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# **Balance-Sheet Netting in U.S. Treasury Markets and Central Clearing**

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# Balance-Sheet Netting in U.S. Treasury Markets and Central Clearing \*

David Bowman   Yesol Huh   Sebastian Infante

Federal Reserve Board

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## Abstract

In this paper, we provide a comprehensive investigation of the potential for expanded central clearing to reduce the costs of the supplementary leverage ratio (SLR) on Treasury market intermediation in both cash and repo markets. Combining a detailed analysis of the rules involved in calculating the SLR with a unique set of regulatory data, we conclude that expanding central clearing would have relatively limited effects on the level of SLRs. We do find intermediaries' increase their balance sheet netting when their regulatory balance sheet costs are higher. Our data permits us to establish a number of empirical facts related to the noncentrally cleared bilateral (NCCB) repo segment, and to repo activity overall, at the bank holding company level. We find that sizeable amounts of bilaterally-cleared activity would not be nettable even if centrally cleared. We also find that a significant portion of activity is already nettable outside of central clearing because dealers are structuring their NCCB trades to net. While expanded central clearing could have other benefits, such as imposing a more uniform margin regime on Treasury market intermediation, the scope of its effects on reducing balance sheet costs associated with the leverage ratio is limited.

*JEL Codes:* G21, G28

*Keywords:* Treasury securities, supplementary leverage ratio, central clearing, netting

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# 1 Introduction

Although U.S. Treasury securities remained the most liquid form of investment, in March 2020, widespread sales of Treasury securities by investors seeking to convert these securities into cash led to severe dislocations and necessitated large-scale asset purchases and an expansion of repurchase agreement (repo) operations by the Federal Reserve in order to avoid further disruptions. A number of studies quickly followed these events pointing to limits in dealers' abilities to warehouse the large flow of sales during this period and also noting that dealers' capacities to intermediate Treasury markets had not kept pace with the growth of Treasury securities available to the public in recent years. Favara et al. (2022) note that both primary dealers' secured lending in the Treasury repo market and their long positions in Treasury securities have remained fairly stable since the global financial crisis even as the stock of Treasury securities held by the public has grown sharply.

Several of these studies, including Duffie (2020), Liang and Parkinson (2020), the Group of Thirty Working Group on Treasury Market Liquidity (2021), and Hubbard et al. (2021), argued that these events warranted further analysis of expanding central clearing in Treasury cash and repo markets. Central clearing replaces bilateral trade arrangements with a centralized system of exposures between a centralized clearing counterparty (CCP) and clearing participants, and these papers argued that expanded central clearing in Treasury cash and repo markets could allow for greater netting as potential way to increase dealer's intermediation capacity. These papers pointed to the potential for expanded central clearing to lower the regulatory capital costs of Treasury-market intermediation, in particular, the costs imposed by the supplementary leverage ratio (SLR) and, more specifically, the enhanced supplementary leverage ratio (eSLR) that applies to most U.S. GSIBs.<sup>1</sup>

A number of studies have previously discussed the impacts of the SLR/eSLR on Treasury markets, including Duffie and Krishnamurthy (2016), Egelhof et al. (2017), Munyan (2017), Kotidis and Van Horen (2018), He et al. (2022), and Favara et al. (2022). The Committee on the Global Financial System (2017) has also pointed to potentially negative impacts from the SLR/eSLR. In 2018, the Federal Reserve Board acknowledged the potential concerns about the impacts of the eSLR when it issued a Notice of Proposed Rulemaking proposing certain changes to the rules as to how the eSLR could be calculated:<sup>2</sup>

*Over the past few years, concerns have arisen that, in certain cases, the standards in the eSLR rule have become a generally binding constraint rather than a backstop to the*

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<sup>1</sup>The SLR is the ratio between a bank's Tier 1 Capital and its Total Leverage Exposure, which accounts for on- and off balance sheet exposures. The eSLR standards requires that U.S. GSIBs maintain a SLR ratio above 5 percent. Importantly, the SLR treats all on-balance sheet exposures equally, regardless of the underlying asset's risk profile.

<sup>2</sup>Joint notice of proposed rulemaking to modify the enhanced supplementary leverage ratio standards applicable to U.S. global systemically important bank holding companies and certain of their insured depository institution subsidiaries. See <https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20180411a1.pdf>.

*risk-based standards. Thus, although the eSLR standards provide incentives to maintain a strong capital base, the current calibration also has created incentives for banking organizations to reduce their participation in lower-risk, lower return business activity, such as repo financing, central clearing services for market participants, and taking custody deposits, notwithstanding client demand for those services.*

In this paper, we provide a comprehensive investigation of the potential for expanded central clearing to reduce the costs associated with the SLR/eSLR on Treasury market intermediation. Combining a detailed analysis of the accounting and regulatory rules involved in calculating the measure of leverage underpinning the SLR/eSLR with a unique set of regulatory data, we conclude that expanding central clearing would have relatively limited impacts on SLR/eSLR ratios. Specifically, we show that broker-dealers are already able to net their cash market transactions under a wide set of circumstances, regardless of whether they are centrally cleared. We then detail the circumstances under which expanded central clearing of Treasury repo activity might reduce the impact of the SLR/eSLR and show that these reductions are relatively small. We also find empirical evidence that netting activity in the centrally cleared segments increases when BHC's balance sheet costs are high, suggesting that these institutions optimize their repo activity to reap the benefits of balance sheet netting. This apparent incentive to optimize the size of their repo activity is consistent with banks' desire to economize on regulatory leverage constraints. We note, however, that while we find a limited impact on leverage constraints based on current patterns of repo activity, it is possible that large BHCs may increase or otherwise change their repo and intermediation activities under expanded central clearing. Expanded central clearing could also have other benefits as emphasized by the SEC in its recently issued final rulemaking to require central clearing of some cash and most Treasury repo transactions, such as imposing a more uniform margin regime on Treasury market intermediation and reducing market segmentation. Of course, it could also have potential costs, including increasing the liquidity needs of and exposures to the central clearing counterparty.

In the remainder of the paper, we first provide background on capital treatment of broker-dealer Treasury activity in the SLR/eSLR in Section 2. Section 3 presents our methodology, which involves combining several different data sets in order to form a complete picture of the GSIB's involvement in Treasury repo markets. Section 4 then presents our results and explains why we find that expanded central clearing in the repo market would have a limited effect on the level of firms' SLR/eSLR. We also show that an increase in the cost associated with balance sheet size induces GSIBs to increase their balance sheet netting activities. These last two results show that expanded central clearing would have modest effects on the leverage ratios in part because these firms are already actively seeking to minimize the impacts of their repo activity on their balance sheets. Section 5 then concludes.

## 2 Background

### *Capital Treatment of Dealer Treasury-market Intermediation Under the SLR*

The SLR is the U.S. implementation of the Basel III Tier 1 leverage ratio, which requires that the ratio of capital to total assets of large bank holding companies (BHCs) and depository institutions (DIs) must be above a fixed threshold. Unlike risk-based regulatory capital requirements, the SLR/eSLR treats all assets equally, independent of their underlying riskiness. Holding equity fixed, the SLR/eSLR acts like a restriction on the overall size of a bank's balance sheet. Because Treasury market intermediation is considered to be a low-risk activity, it has less weight in risk-based capital measures, but because the SLR/eSLR places the same weight on all activities regardless of risk, it is particularly costly for Treasury market intermediation, which is a low yielding, balance sheet intensive, activity. Moreover, this restriction can be particularly burdensome in times of market stress, when large BHCs and their dealer subsidiaries are expected to expand their participation in the Treasury market elastically in response to surges in cash and repo market order flow.<sup>3,4</sup>

Under the Federal Reserve's capital rules, the larger or more globally active ("advanced approach") bank holding companies must meet a minimum supplementary leverage ratio (SLR) of 3 percent, measured as the ratio of a firm's tier 1 capital to its total leverage exposure.<sup>5</sup> The largest bank holding companies, the global systemically important banks (GSIBs), are subject to a higher enhanced SLR requirement (eSLR). Under the eSLR, each GSIB must maintain an SLR greater than 3 percent *plus* an additional leverage buffer of 2 percent.<sup>6</sup> Because the GSIBs play such a large role in Treasury market intermediation, and because they face higher leverage requirements under the eSLR, the eSLR, rather than the SLR, is generally understood to have greater potential implications for Treasury markets.

Initially, the SLR/eSLR (henceforth, SLR) was designed serve as a backstop to more traditional risk-based regulatory capital ratios such as common equity tier 1 (CET1) ratios. However, the

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<sup>3</sup>In addition to the SLR, there are other regulatory capital rules that penalize an increase in balance sheet size, regardless of the riskiness of bank assets. For example, the GSIB surcharge, which is the additional amount of capital that Global Systemically Important Banks (G-SIBs) must hold in excess of minimum requirements, depends in part on the overall size of the bank.

<sup>4</sup>Beyond regulatory capital requirements, BHCs may have internal risk limits or mandates that can act like overall size restrictions. Though it is unclear to what extent these internal limits are a response to the regulatory environment, BHCs may be concerned about investor perception or other risks associated with overall balance sheet size, which can be interpreted as additional costs related to balance sheet size.

<sup>5</sup>A banking organization is an advanced approaches banking organization if it has consolidated assets of at least \$250 billion or if it has consolidated on-balance sheet foreign exposures of at least \$10 billion, or if it is a subsidiary of a depository institution, bank holding company, savings and loan holding company, or intermediate holding company that is an advanced approaches banking organization. See 78 FR 62018, 62204 (October 11, 2013), 78 FR 55340, 55523 (September 10, 2013).

<sup>6</sup>In addition to the SLR/eSLR, banking organizations must also maintain a minimum leverage ratio of 4 percent, measured as the ratio of a firm's tier 1 capital to its average total consolidated assets. Because consolidated assets do not reflect off-balance sheet items, this ratio will generally be less binding than the SLR/eSLR for larger or more complex organizations.

growth of banks’ balance sheets in recent years, in particular as the Federal Reserve has injected more reserves into the banking system, has implied that for some large BHCs the eSLR can be the most restrictive regulatory capital ratio.

While DIs are subject to their own leverage requirements (a bank subsidiary of a holding company subject to the eSLR rule must maintain a 6 percent SLR), we focus on the rules related to BHCs, because most Treasury cash market and repo intermediation typically takes place within a dealer rather than the DI, and the activity at the dealer subsidiary level directly affects their associated BHCs capital position, contributing to the overall regulatory capital ratios. Most large banking organizations have dealer subsidiaries which are designated as primary dealers, the main counterparties of the Federal Reserve Bank of New York, that are expected to participate in primary issuance of Treasury securities and act as intermediaries in secondary markets. These dealers provide immediacy in the Treasury cash market and intermediate funding and securities via securities financing transactions (SFTs), which are predominantly through repo.<sup>7</sup> The footprint of primary dealer subsidiaries of largest GSIBs in the U.S. Treasury market is sizable, and their willingness and ability to participate in these markets are important for overall Treasury market functioning.<sup>8</sup>

The SLR ratio is based on the following calculation:

$$SLR = \frac{\text{Tier 1 Capital}}{\text{Total Leverage Exposure}}$$

where Total Leverage Exposure (TLE) is a measure of both on- and off-balance sheet assets.<sup>9</sup>

To understand the balance sheet netting implications of central clearing, it is necessary to understand the accounting and regulatory rules involved in calculating TLE. As a general matter, the accounting required in the implementation of bank capital rules follows U.S. Generally Accepted Accounting Principles (GAAP) as set by the Financial Accounting Standards Board (FASB) in the Accounting Standards Codification (ASC). The GAAP distinguishes between direct purchases or sales of Treasury securities in the cash market and cash lending and borrowing via SFTs, such as repos and securities lending contracts, backed by Treasury collateral. We discuss each in turn.

### Cash Market Transactions

At the time of settlement, neither cash market purchases nor sales of Treasury securities impact the size of the bank holding company’s TLE. For example, consider a hypothetical dealer that buys \$100 in Treasury securities or sells the same amount. In either transaction, at settlement,

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<sup>7</sup>SFTs include repos, securities lending contracts, and collateral swaps.

<sup>8</sup>See Favara et al. (2022) to see the total footprint of large GSIBs participation in the U.S. Treasury market.

<sup>9</sup>Outright purchases or sales of Treasury securities in the cash market are “on balance-sheet” asset items in calculating TLE. The treatment of Treasury repo activity is covered under the rules governing the calculation of off-balance sheet exposures, as the securities sold by the cash borrower are not recognized on the balance sheet of the cash lender; for reasons discussed in greater detail below, the cash lender is generally not considered to have “effective control” of the collateral under accounting rules.

the overall size of the dealer’s balance sheet remains unchanged. In terms of its books, the dealer exchanges equivalent amounts of cash and securities in its asset position, keeping the size of the balance sheet constant (see Figure 1).<sup>10</sup>

**Figure 1:** Accounting of Treasury Cash Market Transactions After Settlement

	<u>Treasury Security Sale</u>	<u>Treasury Security Purchase</u>
<b>Assets</b>		
Cash	\$100	-\$100
Securities	-\$100	\$100
Receivables		
<b>Liabilities</b>		
Payables		
Loans		

In reality, the accounting is more complicated—both broker-dealers and banks are required to account for any sales and purchases as of the trade date, prior to settlement. The figure below provides an example of a balance sheet for a broker dealer that enters into proprietary trades to either sell or purchase \$100 in Treasury securities. As of the trade date, a standalone sale of a Treasury security would be represented as a reduction in security holdings and an increase in cash receivables (Example 2a). A standalone purchase of a Treasury security would be represented as an increase in security holdings and a matching increase in cash payables, leading both assets and liabilities to increase (Example 2b).

Trade-date accounting for cash transactions thus does not automatically allow for netting of sales and purchases. However, specifically for broker-dealers, the ASC sets out further standards for accounting for proprietary “regular-way” trades in section 940-320 that would apply to standard T+1 settled cash Treasury transactions.<sup>11</sup> Recognizing that dealer balance sheets would otherwise be subject to substantial volatility, ASC 940-320-45 states that broker-dealers can account for the resulting payables/receivables due at settlement on a *net* basis.

Under the terms of 940-320-45, a purchase of one security and offsetting sale of another security can jointly be represented under net receivables or net payables. As shown in Example 2c, under these terms, neither assets nor liabilities will be affected if a dealer intermediary buys a security from one counterparty and sells it, or another security, for the same price to another counterparty,

<sup>10</sup>To enter short positions, a bank would have to lend cash via a SFT in order to source the security to sell it in the cash market. Therefore, the balance sheet effect of shorting is captured through SFTs booked on the asset side of banks’ balance sheet.

<sup>11</sup>Regular-way trades include both of the following: (1) All transactions in exchange-traded financial instruments that are expected to settle within the standard settlement cycle of that exchange (for example, three days for U.S. exchanges); (2) All transactions in cash-market-traded financial instruments that are expected to settle within the time frame prevalent or traditional for each specific instrument (for example, for U.S. government securities, one or two days).

as the cash receivable from the sale is allowed to net against the cash payable from the purchase.

**Figure 2:** Examples of Trade-Date Accounting of Treasury Cash Market Transactions

<u>Example 2a: Treasury Security Sale Only</u>	<u>Example 2b: Treasury Security Purchase Only</u>	<u>Example 2c: Separate Treasury Security Sale and Purchase Transactions by a Broker Dealer under ASC 940-320</u>	
		<u>Sale</u>	<u>Purchase</u>
<b>Assets</b>	<b>Assets</b>	<b>Assets</b>	
Cash	Cash	Cash	
Securities <b>-\$100</b>	Securities     \$100	Securities <b>-\$100</b>	Securities     \$100
Receivables     \$100	Receivables	<i>Net Receivables</i> \$100	<i>Net Receivables</i> <b>-\$100</b>
<b>Liabilities</b>	<b>Liabilities</b>	<b>Liabilities</b>	
Payables	Payables <b>\$100</b>	Payables	
Loans	Loans	Loans	

This netting is allowed for all regular-way proprietary trades by broker-dealers, even when the offsetting transactions are with different counterparties, involve different Treasury securities, or involve a mix of Treasury securities and other securities. Thus, under GAAP accounting rules, balance sheet netting of cash trades by broker-dealers can occur regardless of whether they are centrally cleared or not. Expanding central clearing would not have an impact on broker-dealers ability to net these trades or on their TLE calculations.<sup>12</sup>

### Repo Market Transactions

While broker-dealers are able to net purchases and sales of Treasury securities under quite general circumstances, the same is not true for repo transactions. Repo or reverse repo transaction do not meet the requirements for sale accounting treatment, because in the view of FASB a repo or reverse repo transaction does not satisfy the requirement that the transferor relinquish effective control of the asset. From ASC 860-10-55-51B:

*If a financial asset is transferred under a contemporaneous agreement with the same counterparty to repurchase or redeem it before its maturity at a fixed repurchase price or a price equal to the sale price plus or minus a lender's return and the agreement requires the transferee to settle the agreement in cash, the agreement does not maintain the transferor's effective control over the transferred financial assets.*

For this reason, repo transactions are accounted for as secured borrowing rather than under sale accounting. As secured borrowing under GAAP, in a repo transaction when a bank receives cash in exchange for Treasury securities, the bank's balance sheet would reflect a corresponding

<sup>12</sup>940-320-45 does not apply to DIs, only to brokers, and thus central clearing could allow for greater netting of cash trading within a DI. However, most cash trading of Treasury securities takes place within the broker-dealer. The SEC's central clearing rule will require clearing of any cash trades conducted on interdealer broker platforms, where DIs play almost no role.



receivable for the securities due to them. In a reverse repo transaction in which a bank lends cash to a counterparty in exchange for Treasury securities, the securities pledged to the bank are not recognized on the bank’s balance sheet; instead, the balance sheet reflects the loan of cash as an asset and the return the securities to the other counterparty as a liability.

**Figure 3:** Examples of Repo and Reverse Repo Transaction Accounting

	<b>Securities Lender (transferor)</b>	<b>Securities Borrower (transferee)</b>
<b>Assets</b>		
Cash	\$100	-\$100
Securities		
Receivables		\$100
<b>Liabilities</b>		
Payables		
Loans	\$100	

In this case, because these transactions create a new payable and receivable the overall effect on balance sheet size is affected. For example, for a dealer that intermediates with different counterparties on the reverse repo and repo sides, an activity commonly known as “repo matched book,” its assets and liabilities are “grossed up,” therefore increasing TLE (Figure 3).<sup>13</sup> If the dealer’s balance sheet equity in dollars stays constant, then the equity position relative to TLE decreases as the balance sheet grows with repo matched book activity, making the SLR more binding.

Under the rules set out by the Federal Reserve, offsetting repo and reverse repo transactions can be netted for the purpose of the SLR only if they are with the same counterparty, have the same explicit final settlement date, have legally enforceable offset rights, and are settled on the same settlement system.<sup>14</sup> To the extent that an institution engaging in repo has offsetting repo and reverse repo trades with the same counterparty, central clearing would not necessarily offer any additional netting benefits, but central clearing would offer such benefits if the offsetting trades were with *different* counterparties, because these trades could be netted if they were novated to a CCP. Therefore, the reduction in TLE from centrally clearing repo transactions, and its effect on BHCs SLR ratios, *could* be meaningful.

*SEC’s rule on central clearing of Treasury Securities*

At present, Fixed Income Clearing Corporation (FICC) is the only central clearing agency for

<sup>13</sup>In standard repo contracts, while the cash lender does not have effective control over the security pledged as collateral, they can use the security to either post as collateral to raise funds from another counterparty (a process known as rehypothecation) or sell directly resulting in a short sale.

<sup>14</sup>12 C.F.R. §217.10 (2023). See Appendix A for details.

U.S. Treasury securities, and only cash and repo transactions that are between two members of the FICC are required to be centrally cleared under FICC’s rules. The SEC adopted new rules to expand central clearing in the Treasury market in December 2023, which will go into effect in late 2025 and mid-2026. The new rules require all repo and reverse repo transactions between a FICC member and any other participant to be centrally cleared. As we will show in Section 3, this change will expand central clearing significantly in the repo market.

### 3 Empirical Methodology

Our analysis focuses on data at the BHC level because the SLR calculations relevant for dealer activity are at the BHC level. Even though primary dealers account for much of the repo activity, other subsidiaries of BHCs also engage in repo market activity. In our data, dealers account for roughly  $\frac{2}{3}$  of all of the repo and reverse repo activity while other affiliates of the BHC account for the remaining  $\frac{1}{3}$ . In addition, as we will discuss in greater detail later, a fairly substantial volume of dealer trades are with other BHC affiliates, and it is important to measure this in order to understand the impacts that expanded central clearing could have on BHC TLE. Specifically, at the BHC level, a repo transaction between the dealer and another affiliate would not count in the calculation of TLE because it is an *internal transaction* even though, at the dealer level, it would be recorded in the Government Securities Dealers Reports (FR 2004). We focus on the activity of the 9 largest GSIBs that are active in U.S. Treasury repo markets, at the BHC level for domestic GSIBs and at the intermediate holding company (IHC) level for foreign GSIBs—the BHC counterpart of the U.S. subsidiary of large foreign banks, which, to simplify the exposition, we shall also refer to as BHCs.<sup>15</sup> According to FR 2004, the dealer subsidiaries of these 9 large GSIBs account for 70% of all primary dealer Treasury repo and reverse repo transactions, suggesting that these 9 GSIBs account for the majority of Treasury repo activity in the United States

In order to form a full picture of repo activity at the BHC level, we combine detailed transactions and positions data across repo-market segments. We break down the market into three segments:<sup>16</sup>

- FICC DvP and GCF repo
- Triparty repo (excluding-GCF repo)
- Noncentrally-cleared bilateral repo (NCCB)

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<sup>15</sup>The GSIBs in our sample are Bank of America, Barclays, Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, JP Morgan, Morgan Stanley, and Wells Fargo.

<sup>16</sup>For more a more detailed overview of repo and securities lending markets in the United States see Adrian et al. (2013) and Baklanova et al. (2015).

The FICC DvP and GCF segments are both centrally cleared by FICC. All eligible trades between FICC members are cleared through either the FICC DvP or GCF services. FICC also allows non-clearing members such as money market funds and hedge funds to participate indirectly via a sponsor in these services.<sup>17</sup> The DvP service clears specific issue (SI) repo trades, meaning that the repo contract is based on a specific Treasury security to be used as collateral. The GCF service is much smaller than DvP and clears general collateral (GC) repo trades, meaning that cash borrowers have the flexibility to post any Treasury security within a set class as collateral.<sup>18</sup> Larger US dealers typically lend to foreign or smaller domestic dealers in GCF.

Outside of FICC, repo trades are not centrally cleared—they are individually cleared between the two counterparties to the trade instead. The triparty repo segment involves GC repo trading that is individually cleared but settled on Bank of New York Mellon’s triparty settlement system. The NCCB segment involves trades that are bilaterally cleared and settled between the counterparties to the trade.

For the FICC GCF, FICC DvP, and triparty repo segments, we have access to direct transactions data with information on each counterparty to a trade, which we are able to link to the GSIB BHC by mapping activity observed for any affiliates of each BHC. Transactions data from FICC were available through the repo data collection of the Office of Financial Research (OFR). Data on triparty transactions were available through the Federal Reserve’s supervisory collection of repo data settled on the triparty system from Bank of New York Mellon. There is currently no similar transactions-level data available for repo activity in the NCCB segment, although the OFR has recently conducted a pilot survey of such data for three trading days and has issued rulemaking that will make collection of such data permanent. Instead, we used supervisory data from the Federal Reserve’s FR2052 (5G) data collection. That collection requires GSIB affiliates to report outstanding repo positions on a daily basis, separated by maturity. These data are further broken out between positions held with other BHC affiliates and positions with external counterparties, which is important for our analysis. The 5G data does not always reliably break out positions by repo market segment; instead, we use the aggregated positions reported across the repo segments and our transactions-level data for the three other repo segments to impute the activity in the NCCB repo segment. Our period of analysis is between December 2019 to September 2023, and all data are at a daily frequency.

Coordinating across the different data sets was labor intensive, as in each we had to identify the fairly numerous sets of BHC affiliates active in each repo market segment and link their activity

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<sup>17</sup>FICC clearing members consist of a wide range of dealers, banks, large asset managers, and other larger institutions active in Treasury markets. For some businesses becoming a clearing member may be too costly or may be inconsistent with their governance, making sponsorship an effective way to allow non-clearing members to participate in this segment of the repo market.

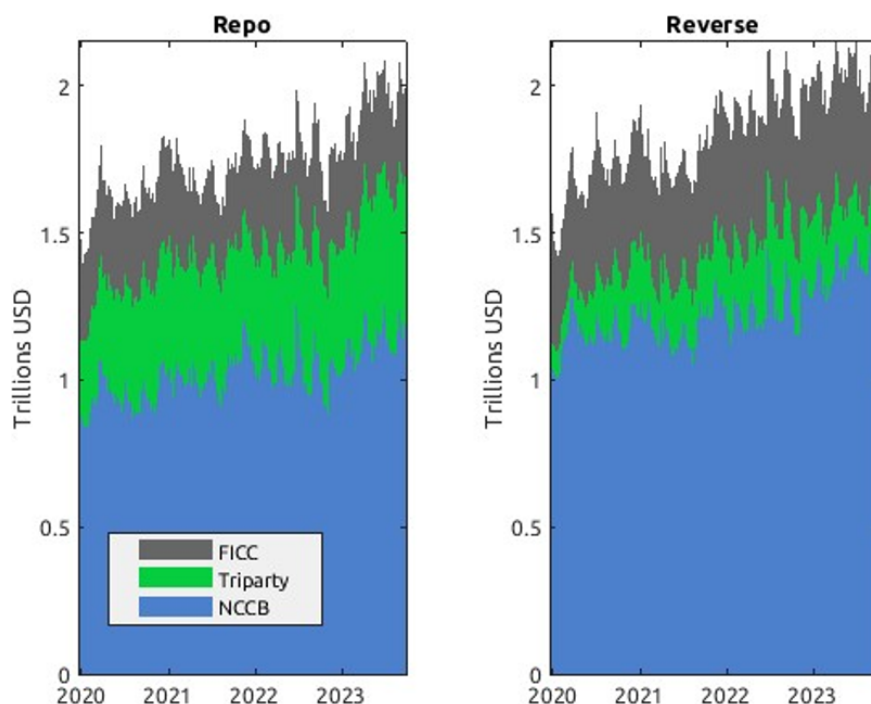
<sup>18</sup>In total across all participants GCF volumes tend to range between \$20-40 billion, which is a small portion of overall repo activity; amongst the firms in our sample, GCF activity is even lower because the GSIBs are less active than smaller and foreign dealers in this market segment.

across those segments. To our knowledge, this is the first paper to use this exact method, and it allows us to present a different picture of repo-market activity in the United States.

Figure 4 presents a picture of GSIB repo activity across these four market segments based on our data. The triparty repo market is an important funding market where cash lenders such as money market funds provide repo funding to large, creditworthy dealers. As shown, the GSIBs borrow more cash through repo than they lend through reverse repo in this segment. The NCCB segment is the largest source of both repo and reverse repo activity. In this market, large dealers provide funding and distribute securities to leveraged asset managers. This market allows investors to take on levered long and short positions and is particularly important for relative value hedge funds which take large positions in government securities markets. The FICC DvP segment is also sizeable. Many of the same market participants active in NCCB are also active in the DvP segment, and for these participants, trading can move fluidly between the two segments.

**Figure 4:** GSIB Repo Activity by Market Segment:

This figure plots the total repo and reverse repo volumes for the 9 GSIBs broken out by FICC, Triparty, and NCCB segments over the sample period.



Overall, the centrally cleared transactions (the FICC DvP and FICC GCF segments) comprise less than  $\frac{1}{3}$  of all repo or reverse repo transactions by the GSIBs. Thus, it would appear at first glance that expanding central clearing might have appreciable impacts on TLE for these institutions. We turn in the next section to consider whether this is really the case.

## 4 Analysis of the Impact of Expanded Treasury Repo Central Clearing

While the \$1.5–1.7 trillion of noncentrally cleared repo and reverse repo transactions is appreciably larger than the volume of transactions that are currently centrally cleared, that does not necessarily mean that aggregate TLE would decline by that amount under an expansion of central clearing. To analyze the impact on GSIB TLEs, we have to apply the accounting and regulatory rules set out in Section 2 in order to understand (a) the current treatment of those transactions outside of central clearing and (b) how their treatment would change if they were centrally cleared. We first discuss the centrally-cleared transactions that cannot be netted (subsection 4.1), then turn to bilaterally-cleared transactions that are netted even though they are not centrally cleared (subsection 4.2). We then focus on the six U.S. GSIBs in our sample that are subject to the more stringent eSLR, estimating the potential effect of expanded central clearing and showing that the increase in balance sheet netting is modest (subsection 4.3). We then show empirical results indicating that these U.S. GSIBs increase the amount of netting when their balance sheet costs are high, indicative of their desire to optimize the regulatory size of their balance sheet (subsection 4.4).

### 4.1 Transactions That Would Not be Netted Within Central Clearing

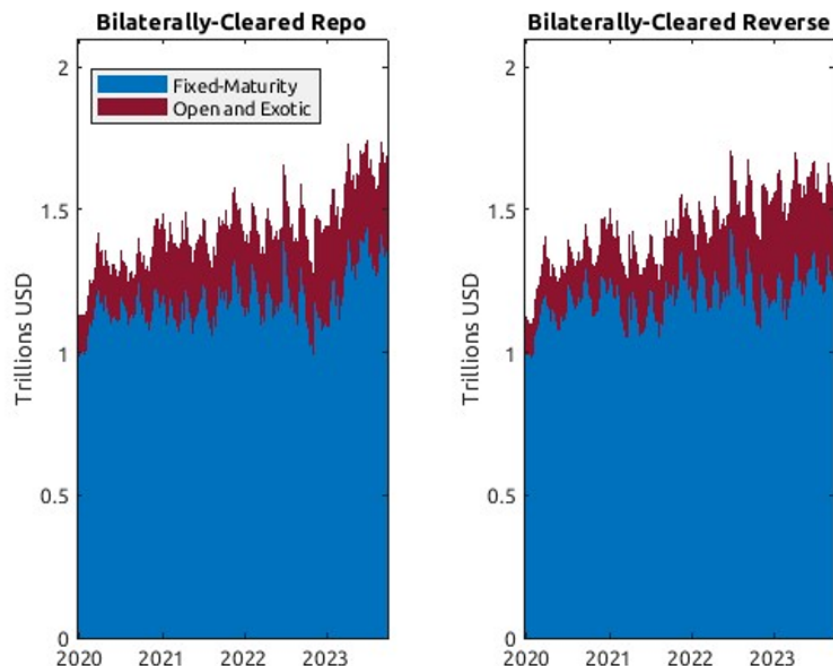
While a repo and reverse repo transaction entered into by a dealer or other affiliate that were both centrally cleared with FICC would involve the same counterparty and would be settled on a net basis, the repo and reverse repo transactions must also have the same explicit maturity date in order to be netted in TLE calculations. Under the supervisory rules for netting repo transactions set out in Section 2, transactions that do not have a fixed maturity date or that do not have matching maturity dates cannot be netted for the purpose of calculating TLE. We cover each of these in turn.

#### *Transactions without Fixed Maturity Dates*

While most repo transactions do have a set, specific, maturity date, not all trades do. Open repo transactions (in which the repo agreement is automatically rolled over to the next day unless one of the two counterparties ends the agreement), evergreen transactions (similar to open transactions, but involving a set notice period greater than one day to end the agreement), and option-embedded transactions that give one or both counterparties the option to terminate the agreement after some period of time, are all used in the triparty and NCCB market segments. These transactions do not meet the requirement of having an explicit maturity date and cannot be netted under the regulatory rules for calculating TLE, even if these transactions were centrally cleared.

For the GSIBs in our analysis, Figure 5 shows that the amounts of open, evergreen, and option-embedded (exotic) repo transactions taking place in the triparty and NCCB repo segments are not

**Figure 5:** Maturity Type in Bilaterally-cleared Repo and Reverse Repo Transactions: These figures plot the total volume of triparty and NCCB repo and reverse repo for the 9 GSIBs by maturity type. Open, evergreen, and option-imbedded repo and reverse repo volumes are in red, and fixed-maturity repo and reverse repo volumes are in blue.



insubstantial. The volume of these trades has grown over time, representing roughly 20 percent of all transactions in these two segments over 2023.<sup>19</sup> It is also possible that these volumes will grow further, as participants seeking to continue to bilaterally clear overnight transactions that are regularly rolled over may choose to reposition these trades as open or exotic, thus falling outside of the SEC’s recent central clearing rule.

#### *Fixed-Term Transactions Without Offsetting Trades*

While fixed-term trades are both centrally cleared by FICC and potentially nettable for the purpose of TLE calculations, these repo and reverse repo positions must be offsetting and must have the same maturity in order to be netted. There are several reasons as to why these two requirements are not always met.

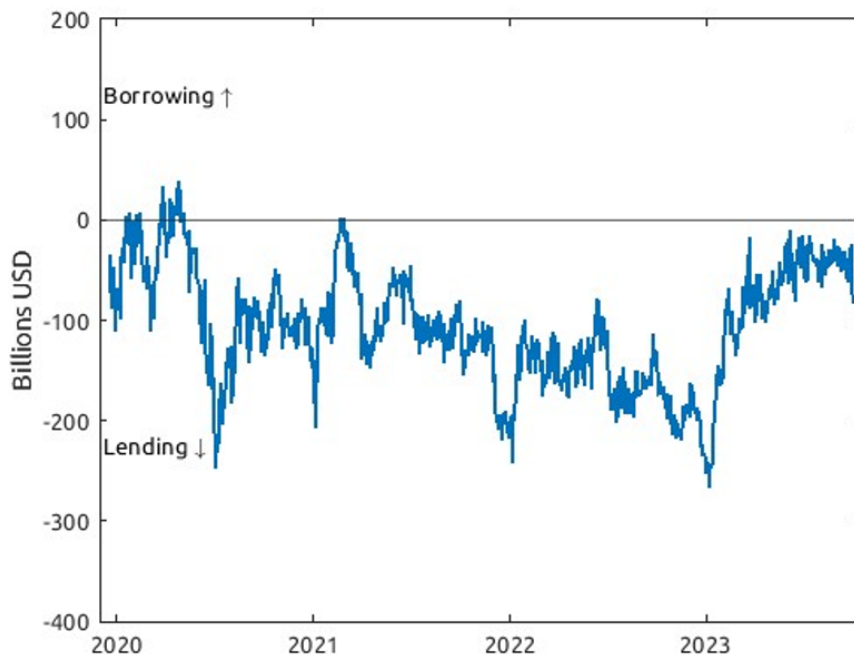
First, although different firms have different strategies, on average the GSIBs lend more cash in reverse repo than they borrow in repo. Thus, in aggregate, the GSIBs are net cash lenders in the

<sup>19</sup>This figure may be an underestimate, as we observe open positions in the 5G data but not evergreen or exotic repo positions, which are likely reported as term trades. Repo transactions that allow the cash lender the option to call after a fixed period of time, typically 7 days, are popular with some money market mutual funds in triparty because they allow the fund to ensure that its position can be counted as a sufficiently short-term investment.

Treasury repo market. As shown in Figure 6, in total, the GSIBs generally lend between \$100-\$200 billion of their own funds into the Treasury repo market and tend to lend more than that around year ends. These amounts cannot be netted because there is no offsetting repo transaction.

**Figure 6:** Net Cash Borrowing/Lending:

This figure plots the total amount of repo minus the total amount of reverse repo across the 9 GSIBs. Negative amounts mean that the GSIBs on aggregate are lending cash.

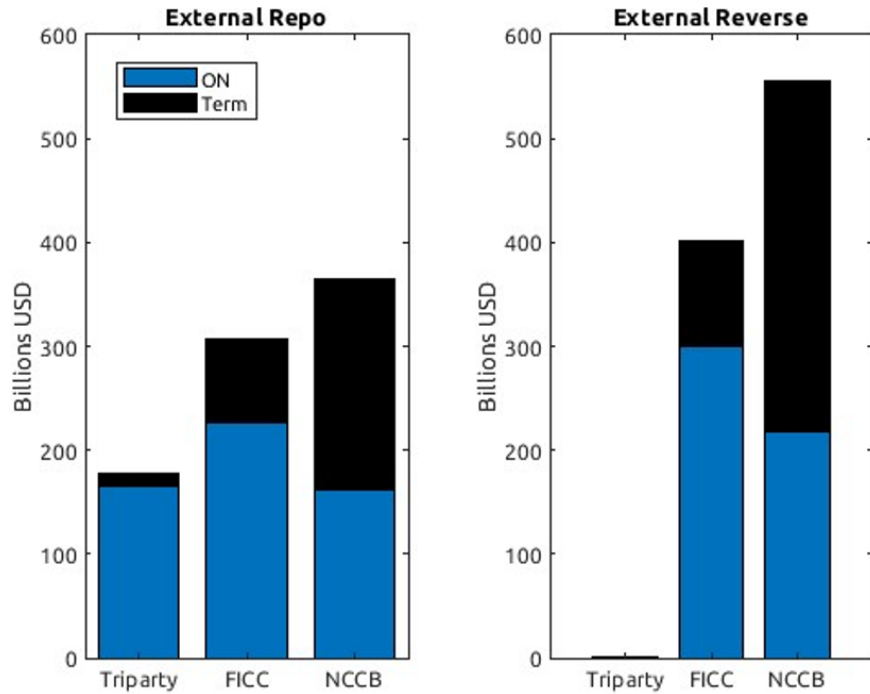


Second, apart from the own funds that they put into the Treasury repo market, the GSIBs also engage in some amount of maturity transformation as they intermediate between cash lenders and cash borrowers. Figure 7 breaks out the average dollar volumes of overnight and term activity excluding inter-affiliate transactions (which are discussed in the next section) across the three market segments. The maturity structure of activity is very different across the three segments: triparty activity is predominantly overnight, and the GSIBs borrow cash on net; the FICC segment has slightly higher proportions of term trading but overnight transactions still make up about  $\frac{3}{4}$  of all activity; and, in contrast, term trading makes up more than half of all activity in the NCCB segment and the GSIB firms lend much more than they borrow in NCCB. On aggregate, we calculate that GSIBs intermediate between overnight and term, on average borrowing about \$50 billion of funds in overnight repo that they then lend out in term repo (Figure 8). There is also a certain amount of activity that is involved in borrowing at one term maturity and lending in another. This type of activity built around maturity transformation also will not net, because the maturity of the repo and reverse repo transactions do not match.

Finally, even if aggregate repo and reverse repo volumes at each maturity across GSIBs were

**Figure 7:** Amount of Overnight and Term Repos:

This figure plots the amount of overnight and term repos broken down by segments for external repos (excluding trades with affiliates), summed across the 9 GSIBs. The amounts plotted are the average over the sample period.

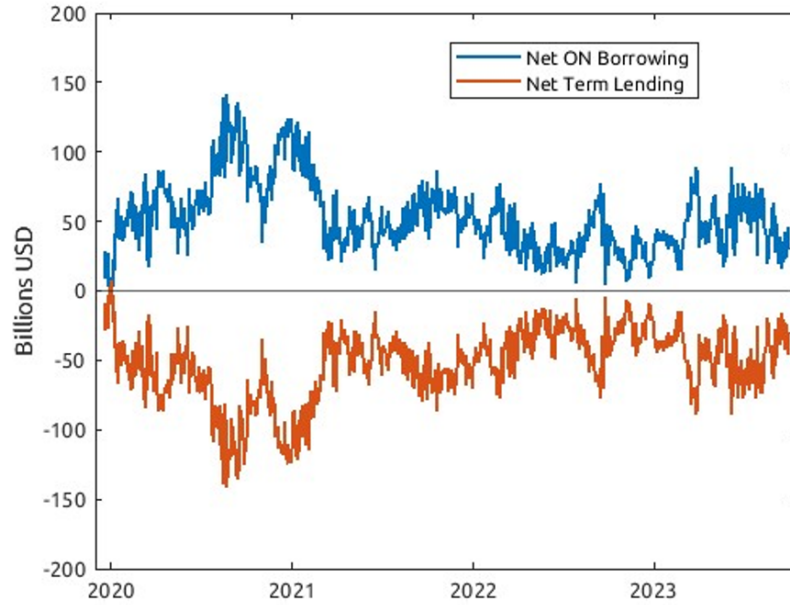


exactly equal, repo activity is not always matched within a GSIB. For example, if one GSIB engages in \$100 billion in repo activity and another engages in an equal amount of reverse repo, these amounts would not be nettable even though in aggregate there was no net lending or borrowing. Figure 9 graphs our calculation of the amount of mismatch, both across repo maturities and across GSIB activity. We find that on average a total of about \$100 billion of repo activity is not nettable for these two reasons.



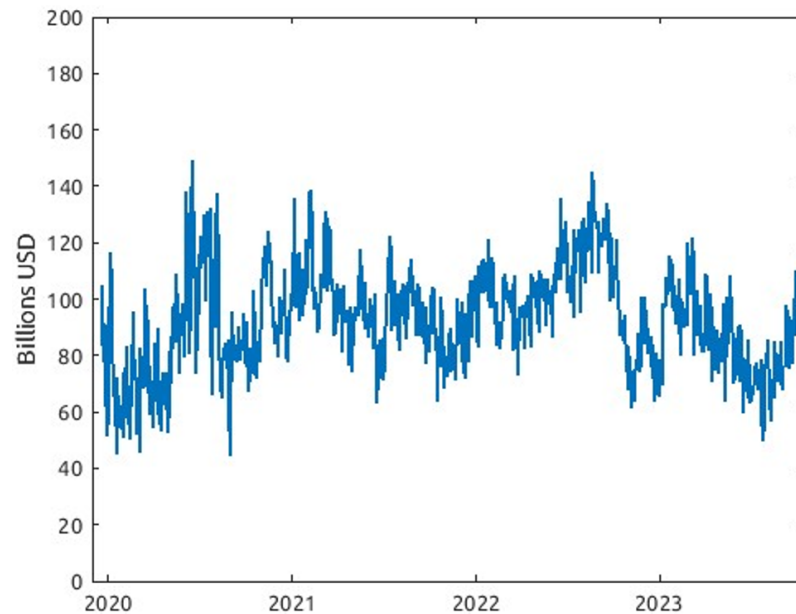
**Figure 8:** Maturity Transformation:

This figure plots the total amount of maturity transformation that GSIBs engage in. We first calculate the amount of net overnight borrowing that is lent out in term for each GSIB, and then sum across the firms. Blue line having positive values (and negative values for the orange line) indicate that GSIBs on average borrow overnight on net to lend in term. The two lines sum to zero by construction.



**Figure 9:** Total Volume of Mismatched Positions Across Maturities and GSIBs:

This figure plot the amount of repo volume that is not netted because of mismatch in maturities or GSIBs by subtracting the maturity-and-GSIB-matched volume from the minimum of total repo and total reverse repo.



## 4.2 Transactions That Are Already Netted Outside of Central Clearing

In addition to certain transactions that would not net even if centrally cleared, there are also transactions that can already be netted even though they are not centrally cleared.

### *Inter-affiliate Transactions*

As discussed in Section 2, dealers will be impacted by the SLR requirements placed on the BHC. At the BHC level, repo or reverse transactions only enter into TLE calculations if they are with an external counterparty—any trades between two affiliates will net out at the BHC level and thus are not relevant to the calculation of the BHC’s TLE.

One of the benefits of our methodology is that we can observe whether repo or reverse positions are with an affiliate and thus would be excluded from the calculation of the BHC’s TLE. As shown in Figure 10, affiliate trades are a fairly large component of activity in both the triparty and NCCB market segments.

In triparty, almost all reverse repo transactions by the GSIBs involves a trade between affiliates, which we label as “internal” trades. While dealers or other affiliates borrow substantial amounts of cash from non-affiliated counterparties in the triparty market, they rarely lend cash out externally. In the majority of cases although not always, internal trading in the triparty segment involves the dealer receiving cash from other affiliates. Dealers also use the NCCB market to trade with affiliates. In the NCCB segment, however, flows between dealer and non-dealer affiliates are more symmetric, with cash flowing in nearly equal proportions in both directions. While there is also some internal trading in FICC (recall that any trades between FICC members must be centrally cleared at FICC, and in some cases BHC depository institutions have separate memberships at FICC in addition to the dealer memberships), most internal trades take place in the triparty and NCCB segments.

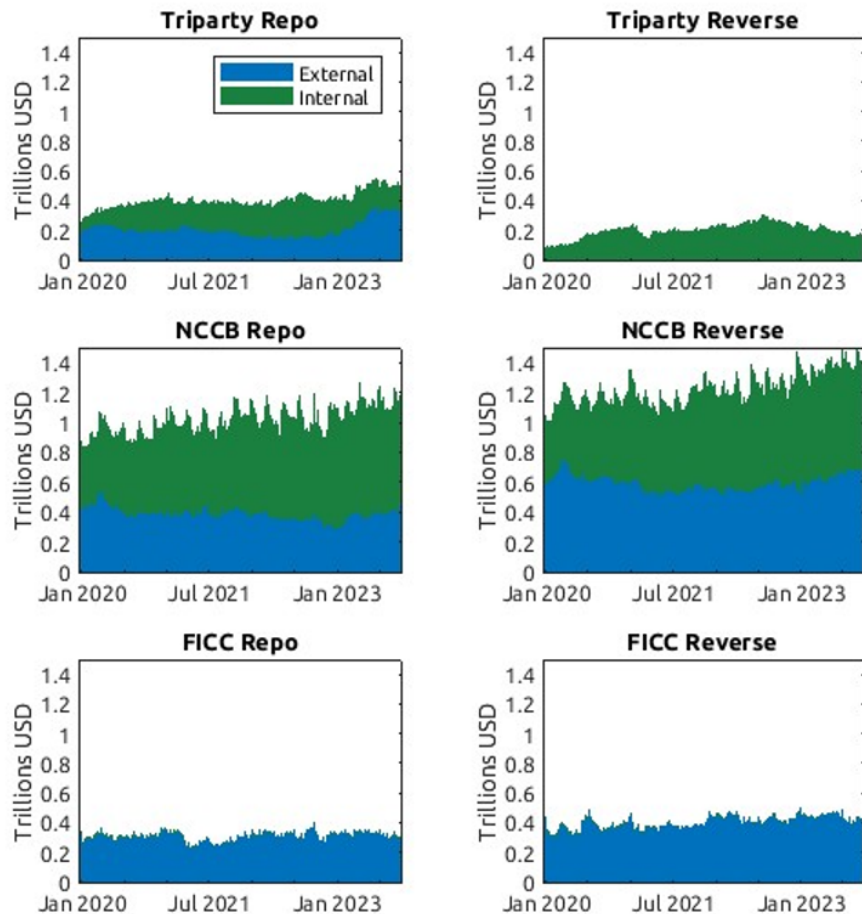
These data show the sizable volume of cash and collateral move between different subsidiaries of the BHC through repo markets, underscoring that observing dealer activity alone significantly overstates the balance sheet impact of these transaction at the BHC level.

### *Matched Transactions with External Counterparties*

The accounting and regulatory rules set out in Section 2 do not require that repo transactions be centrally cleared in order to be netted in calculation of the leverage ratio. As set out in the Federal Reserve Board’s rules for the SLR, repo transactions can be offset with reverse repo transactions as long as they are settled on a net basis with the same counterparty and have the same maturity date. And, in fact, it is well known that in the NCCB repo segment dealers often structure transactions with clients so that they meet these requirements. For example, a dealer may receive

**Figure 10:** Internal and External Activity by Market Segment:

The following graphs plot the volume of aggregate internal and external repo and reverse repos by market segments. Internal transactions, in green, are trades between affiliates of the same GSIB. External transactions, in blue, are trades with non-affiliated counterparties.



certain Treasury securities and in turn provide other Treasury securities to a relative-value hedge fund, and the dealer is incentivized to structure these trades so that they meet the regulatory requirements for netting.

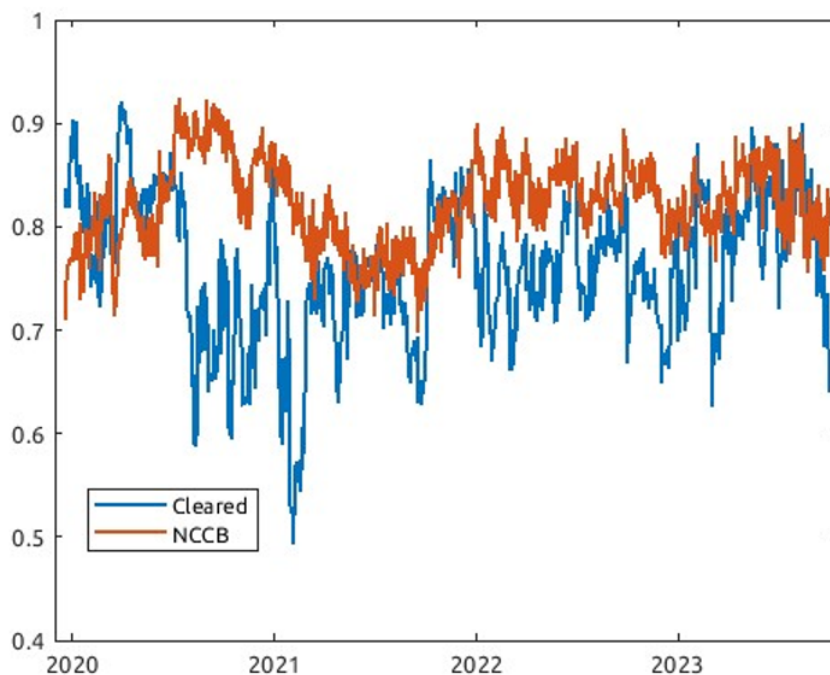
While it has long been known that dealers sought to structure their NCCB transactions to net where possible, a precise picture of how much netting occurred was not available until a recent pilot study of NCCB activity by the Office of Financial Research (OFR). The OFR study collected transactions-level data, including data on counterparties where available, on all NCCB transactions from nine dealers over three days in June 2022 (Hempel et al., 2023). The participants in the survey represented a range of both domestic and foreign dealers. The study found that roughly 55 percent of dealer NCCB repo activity (or 40 percent of reverse repo) were netted packages, in which a dealer conducted both repo and reverse repo transactions with the same maturities and with the same

counterparty. The OFR pilot therefore indicates that substantial proportions of NCCB activity are already netted outside of central clearing, thereby minimizing the impact of transactions on the dealer’s TLE.

We do not have external counterparty information in our data on NCCB activity, but we do have information on the maturity structure of these positions. Figure 11 graphs our estimates of the “matching efficiency” of term NCCB repo activity, defined as the maturity-matched term NCCB repo summed across GSIBs divided by the minimum of sum of term NCCB repo across GSIBs and the sum of term NCCB reverse repo. We compare this measure to the similarly-calculated matching efficiency for to centrally cleared term trades in FICC. We find that in aggregate the matching efficiency in NCCB is actually higher than in centrally cleared trading, which we take as indirect evidence that firms are indeed seeking to maximize their netting opportunities within NCCB as otherwise there would be relatively little incentive to match repo and reverse repo maturities so closely.

**Figure 11:** Term Matching Efficiencies:

This graph plots the matching efficiencies for term FICC and NCCB repos and reverse repos. The cleared term matching efficiency, in blue, is calculated as the BHC-and-maturity-matched amount of term FICC repos divided by the lower of term FICC repos and reverse repos. We use repo and reverse repo volumes summed across the 9 GSIBs for this calculation. The red line is the counterpart for the NCCB term repos.



To more formally test whether the structure of NCCB trading appears to be optimized in order to net, in Table 1, we test whether matching efficiencies for NCCB trades are correlated with those

for FICC trades. We run the following regression:

$$NCCBeff_{i,t} = \alpha + \beta FICCe_{i,t} + \epsilon_{i,t}, \quad (1)$$

**Table 1:** Relationship between NCCB matching efficiency and FICC netting efficiency. The following table presents the results for regression (1).

	NCCBeff		
	(1)	(2)	(3)
FICCe <sub>eff</sub>	0.266*** (0.037)	0.076* (0.042)	0.098** (0.048)
Constant	0.556*** (0.035)	0.810*** (0.037)	0.691*** (0.044)
entity f.e.	No	Yes	Yes
date f.e.	No	No	Yes
Observations	8,475	8,475	8,475
R <sup>2</sup>	0.027	0.534	0.586

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01  
Driscoll-Kraay standard errors

where  $FICCe_{eff}(i,t)$  is defined as the amount of maturity-matched FICC repo—i.e, the amount of netted repo in FICC—divided by the smaller of FICC repo and reverse repo for BHC  $i$  on day  $t$ , and  $NCCBe_{eff}(i,t)$  is defined as the amount of maturity-matched NCCB repo over the smaller of NCCB repo and reverse repo for BHC  $i$  on day  $t$ . The results in Table 1 show that there is a positive correlation between NCCB trade matching efficiencies and cleared market netting efficiencies, both across GSIBs and over time. This positive correlation suggest that similar factors drive both the cleared market netting efficiencies and the NCCB matching efficiencies, indicating that NCCB matching are likely driven by incentives to net.

### 4.3 Implications for the Impact of Expanding Central Clearing on TLE

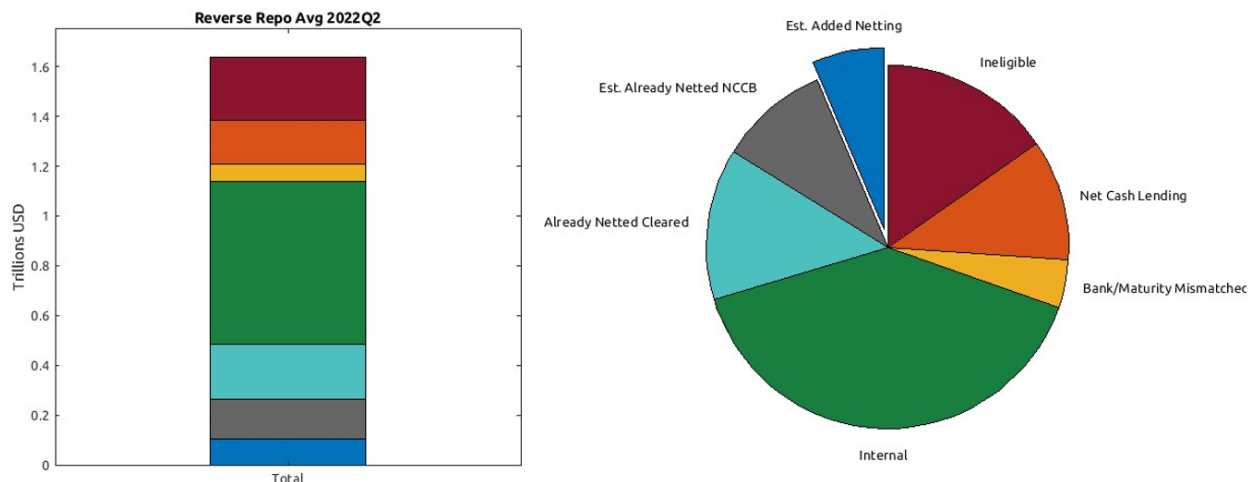
Each of the points discussed in sections 4.1 and 4.2 have implications for the impact that expanding central clearing of Treasury repo transactions would be expected to have on GSIBs SLR constraints. In this section, we estimate the extent to which each factor would reduce the impact on the eSLR for the 6 U.S. GSIBs in our sample. A number of the areas we have highlighted partially intersect with each other to some extent—for example, some internal trades between affiliates are open rather than fixed-term—thus, our decomposition is not unique, but the end result, that there would be a

limited impact on aggregate TLE, is invariant to this decomposition.

Figure 12 demonstrates the impact of each factor using the data for 2022:Q2, the quarter in which the OFR took its sample of NCCB activity. During that quarter, the U.S. GSIB BHCs that are subject to the eSLR have an outstanding reverse repo of \$1.6 trillion on an average day. Of that amount, only \$356 billion was centrally cleared by FICC. However, while the majority of transactions were not centrally cleared, a relatively small proportion of those trades would impact BHC TLE if central clearing were expanded. First, \$236 billion (14 percent of all trades) of these transactions do not have fixed, explicit maturity dates and thus are not eligible for netting or for clearing by FICC (the dark red areas). Of the remaining trades, a substantial portion (\$652 billion or 40 percent of all trades) are affiliated trades internal to the BHCs (dark green) and thus would not enter into BHC calculations of TLE. And about \$245 billion (15 percent) are not matched at the BHC level, either because they represent cash lending through reverse repo trades that is not matched by cash borrowing (in orange) or the trades are mismatched by maturity or are across GSIBs (in yellow) and would not net even if centrally cleared. Of the cleared trades, \$220 billion are already netted and, based on the analysis in the OFR pilot study, we estimate that \$160 billion of NCCB trades (in grey), or 10 percent, would be already netted. Taking account of each of these factors, we estimate that, of the \$1.6 trillion of trades outside of central clearing, only the dark blue area at about \$104 billion—or 6 percent—would be additionally netted from TLE calculations if all repo transactions were centrally cleared.

**Figure 12:** Decomposition of US GSIB Aggregate Reverse Repo Positions:

The bar chart and pie chart below show the decomposition of aggregate reverse repo positions for the 6 US GSIBs. The amounts plotted use the average over the second quarter of 2022. The estimated amount of NCCB netting (gray area) uses the share of NCCB repo netted from Hempel et al. (2023).



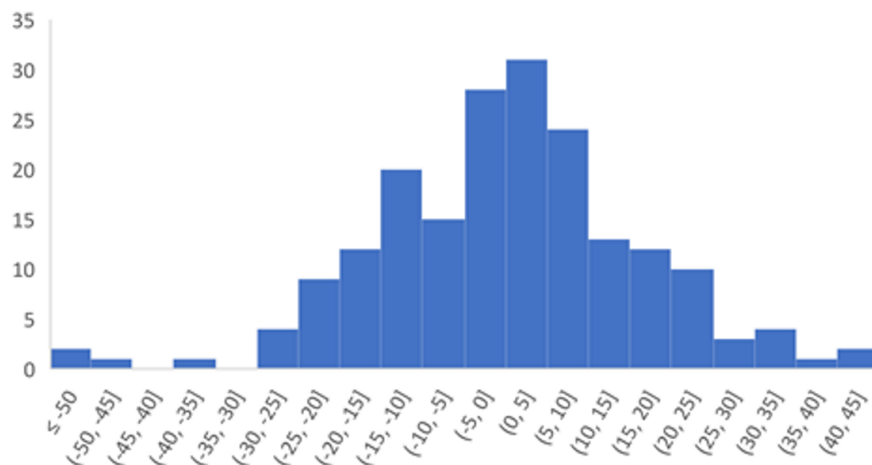
Of course, \$104 billion is still a nontrivial sum, but this aggregate figure needs to be apportioned

across each of the 6 US GSIBs, and therefore on average amounts to \$17 billion per BHC. Given the size of these holding companies, these amounts will have relatively little impact on the BHC’s eSLR ratio. For each of these six firms, the additional netting under expanded central clearing would have lowered their eSLR values by less than 10 basis points, which is roughly equal to one-half of the standard deviation of quarterly movements in eSLR ratios between 2015 and 2023.<sup>20</sup> As shown in Figure 13, movements of similar size occur roughly half the time; in other words, the added netting benefits would have been indistinguishable from any other typical quarterly movements in the data.

We focus on the US GSIBs in this subsection because foreign GSIBs are not subject to the more stringent eSLR rule and because we do not observe a large share of foreign GSIB activities, which may be more relevant for these firms’ overall regulatory compliance. Using only the U.S. IHC data, we find somewhat higher impacts on the ratios for the foreign GSIBs.

**Figure 13:** Quarterly Variation in US GSIB eSLR Ratios, 2015-2023:

We plot the distribution of quarter-to-quarter change in the eSLR ratio, in bps, for the 6 US GSIBs. Sample period is from 2015 to 2023 but excludes 2020Q2 and 2021Q2, the dates in which SLR relief was started and was pulled back, respectively.



#### 4.4 Incentives to Net

So far, we have concentrated on estimating the degree to which expanded central clearing may increase the amount of balance sheet netting. Our analysis suggests that the increase in balance sheet netting from expanded central clearing is relatively small when compared to GSIBs overall repo participation and TLE.

One of the key reasons for this finding is that that these firms appear to already be optimizing in order to minimize much of their balance sheet costs. To test this hypothesis, we exploit quarter-

<sup>20</sup>Our calculations of the standard deviation omit changes in the second quarter of 2020, when the Federal Reserve enacted temporary relief to the eSLR, and the second quarter of 2021, when that relief expired.

end dates and the share of the nonnettable portion of U.S. GSIBs repo book as proxies for changes to their balance sheet costs. Prior literature has documented GSIBs’ incentives to change their activities around quarter-end regulatory reporting dates to “window dress” the size and composition of their balance sheet, which can be viewed as an exogenous change in balance sheet costs (e.g., Munyan, 2017). These incentives are particularly large for balance-sheet intensive activities that can be adjusted quickly, such as Treasury repo. Thus, we would expect GSIBs to have higher incentives to net during quarter ends. In addition, because GSIBs have very little triparty reverse repo positions (Figure 8), GSIBs, for the most part, cannot net their triparty repo positions. Therefore, a GSIB with a larger triparty repo as a share of its total repo position would have higher incentives to net the rest of their repo and reverse repo positions.

To get at both of these incentives to net, we estimate the impacts of quarter-ends and the relative share of a GSIB’s triparty repo book on the amount of netting in the centrally cleared segment of the repo markets via the following regression:

$$\begin{aligned}
 FICCEff_{i,t} = & \alpha_i + \beta_1 1(NearQtrEnd_t) + \beta_2 TriRepoShare_{i,t} + \beta_3 SLRexempt_t \\
 & + \beta_4 TriRepoShare_{i,t} \times SLRexempt_t + \epsilon_{i,t}
 \end{aligned} \tag{2}$$

where  $FICCEff(i, t)$  is the matching efficiency for BHC  $i$  on day  $t$  in FICC segment, measured as maturity-matched amount divided by the minimum between FICC repo and reverse repo.  $1(NearQtrEnd_t)$  is an indicator variable that is equal to one on five days surrounding the quarter-end date,  $TriRepoShare_{i,t}$  is the triparty repo volume over total repo volume for BHC  $i$  on day  $t$ . We also include  $SLRexempt_t$  as an indicator variable that is equal to one during the period in which reserves and Treasury positions were exempted from SLR calculations (April 1, 2020 to March 31, 2021) to capture changes in the regulatory environment that may change incentives to intermediate repo.

This regression captures BHCs’ higher incentives to net during quarter-end dates and when they have larger triparty repo share. Results in Table 2 suggest that BHCs net cleared repo more during those times, which indicates that BHCs optimize netting, especially when their balance sheet costs are higher.



**Table 2:** Sensitivity of U.S. GSIBs FICC matching efficiency to balance sheet costs. The following table presents the results from regression (2).

	FICCe <sub>eff</sub>				
	(1)	(2)	(3)	(4)	(5)
NearQtrEnd	0.010*** (0.003)	0.010*** (0.003)			0.010** (0.005)
TriRepoShare			0.041** (0.018)	0.062*** (0.022)	0.062*** (0.022)
SLRexempt				0.003 (0.007)	0.003 (0.007)
TriRepoShare:SLRexempt				-0.062* (0.034)	-0.062* (0.034)
Constant	0.916*** (0.012)	0.804*** (0.049)	0.894*** (0.007)	0.892*** (0.007)	0.891*** (0.007)
entity f.e.	Yes	No	Yes	Yes	Yes
entity times mnth f.e.	No	Yes	No	No	No
Observations	5,656	5,656	5,656	5,656	5,656
R <sup>2</sup>	0.475	0.838	0.442	0.443	0.444

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Driscoll-Kraay standard errors

These results, together with the ones in previous subsections, suggest that even though the overall balance sheet netting relief via expanded central clearing is modest, much of this is because these firms are already optimizing by taking advantage of netting opportunities both within central clearing and outside of it.

## 5 Conclusion

We have linked together a number of different data sets to form a unique view of Treasury repo market activity and have combined this with a detailed analysis of the underlying accounting and regulatory rules to determine the extent to which expanded central clearing would reduce the impact of the eSLR. Although the SEC's recent rulemaking expanding central clearing may have a number of benefits, we find that it may have only relatively modest impacts in reducing GSIB eSLRs. While the SEC rule could double the amount of Treasury repo activity that is centrally

cleared, a substantial amount of the activity that will be brought into central clearing is already structured so as to be netted under the accounting and regulatory rules, and a nontrivial amount is not structured to be nettable even if it is brought into central clearing. Of course, there are a number of caveats to our analysis: while the average benefit may be modest, there may be marginal benefits to netting efficiency that are important when balance sheet costs are high; and BHCs may be able to restructure trading activity to take advantage of central clearing, for example by moving more trades to overnight rather than term repo activity so that trades with different counterparties can be more readily netted. Importantly, central clearing can have other benefits, including subjecting Treasury repo activity to uniform margining regime. Hempel et al. (2023) found that a significant portion of NCCB activity with hedge funds is currently conducted without margin. While Hempel et al. (2023) find that much of this activity is netted on a portfolio basis, a CCP’s margining framework would likely be more rigorous than individually-negotiated margining agreements between dealers and their clients.<sup>21</sup> These benefits will need to be balanced against the potential costs, including a larger systemic footprint of the CCP and the risk that larger firms will have a competitive advantage in offering central clearing services to their clients, raising market concentration.

## Appendix

### A Accounting Rules

#### Cash Market Transactions

The FASB sets out standards in ASC 860-10-40-5 under which transfers of financial assets can be accounted for under “sale accounting”:

- a. The transferred financial assets have been isolated from the transferor—put presumptively beyond the reach of the transferor and its creditors, even in bankruptcy or other receivership.
- b. Each transferee has the right to pledge or exchange the assets (or beneficial interests) it received, with no condition that constrains the transferee (or third-party holder of its beneficial interests) from taking advantage of its right to pledge or exchange.
- c. The transferor does not maintain effective control over the transferred financial assets or third-party beneficial interests related to those transferred assets.

#### Netting of Repo Transactions for calculating the SLR

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<sup>21</sup>To the extent that dealers continue to post their own funds as margin on behalf of their clients in central clearing (as is often the case currently) the CCP’s margining regime may have little impact on client leverage.

The Federal Reserve has set out conditions under which matching repo and reverse repo transactions can be netted for the purposes of calculating the SLR/eSLR:<sup>22</sup>

- v. Where a Board-regulated institution acting as a principal has more than one repo-style transaction with the same counterparty and has offset the gross value of receivables due from a counterparty under reverse repurchase transactions by the gross value of payables under repurchase transactions due to the same counterparty, the gross value of receivables associated with the repo-style transactions less any on-balance sheet receivables amount associated with these repo-style transactions included under paragraph (c)(2)(i) of this section, unless the following criteria are met:
  - A) The offsetting transactions have the same explicit final settlement date under their governing agreements;
  - B) The right to offset the amount owed to the counterparty with the amount owed by the counterparty is legally enforceable in the normal course of business and in the event of receivership, insolvency, liquidation, or similar
  - C) Under the governing agreements, the counterparties intend to settle net, settle simultaneously, or settle according to a process that is the functional equivalent of net settlement, (that is, the cash flows of the transactions are equivalent, in effect, to a single net amount on the settlement date), where both transactions are settled through the same settlement system, the settlement arrangements are supported by cash or intraday credit facilities intended to ensure that settlement of both transactions will occur by the end of the business day, and the settlement of the underlying securities does not interfere with the net cash settlement;

## **B Results using Alternative Subset of GSIBs**

In the paper, we mostly present results for the nine GSIBs, three of which are IHCs of foreign GSIBs. As a robustness check for Table 1, we show results here using six US GSIBs.

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<sup>22</sup>12 C.F.R. §217.10 (2023)

**Table B.1:** Relationship between NCCB matching efficiency and FICC netting efficiency for US GSIBs. The following table is similar to Table 1 but uses six US GSIBs.

	NCCBeff		
	(1)	(2)	(3)
FICCe	0.554*** (0.045)	0.155*** (0.045)	0.183*** (0.056)
Constant	0.342*** (0.042)	0.739*** (0.042)	0.624*** (0.051)
entity f.e.	No	Yes	Yes
date f.e.	No	No	Yes
Observations	5,656	5,656	5,656
R <sup>2</sup>	0.199	0.484	0.560

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Driscoll-Kraay standard errors

The results in Table 2 are for the six U.S. GSIBs that are subject to the eSLR. For completeness, this table reports the results for the nine GSIBs in our original sample.

**Table B.2:** Sensitivity of GSIBs FICC matching efficiency to balance sheet costs. The following table is similar to Table 2 but uses all nine GSIBs.

	FICCe <sub>eff</sub>				
	(1)	(2)	(3)	(4)	(5)
NearQtrEnd	0.022*** (0.003)	0.022*** (0.003)			0.027*** (0.004)
TriRepoShare			0.037* (0.020)	0.057*** (0.021)	0.059*** (0.021)
SLRexempt				0.023*** (0.007)	0.023*** (0.007)
TriRepoShare:SLRexempt				-0.128*** (0.034)	-0.128*** (0.034)
Constant	0.916*** (0.009)	0.801*** (0.048)	0.894*** (0.007)	0.889*** (0.007)	0.887*** (0.007)
entity f.e.	Yes	No	Yes	Yes	Yes
entity times mnth f.e.	No	Yes	No	No	No
Observations	8,475	8,475	8,475	8,475	8,475
R <sup>2</sup>	0.417	0.726	0.393	0.402	0.405

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01  
Driscoll-Kraay standard errors

## References

- Adrian, T., Begalle, B., Copeland, A. and Martin, A. (2013), Repo and securities lending, *in* ‘Risk topography: Systemic risk and macro modeling’, University of Chicago Press, pp. 131–148.
- Baklanova, V., Copeland, A. M. and McCaughrin, R. (2015), ‘Reference guide to US repo and securities lending markets’, *FRB of New York Staff Report* (740).
- Committee on the Global Financial System (2017), ‘Repo market functioning’.  
**URL:** <https://www.bis.org/publ/cgfs59.pdf>
- Duffie, D. (2020), ‘Still the world’s safe haven?’, *Redesigning the US Treasury Market After the COVID-19 Crisis. Hutchins Center Working Paper* (62).
- Duffie, D. and Krishnamurthy, A. (2016), *Passthrough efficiency in the Fed’s new monetary policy setting*.
- Egelhof, J., Martin, A. and Zinsmeister, N. (2017), ‘Regulatory incentives and quarter-end dynamics in the repo market’.
- Favara, G., Infante, S. and Rezende, M. (2022), ‘Leverage regulations and treasury market participation: Evidence from credit line drawdowns’, *Available at SSRN* **4175429**.
- Group of Thirty Working Group on Treasury Market Liquidity (2021), ‘U.S. treasury markets: Steps toward increased resilience. group of thirty’.  
**URL:** <https://group30.org/publications/detail/4950>
- He, Z., Nagel, S. and Song, Z. (2022), ‘Treasury inconvenience yields during the COVID-19 crisis’, *Journal of Financial Economics* **143**(1), 57–79.
- Hempel, S. J., Kahn, R. J., Mann, R. and Paddrik, M. E. (2023), ‘Why is so much repo not centrally cleared?’, *Office of Financial Research Brief Series* (23-01).
- Hubbard, G., Kohn, D., Goodman, L., Judge, K., Koijen, R., Masters, B., O’Connor, S. and Stein, K. (2021), ‘Task force on financial stability’, *Brookings Institution and University of Chicago Booth School of Business* .
- Kotidis, A. and Van Horen, N. (2018), ‘Repo market functioning: The role of capital regulation’.
- Liang, N. and Parkinson, P. (2020), ‘Enhancing liquidity of the US treasury market under stress’, *Hutchins Center Working Paper* (62).
- Munyan, B. (2017), ‘Regulatory arbitrage in repo markets’, *Office of Financial Research Working Paper* (15-22).