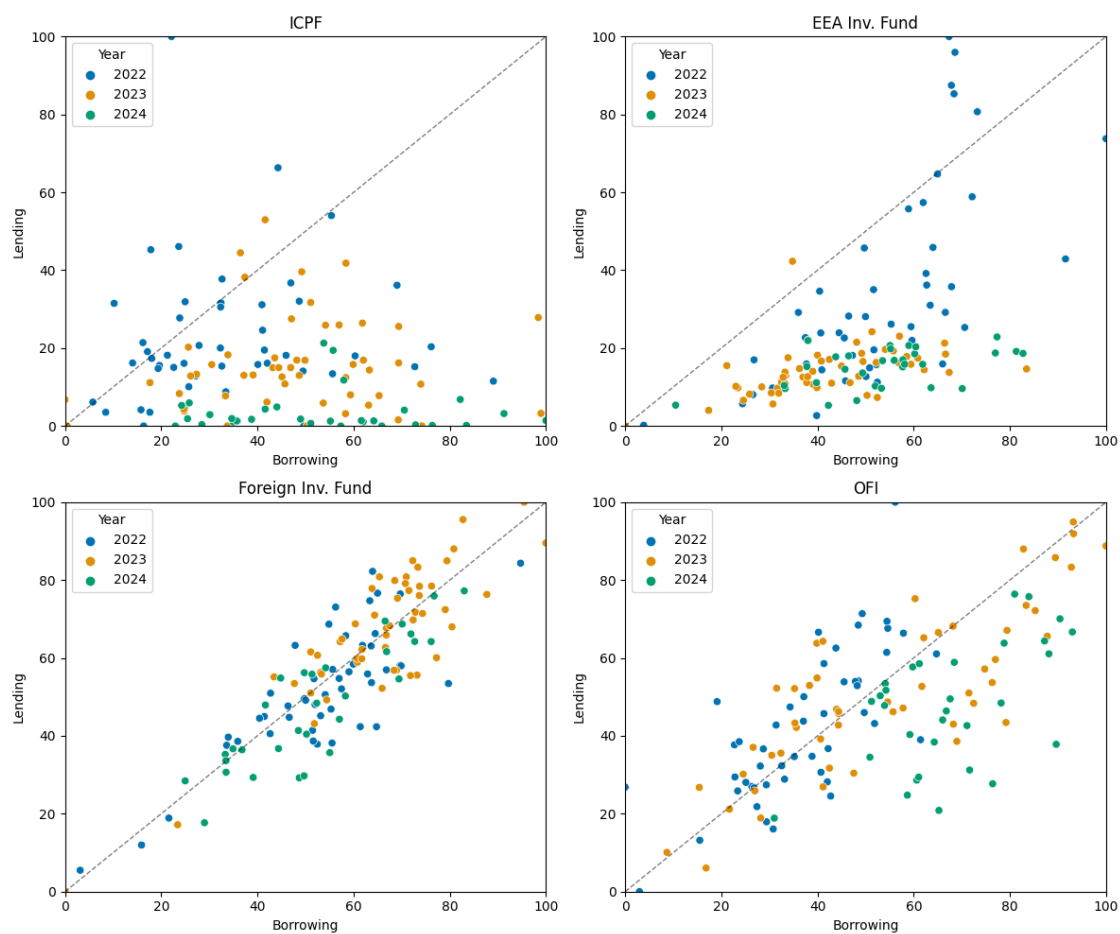
Figure A.3: Haircut and number of lenders, by borrower HHI



Note: Haircut (weighted by principal amount) by borrower HHI, for overnight repos with NBFIs borrowers backed by selected collateral (IT, DE, FR and ES government bonds). Only trades with repo rate within 1bp of the median rate included. Average number of cash lenders by borrower HHI on the rhs.

Source: SFTR, authors' calculations.

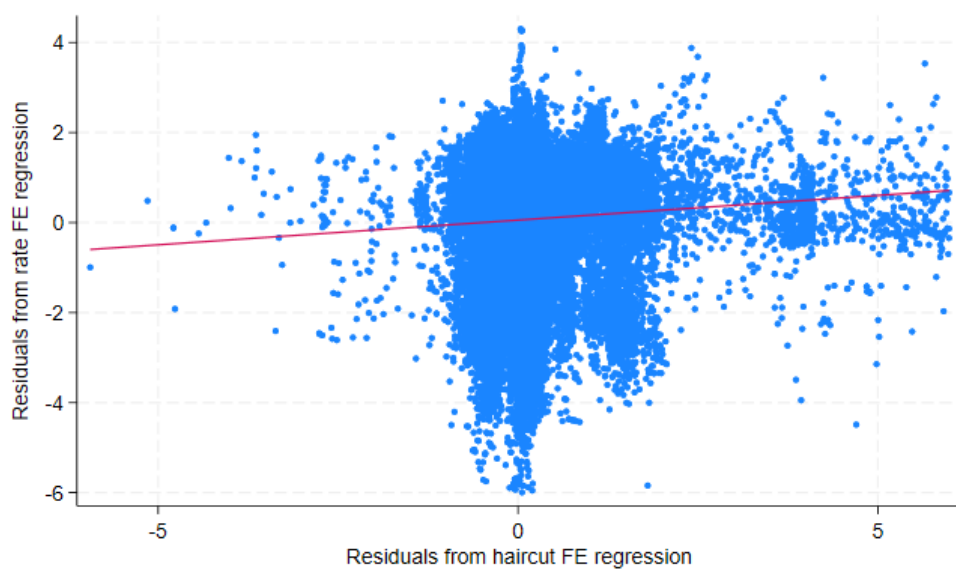
Figure A.4: Two-way activity of NBFI borrowers by type



Note: Total weekly borrowing and lending activity of NBFI repo borrowers, by type of borrowing institution and across years. Amounts standardized between 0 and 100.

Source: SFTR, authors' calculations.

Figure A.5: Haircut and rate conditional correlation (residuals)



Note: This figure displays residuals estimated from fixed effect regressions on haircut and repo rate. Standard control variables adopted throughout the paper are included, along with fixed effects for borrower, security and week.

Source: SFTR, authors' calculations.

Table A.1: Correlation between repo rate and haircut

	Unconditional correlation	Conditional correlation
Full Sample	-0.037***	0.032***
Subsample: Overnight	-0.028***	0.047***
Subsample: Interbank	-0.037***	0.036***
Subsample: Bank-NBFI	-0.042***	-0.005*

Note: The table displays the simple correlation (unconditional) between rates and haircuts, and the conditional correlation of rate and haircut residuals, estimated from a panel FE regression. Standard control variables adopted throughout the paper are included, along with borrower, security and weekly fixed effects. Data source: SFTR, author's calculations.

Table A.2: Tobit (ME) - Complete sample

Dependent variable: Haircut	(1)	(2)	(3)	(4)	(5)	(6)
HHI borrower	1.019*** (0.063)	1.016*** (0.057)	1.064*** (0.050)			
Num. lenders				-0.045*** (0.003)	-0.044*** (0.003)	-0.045*** (0.002)
ICPF	-1.744*** (0.143)	-1.464*** (0.127)	-1.263*** (0.110)	-2.578*** (0.156)	-2.198*** (0.142)	-1.927*** (0.124)
EEA Inv. Fund	2.467*** (0.103)	2.357*** (0.087)	2.201*** (0.080)	1.728*** (0.092)	1.545*** (0.077)	1.332*** (0.071)
Foreign Inv. Fund	2.079*** (0.064)	1.996*** (0.058)	1.994*** (0.053)	2.038*** (0.067)	1.871*** (0.057)	1.812*** (0.051)
OFI	2.156*** (0.111)	2.075*** (0.106)	2.148*** (0.102)	1.866*** (0.104)	1.718*** (0.100)	1.735*** (0.097)
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes
Asset Class FE	No	No	Yes	No	No	Yes
Observations	1839254	1839254	1839254	1862011	1862011	1862011

Note: The table shows the marginal effects from a Tobit regression model, where the dependent variable exhibits left-censoring. The dependent variable is the haircut, reported at transaction level. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table A.3: Tobit (Coefficients) - Complete sample

Dependent variable: Haircut	(1)	(2)	(3)	(4)	(5)	(6)
HHI borrower	2.513*** (0.161)	2.486*** (0.144)	2.586*** (0.125)			
Num. lenders				-0.115*** (0.007)	-0.112*** (0.007)	-0.115*** (0.006)
ICPF	-4.302*** (0.359)	-3.583*** (0.314)	-3.070*** (0.271)	-6.636*** (0.423)	-5.618*** (0.384)	-4.890*** (0.333)
EEA Inv. Fund	6.084*** (0.261)	5.768*** (0.218)	5.350*** (0.198)	4.448*** (0.238)	3.949*** (0.193)	3.379*** (0.177)
Foreign Inv. Fund	5.128*** (0.169)	4.884*** (0.152)	4.847*** (0.139)	5.248*** (0.183)	4.781*** (0.154)	4.597*** (0.136)
OFI	5.319*** (0.286)	5.078*** (0.269)	5.223*** (0.258)	4.805*** (0.276)	4.391*** (0.263)	4.403*** (0.252)
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes
Asset Class FE	No	No	Yes	No	No	Yes
Observations	1,839,254	1,839,254	1,839,254	1,862,011	1,862,011	1,862,011
Pseudo R2	0.28	0.30	0.31	0.26	0.28	0.30

Note: The table shows the coefficients from a Tobit regression model, where the dependent variable exhibits left-censoring. The dependent variable is the haircut, reported at transaction level. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table A.4: Tobit (ME) - NBFI sample

Dependent variable: Haircut	(1)	(2)	(3)	(4)	(5)	(6)
HHI borrower	0.062 (0.066)	0.039 (0.044)	0.098*** (0.037)			
Num. lenders				-0.085*** (0.008)	-0.064*** (0.005)	-0.075*** (0.004)
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes
Asset Class FE	No	No	Yes	No	No	Yes
Observations	196908	196908	196908	208261	208261	208261

Note: The table shows the margin effects from a Tobit regression model, where the dependent variable exhibits left-censoring. The dependent variable is the haircut, reported at transaction level. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sample: only non-banks (NBFI) as borrowers. Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table A.5: Tobit (Coefficients) - NBFI sample

Dependent variable: Haircut	(1)	(2)	(3)	(4)	(5)	(6)
HHI borrower	0.285 (0.303)	0.182 (0.203)	0.455*** (0.174)			
Num. lenders				-0.369*** (0.035)	-0.286*** (0.025)	-0.336*** (0.019)
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes
Asset Class FE	No	No	Yes	No	No	Yes
Observations	196,908	196,908	196,908	208,261	208,261	208,261
Pseudo R2	0.22	0.26	0.30	0.21	0.26	0.30

Note: The table shows the coefficients from a Tobit regression model, where the dependent variable exhibits left-censoring. The dependent variable is the haircut, reported at transaction level. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sample: only non-banks (NBFI) as borrowers. Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table A.6: Zero haircut probability - NBF1 type

Dep. variable: 1(ZeroHaircut)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ICPF	ICPF	EEA Inv. Fund	EEA Inv. Fund	Foreign Inv. Fund	Foreign Inv. Fund	OFI	OFI
Specification A: Borrower HHI as a measure of concentration								
HHI borrower	-0.124*** (0.018)	-0.109*** (0.016)	0.032 (0.021)	0.050*** (0.013)	0.115*** (0.011)	0.118*** (0.010)	0.017 (0.035)	0.030 (0.028)
Observations	19019	18606	40485	39955	88536	87976	48862	48530
Adj. R ²	0.54	0.64	0.82	0.92	0.46	0.52	0.60	0.69
Specification B: Number of lenders as a measure of concentration								
Num. lenders	0.010*** (0.001)	0.007*** (0.001)	-0.016*** (0.002)	-0.017*** (0.002)	0.001 (0.002)	-0.001 (0.002)	0.011*** (0.003)	0.008*** (0.003)
Observations	22272	21827	43415	42802	93176	92615	49381	49037
Adj. R ²	0.52	0.63	0.81	0.92	0.46	0.53	0.60	0.70
Specification C: high borrowing power as a measure of concentration								
1(Num. lenders $\geq$ 4)	0.133*** (0.014)	0.104*** (0.012)	-0.061*** (0.013)	-0.069*** (0.011)	0.001 (0.010)	-0.007 (0.010)	-0.041 (0.027)	-0.081*** (0.024)
Observations	22272	21827	43415	42802	93176	92615	49381	49037
Adj. R ²	0.53	0.64	0.80	0.91	0.46	0.53	0.60	0.70
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	No	Yes	No	Yes	No	Yes	No
Asset Class FE	Yes	No	Yes	No	Yes	No	Yes	No
Bond FE	No	Yes	No	Yes	No	Yes	No	Yes

Note: The table shows the results of a Linear Probability Model regression, where the dependent variable is the likelihood of zero haircuts. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sectors in columns (1)-(8) refer to the borrowing counterparty (*ICPF* = 'Insurance Corporations & Pension Funds', *OFI* = 'Other Financial Institutions'). Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table A.7: Concentration and two-way activity: directional borrowers

Dep. variable: 1(ZeroHaircut)	(1)	(2)	(3)	(4)	(5)	(6)
	ICPF	ICPF	ICPF	EEA Inv. Fund	EEA Inv. Fund	EEA Inv. Fund
HHI borrower	-0.093*** (0.018)	-0.041 (0.032)	-0.033 (0.030)	0.035*** (0.012)	0.055 (0.035)	0.053 (0.035)
Netting Opportunity $\times$ HHI borrower	-0.108*** (0.035)	0.015 (0.023)	0.005 (0.023)	0.193*** (0.021)	0.039 (0.025)	0.039 (0.025)
Lending amount (log)		0.005 (0.005)			0.011** (0.005)	
Num. lending trades (log)			0.019 (0.012)			0.010** (0.005)
Lender FE	Yes	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18605	699	699	15403	8023	8023
Adjusted R^2	0.65	0.98	0.98	0.90	0.95	0.95

Note: The table shows the results of a Linear Probability Model regression, where the dependent variable is the likelihood of zero haircuts. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sectors in columns (1)–(6) refer to the borrowing counterparty (*ICPF* = 'Insurance Corporations & Pension Funds'). Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table A.8: Concentration and two-way activity: Logit (ME)

Dependent variable: 1(ZeroHaircut)	(1) NBFIs	(2) Foreign Inv. Fund	(3) OFI	(4) ICPFs	(5) EEA Inv. Fund
HHI borrower					
1(Netting Opportunity = 0)	-0.217*** (0.012)	-0.163*** (0.025)	-0.077 (0.048)	-0.072*** (0.009)	-0.031* (0.017)
1(Netting Opportunity = 1)	0.145*** (0.011)	0.165*** (0.011)	0.030 (0.046)	-0.188*** (0.028)	0.062*** (0.021)
Lender FE	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Asset Class FE	Yes	Yes	Yes	Yes	Yes
Observations	159781	82747	19771	13971	13210

Note: The table shows the marginal effects of the HHI borrower variable from a Logit model regression, where the dependent variable is the likelihood of zero haircuts. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sectors in columns (1)-(5) refer to the borrowing counterparty (*ICPF* = 'Insurance Corporations & Pension Funds', *OFI* = 'Other Financial Institutions'). Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

Table A.9: Concentration and two-way activity: Logit (Coefficients)

Dependent variable: 1(ZeroHaircut)	(1) NBFIs	(2) Foreign Inv. Fund	(3) OFI	(4) ICPFs	(5) EEA Inv. Fund
HHI borrower	-1.969*** (0.123)	-1.317*** (0.222)	-1.140 (0.698)	-2.901*** (0.383)	-0.538* (0.317)
Netting Opportunity $\times$ HHI borrower	3.189*** (0.148)	2.537*** (0.254)	1.614* (0.880)	-1.529 (1.847)	1.865*** (0.381)
Lender FE	Yes	Yes	Yes	Yes	Yes
Week FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Asset Class FE	Yes	Yes	Yes	Yes	Yes
Pseudo R ²	0.46	0.43	0.68	0.70	0.77
Observations	159781	82747	19771	13971	13210

Note: The table shows the coefficients of the HHI borrower variable from a Logit model regression, where the dependent variable is the likelihood of zero haircuts. HHI Borrower is the Herfindahl–Hirschman index computed daily with reference to the volumes borrowed in the previous 30 days. Sectors in columns (1)-(5) refer to the borrowing counterparty (*ICPF* = 'Insurance Corporations & Pension Funds', *OFI* = 'Other Financial Institutions'). Control variables include the log of the principal amount, maturity fixed effects, the log of collateral outstanding maturity and CDS spread. CDS data come from Refinitiv Datastream. All other data come from SFTR. Robust standard errors (clustered weekly) are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively.

B. Data preparation and cleaning

The analysis relies on trade-activity data from the SFTR database. Due to their complexity and size, various methodological choices and data cleaning procedures were applied. In order to prepare the research sample, the steps outlined below have been undertaken:

- **Filtering:** The analysis focuses on new transactions executed between 1 February 2022 and 1 August 2024, and retains only repos collateralized with EEA-issued fixed income securities, consistent with the scope of this paper. The focus is solely on EUR-denominated repos. Repos with a value date after 1 August 2024 are dropped from the analysis. Moreover, transactions collateralized by multiple securities are excluded, noting that haircut setting practices may differ in such cases, which represent a negligible share in the dataset.²⁵ In terms of counterparty sector, repos with non-financial entities and with counterparties that we are not able to classify are removed. Additional filtering criteria include the removal of small-scale transactions (those with principal amounts below EUR 500,000), observations with negative haircuts, and the exclusion of reverse repo activity conducted by central counterparties for their own account. Finally, Generic Collateral (GC) repos are removed, since the security pledged as collateral is typically unknown at the time of trade execution and contract agreement. The analysis focuses instead on specific repos - the predominant segment of bilateral European repo markets.²⁶
- **Data cleaning:** First, observations with same-sided transactions, invalid dates and stale records are excluded. Second, potential duplicates are removed by using a composite key approach that incorporates counterparties identities, the ISIN of the security, principal and collateral amounts, value and maturity dates and execution timestamps within a narrow time window. Third, we exclude other reporting anomalies, including outliers and extreme collateral-to-loan values.²⁷ Fourth, extensive data validation through manual verification was conducted. Finally, the sample is further restricted by excluding observations corresponding to market closures due to European public holidays.
- **Other steps:** Making use of consistent reference information for each security and economic agent (and retrieval of such information where missing) is a fundamental and non-trivial step when dealing with such rich data. In addition, in case both counterparties are subject to the SFTR reporting obligation, a necessary step to analyse volume data is the deduplication of double-reported records.²⁸ This process is executed in two sequential steps: first, through a quality score, we identify the superior observation within each reporting pair, based on the presence of missing information or implausible values, and retain the higher-quality record. Second, when neither record demonstrates clear superiority, we maintain consistent reporting by the same counterparties over time.

²⁵Cf. ESMA (2024).

²⁶Cf. ECB (2024) and Bassi et al. (2024).

²⁷For the implementation of the collateral-to-loan ratio, we follow the approach described in ESMA (2024).

²⁸See ESMA (2024) for a detailed explanation of the SFTR reporting obligation.

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