Clearing Markets and Client Clearing Services*

Salil Gadgil†
Robin L. Lumsdaine‡
Mark Paddrik⋆

August 29, 2025

Abstract

This paper examines the economics of client clearing in the wake of central clearing expansion–most recently to U.S. Treasuries–which accounts for the majority of risk managed in centrally cleared markets today. Using confidential transaction-level data from the credit default swap market, we show that client clearing improves netting efficiency for member dealers and generates pricing advantages for clients. Clearing adoption leads clients to broaden their dealer networks and reduce counterparty concentration, thereby enhancing market access and competition. Clearing agents—member firms that facilitate client access to central counterparties—gain through client retention and strengthened bargaining power. These relationships are highly concentrated, however, which may create operational fragilities under stress.

Keywords: Central Clearing, Client Intermediation, Counterparty Risk, Market Structure, Clearing Agents

JEL Classification Numbers: G23,G28,L14

*We would like to thank Mark Carey and Sriram Rajan as well as seminar participants at the Office of Financial Research, for comments and suggestions. Any errors are our own. Views and opinions expressed are those of the authors and do not necessarily represent official positions or policy of the OFR, the U.S. Department of the Treasury, or any of the other institutions with which the authors are affiliated.

†Office of Financial Research, U.S. Department of the Treasury; email: Salil.Gadgil@ofr.treasury.gov.

‡Kogod School of Business, American University; Econometric Institute, Erasmus University Rotterdam; Advisory Scientific Committee, European Systemic Risk Board; National Bureau of Economic Research; Tinbergen Institute; Center for Financial Stability; email: Robin.Lumsdaine@american.edu.

⋆Office of Financial Research, U.S. Department of the Treasury; email: Mark.Paddrik@ofr.treasury.gov.

Conflict-of-interest disclosure statement

Salil Gadgil
To preserve data confidentiality, the Office of Financial Research and the Depository Trust Clearing Corporation had the right to review the manuscript prior to submission. I have no other potential conflicts to disclose.

Robin Lumsdaine
To preserve data confidentiality, the Office of Financial Research and the Depository Trust Clearing Corporation had the right to review the manuscript prior to submission. I have no other potential conflicts to disclose.

Mark Paddrik
To preserve data confidentiality, the Office of Financial Research and the Depository Trust Clearing Corporation had the right to review the manuscript prior to submission. I have no other potential conflicts to disclose.

1 Introduction

The expansion of central counterparty (CCP) clearing following the 2007–2009 financial crisis represents a foundational shift in the architecture of global financial markets. CCPs eliminate complex networks of bilateral exposures by interposing themselves between the buyer and seller of traded contracts. In doing so, they aim to reduce counterparty risk and enhance market transparency. These benefits come with tradeoffs, however, as CCPs impose stringent collateral requirements on traders and themselves become concentrated sources of risk. A growing body of research has examined the behavior of clearing members—typically large dealer banks—highlighting how clearing affects their individual risk-taking incentives, capital efficiency, and contributions to systemic risk (e.g., Biais et al., 2016; Boissel et al., 2017). Appreciably less is known about how the growth of clearing has impacted non-member clients, who can only access CCPs indirectly through intermediating members (Menkveld and Vuillemey, 2021).

The comparative lack of work on clients is notable, given that their incentives and constraints differ meaningfully from those of direct clearing members. The use of CCPs enables the latter group to obtain relief from capital requirements and minimize margin demands through multilateral netting (e.g., Benos et al., 2024; Kubitza et al., 2024). Clients do not reap such benefits, but they must still bear the costs of clearing, including intermediary fees and collateral deposits. Their clearing decisions instead reflect a trade-off shaped by regulatory mandates, counterparty risk considerations, and the value of expanded market access. Understanding the mechanisms governing client behavior is important, as non-members have historically been catalysts of CCP failures (see, e.g., Bignon and Vuillemey, 2020). The risks posed by clients have become especially pronounced in recent years because clients now account for a large share of cleared activity. According to data from the Commodity Futures Trading Commission (CFTC), clients were responsible for 73% of margin posted at the largest U.S. and European CCPs as of January 2025.

In this paper, we examine the economic drivers of client clearing and its implications for market structure and stability. Using confidential data on credit default swaps (CDS) from The Depository Trust & Clearing Corporation (DTCC), we leverage both mandatorily cleared index contracts and voluntarily cleared single-name contracts to study why clients adopt clearing and how doing so affects their interactions with dealer banks. We show that central clearing improves

netting efficiency for dealers and is accordingly associated with more favorable pricing for clients. Non-members that adopt clearing expand their dealer networks and reduce counterparty concentration, consistent with enhanced competition. Nonetheless, clients' reliance on clearing agents to access CCPs introduces new sources of friction. These agent relationships are concentrated and persistent, driven by prior trading activity and agent credit quality. The intermediation structure creates operational dependencies, as clients face impaired access to the CCP when clearing agents experience distress.

Though the analysis centers on CDS, our findings have implications for a broad array of markets. Other classes of derivatives, including interest rate swaps, have been subject to the same set of regulatory reforms and now share similar market structures. Our results are especially timely given the ongoing dialogue regarding the mandatory clearing of U.S. Treasury cash and repurchase agreement transactions. Much of the debate has focused on how various regulatory proposals will affect the industrial organization and resilience of these markets. Our work helps inform such discussion by shedding light on the intermediation frictions and systemic implications that come from the expansion of central clearing.

The first portion of the paper examines the incentives to clear. Prior studies have shown that central clearing promotes margin efficiency by facilitating the netting of offsetting positions, but that this benefit may be limited in settings with partial uptake (Duffie and Zhu, 2011; Duffie et al., 2015). Much of the work is theoretical in nature or reliant on static position snapshots, so we begin by combining position and transaction data to determine if central clearing improves netting. Consistent with clearing reducing margin demand, dealers that clear a greater share of their single-name transactions have lower gross exposures relative to trading volumes for these reference entities. The efficiency gains appear to be passed on to clients through more favorable pricing, as cleared trades tend to receive better terms than those that are uncleared.

Despite the pricing advantages, not all clients adopt clearing. Following the implementation of collateral reforms that make uncleared transactions costlier, many non-members opt to stop trading single-name CDS entirely rather than incur the fixed costs required to use CCPs. We show that clients with the most trading activity and those holding index contracts subject to clearing mandates were the most likely to stay in the market and embrace voluntary clearing. Even among

this set of clients, however, an appreciable share of single-name transactions remain uncleared. The limited uptake allows us to further explore the incentives to clear. We find that on a trade-level basis, counterparty credit risk and margin considerations are the primary drivers of clearing. Our work extends that of Eisfeldt et al. (2023) and Du et al. (2024), who show that clients actively manage counterparty risk in uncleared markets through dealer selection.

The second part of the paper investigates how the growth of clearing affects market structure. The theoretical literature suggests that the use of CCPs may enhance dealer competition by, for example, reducing barriers to entry for new market makers (e.g., Carapella and Monnet, 2020). Extant empirical studies provide only indirect support for this hypothesis using bid-ask spreads and often rely on periods in which the adoption of clearing closely coincides with mandates requiring the use of swap execution facilities (SEFs), electronic platforms through which clients simultaneously request quotes from multiple dealers (e.g., Loon and Zhong, 2016). In contrast, our data allow us to directly observe the actions of individual market participants and we consider a setting without SEFs. We find no evidence that clearing leads to dealer entry in the aggregate, but we establish that clients expand their set of relationships with existing dealers and reduce counterparty concentration once they begin to clear. Our results offer nuanced support for the notion that clearing fosters competition in OTC derivatives markets.

To our knowledge, we are also the first to explore how the provision of client clearing services affects dealers' market making activities. Though the adoption of CCPs adversely impacts the intermediation shares of some dealers, our findings reveal that they are able to preserve trading relationships by acting as clearing agents for clients. We show that clients tend to route a greater portion of transaction volume through dealers affiliated with their chosen clearing agents. The ability to maintain or grow market share by providing clearing services thus offers dealers a strategic incentive to absorb the regulatory and operational costs associated with acting as an agent. Moreover, these relationship effects create cross-selling opportunities and enhance dealers' pricing power, as clients receive worse pricing terms on contracts for which the transacting dealer also acts as a clearing agent.

Finally, the paper examines several important frictions in client clearing that arise from constraints related to CCP member selection. Clients must access central clearing through a limited

set of member firms acting as agents and the resulting concentration of client exposure can become a point of fragility. During the 2022 London Metal Exchange (LME) nickel market turmoil, for example, the distress of several clearing members due to concentrated client losses nearly triggered defaults (Heilbron, 2024). Despite the importance of agent selection, little is known about the relationship formation process. We first document that while the largest traders enlist the services of many CCP members, the modal client has only a single clearing agent. We then show that member relationships are persistent and that clients typically select agents affiliated with dealers they frequently trade with. Larger clients that engage multiple agents are also mindful of counterparty risk, choosing members with better credit quality.

Reliance on a small number of clearing agents presents tradeoffs for clients. Concentrating portfolios with fewer members improves margin efficiency because it facilitates the netting of offsetting positions. Doing so also introduces vulnerabilities given the frictions impeding relationship formation, as disruption at a single clearing member may impair a client's ability to access the CCP. Consistent with this hypothesis, we show that the amount of client margin handled by Credit Suisse decreased sharply when the former investment bank encountered financial distress due to the unexpected collapse of the family office Archegos Capital Management. The reduction did not stem simply from clients porting their positions to other clearing agents. Clients heavily reliant on Credit Suisse for clearing services ended up with smaller cleared positions than their peers who used other CCP members. This effect, which we demonstrate is not explained by heterogeneity in client demand, is less pronounced for clients with many member relationships. Our findings highlight a key friction in client clearing: while agents facilitate CCP access, they also create concentrated operational dependencies that can undermine market resilience during periods of stress. More generally, our results underscore the need to consider not only the benefits of central clearing but also the fragility introduced by the structure of client-agent relationships (e.g., Paddrik et al., 2020; Paddrik and Young, 2021; Ghamami et al., 2023).

The remainder of the paper is organized as follows. Section 2 provides background on the structure of central and client clearing, with a particular focus on the evolution of client clearing in the CDS market. Section 3 describes the transaction and position data used in the analysis and presents key summary statistics. Sections 4 and 5 together address the two main aspects of client

clearing that we highlight in this paper, namely the incentives to clear and the strategic role of clearing agents. Section 6 concludes.

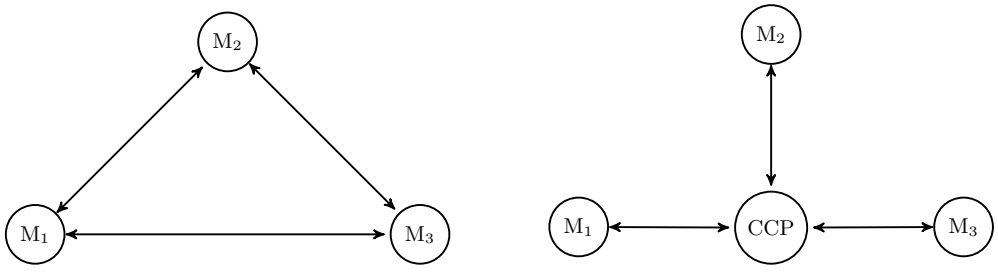
2 Background

Central clearing has become a cornerstone of post-crisis reform, particularly in over-the-counter derivatives markets. This section outlines the structure and key benefits of central clearing, with a focus on its risk-reducing and efficiency-enhancing features. It then discusses client clearing, where non-members access CCPs through intermediating members, introducing distinct frictions and constraints. The section concludes with a review of the evolution of CDS clearing, emphasizing regulatory milestones—such as clearing mandates and margin rules—that have shaped dealer and client participation. These topics provide essential context for the analysis that follows.

2.1 Central Clearing

In a centrally cleared transaction, a CCP legally intermediates between the buyer and seller, assuming the counterparty exposure of both sides. This structure replaces a web of bilateral exposures with a hub-and-spoke model, enabling multilateral netting of positions and more efficient collateral use (see Figure 1). By concentrating risk management within a single, regulated entity, central clearing has the ability to reduce counterparty credit risk, enhance transparency, and facilitate standardized margining and default management protocols.

Figure 1: Diagram of Clearing Models



(a) Bilateral Clearing **(b)** Central Clearing

Note: This figure compares a bilateral client clearing model (a) to the central clearing hub-and-spoke structure (b). The role of the CCP is to help facilitate trading and mitigate clients' counterparty risk.
Source: Authors' creation.

Access to central clearing is generally limited to a subset of financial institutions, referred

to as *clearing members*, that meet the stringent capital, operational, and risk management requirements set by the CCP. These members are typically large dealer banks that play a key role in market intermediation, in part because the advantages of central clearing are most pronounced for firms engaged in substantial trading activity. Clearing allows such institutions to multilaterally net offsetting trades across counterparties, which reduces gross exposures and lowers both margin requirements and regulatory capital charges. Moreover, it can enhance their credibility and intermediation capacity in the market by reducing counterparty risk and enabling access to a broader set of trading partners within a standardized risk management framework.

2.2 Client Clearing

Non-member clearing market participants such as asset managers, hedge funds, and smaller dealers are known as *clients*. They typically do not meet the stringent requirements for direct CCP membership and must instead access central clearing indirectly through client clearing arrangements. In these arrangements, a clearing member acts as an agent on the client's behalf, submitting trades to the CCP and managing associated obligations. This setup allows clients to benefit from the protections and efficiencies of central clearing, such as reduced counterparty risk and standardized risk management, without assuming the full operational and financial responsibilities of CCP membership. However, it also introduces important frictions: clients must negotiate terms of access, margining, and collateral management with their clearing agents, and often rely heavily on a small number of intermediaries for continued market participation.

Clearing member dealers that offer client clearing services often are believed to do so as part of a broader intermediation strategy aimed at retaining client flow and consolidating market share in centrally cleared markets. These services also complement other dealer functions—including execution, collateral transformation, and financing—and serve as a strategic tool for shaping liquidity dynamics and market structure in cleared environments. Although client clearing entails operational and capital costs, it enables members to meet regulatory requirements while preserving trading relationships that might otherwise fragment under clearing mandates.

When clearing is not mandated, these forces are not necessarily easy to disentangle, as both parties have distinct incentives and require mutual consent. Dealers benefit from netting efficiencies

and regulatory capital relief when more trades are cleared, giving them reason to steer clients toward CCPs. Clients, in contrast, must weigh the collateral efficiencies and counterparty risk benefits of clearing against the costs of establishing and maintaining clearing relationships.

Understanding which party drives the decision to clear is particularly important because it shapes how clients gain access to central clearing in practice. The most common and traditional access model members offer clients is the *agency* model, in which the clearing member submits trades to the CCP on behalf of the client and bears legal responsibility for the client's obligations, including margin payments and default procedures. A variation is the *principal model*, where the clearing member enters into back-to-back trades with both the client and the CCP. This structure often involves omnibus accounts that pool multiple clients' positions, which may reduce margins costs but weaken legal protections for individual clients.

In recent years, alternative models have emerged to address some of the limitations inherent in traditional setups (CPMI-IOSCO, 2021). The *sponsored access model*, for example, enables large clients to face the CCP directly while a sponsoring clearing member provides credit backing and oversight. This arrangement reduces the client's operational reliance on the clearing agent and may enhance efficiency, though the sponsor remains liable in the event of client default. Each of these models presents trade-offs in terms of operational complexity, cost, transparency, and counterparty risk. Crucially, the choice of access model shapes client behavior, dealer competition, and broader market resilience—particularly as regulatory reforms continue to expand central clearing mandates across asset classes.

Understanding these structures is particularly important given the historical and ongoing role clients play in CCP risk. Client defaults were central to the first documented failure of a CCP—Caisse de Liquidation des Affaires en Marchandises (CLAM) in Paris in 1974—when the CCP's largest clearing member collapsed after being unable to absorb losses from a large and concentrated group of unsophisticated retail clients who defaulted (Bignon and Vuillemey, 2020). Although modern CCPs employ concentration margins to help mitigate such risks, they generally do not account for correlated exposures across clearing members (see, Lopez et al., 2017; Menkveld, 2017; Huang et al., 2021). As recently as March 2022, extreme volatility in the nickel market on the London Metal Exchange (LME) triggered a short squeeze that caused substantial losses

among a concentrated group of clients clearing through multiple members—nearly resulting in the default of eight clearing members (Heilbron, 2024). These episodes underscore the importance of understanding how client clearing arrangements can both mitigate and concentrate risk within the clearing system.

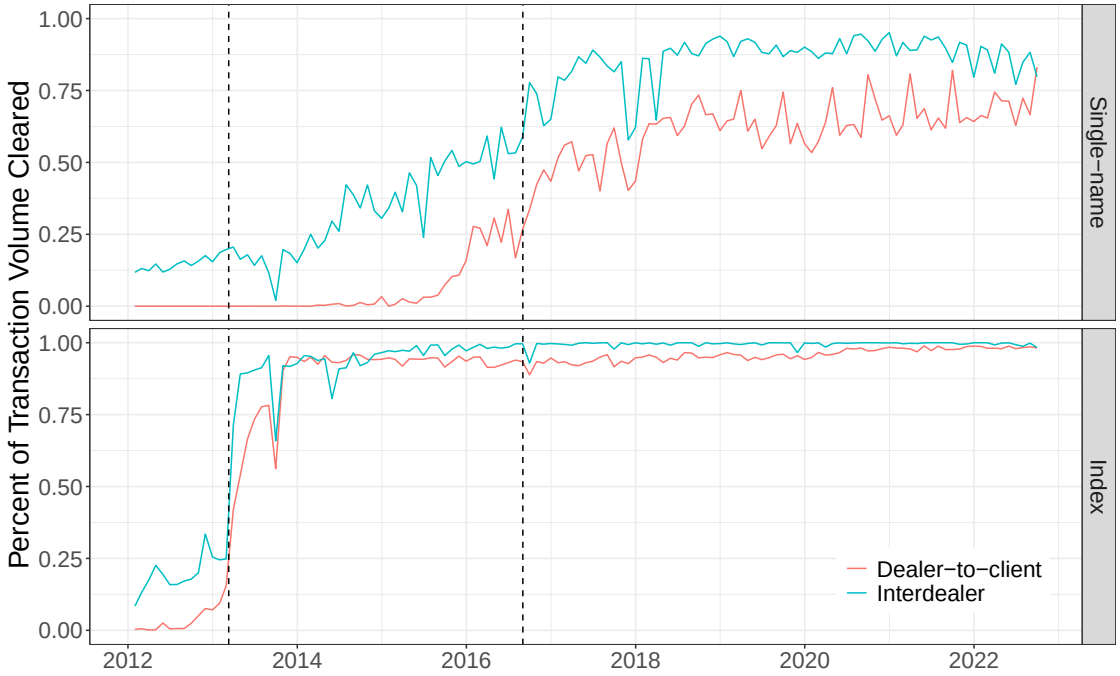
2.3 Credit Default Swap Clearing

Prior to the 2007–09 financial crisis, CDS were traded bilaterally in dealer-intermediated over-the-counter markets. To mitigate counterparty risk inherent in such arrangements, market participants historically exchanged a combination of initial margin, posted at trade inception and held throughout the contract term, and variation margin, which adjusts in response to market valuations. Collateral terms on uncleared swaps exhibited considerable heterogeneity across counterparties. Dealers seldom exchanged initial margin with one another, while clients frequently posted initial margin unilaterally to dealers.

The launch of ICE Clear Credit in 2009, the first CCP for CDS in North America, enabled voluntary clearing by dealers and clients. Specifically, ICE Clear Credit members can allow client's access to clearing service through an agency clearing model. Demand for central clearing accelerated following two key regulatory interventions. The first was the 2010 Dodd–Frank Act, which mandated central clearing of major index CDS and interest rate swaps. Clearing requirements took effect for large participants on March 11, 2013, and for smaller firms beginning June 10, 2013. As shown in the bottom panel of Figure 2, which plots the share of centrally cleared volume over time, the mandate resulted in near-universal clearing of index swaps.

The implementation of the Uncleared Margin Rules (UMR), developed jointly by the Basel Committee on Banking Supervision (BCBS) and the International Organization of Securities Commissions (IOSCO), marked a second major turning point in the adoption of central clearing. Initiated in September 2016, the early phases of UMR required the largest trading entities to exchange initial and variation margin on their uncleared swap exposures, with subsequent phases extending coverage to a broader set of market participants. Prior to UMR, bilaterally negotiated margin arrangements were generally more favorable to clients than the standardized collateral requirements imposed by CCPs (Rennison, 2015). As shown in the top panel of Figure 2, this disparity con-

Figure 2: Rate of CDS Central Clearing



Note: This figure shows the proportion of trades cleared for both single-name CDS (top panel) and index CDS (bottom panel). The vertical dashed lines indicate the start of mandated central clearing for major index CDS and interest rate swaps on March 11, 2013 and the implementation of the Uncleared Margin Rules (UMR) on September 1, 2016. In each panel, the top (blue) line represents dealer-to-dealer trades and the bottom (red) line dealer-to-client trades.
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

strained voluntary clearing of single-name CDS by clients before 2016. The introduction of UMR increased the costs of uncleared trading, thereby spurring broader adoption of clearing.

Figure 2 also shows that interdealer trades consistently exhibit higher clearing rates than dealer-to–client transactions, both before and after regulatory intervention. This pattern likely reflects dealers' efforts to reduce capital charges and collateral requirements via multilateral netting. The persistence of uncleared trading following the implementation of UMR suggests that CCPs remain prohibitively costly for some clients and that others selectively clear only a subset of their trades.

We exploit this heterogeneity in clearing behavior, permitted by the voluntary nature of single-name CDS clearing, to analyze the incentives shaping both member and client actions in Section 4. Specifically, we assess how netting efficiency, counterparty risk, and regulatory costs influence the clearing choices of both classes of market participants. Beyond the clearing decision itself, in Section 5 we examine dealers' strategic motivations for offering clearing services and the

implications of client choices regarding which trades to clear and which agents to engage.

3 Data and Summary Statistics

The confidential CDS data come from The Depository Trust & Clearing Corporation (DTCC). We observe all transactions for which (i) the underlying is a U.S.-domiciled corporation or North American index or (ii) at least one counterparty is a U.S.-based entity. To ensure data completeness, we restrict our analysis to new trades referencing individual U.S. corporates or the two benchmark North American corporate indices: CDX.NA.IG and CDX.NA.HY. The dataset includes detailed information on confirmed contract terms, and buyer and seller identities for every trade. Critically, we develop algorithms to match the buy and sell legs of centrally cleared transactions which allows us to identify the clearing agents used by both trading parties.[1] This will allow us to examine potential asymmetries stemming from whether a counterparty is a buyer or seller, or who provides clearing services.

The full sample spans from January 2010 through September 2022 and, as shown in Table 1, includes 1,340 reference entities. Approximately one-third of single-name and two-thirds of index reference entities are eligible for central clearing.[2] The sample includes 33 dealers, 16 of which are registered clearing members. Of these members, 12 serve as clearing agents, providing clearing services to clients. Though many of the 1,885 clients in the data are active in both the single-name and index markets, they are more likely to centrally clear index contracts than single-name CDS.

The transaction records are supplemented with weekly position data, also provided by DTCC. We observe all open contracts that meet conditions (i) or (ii) described above, as well as all positions facing ICE Clear Credit, the primary CCP for North American CDS. Reference entity information and daily indicative price quotes for both single-name and index contracts are sourced from S&P Global, which acquired IHS Markit in 2022. We use contract characteristics—maturity, seniority, and currency—to match end-of-day quotes to corresponding transactions. To mitigate the impact of potential reporting errors, we apply a filtering procedure similar to that of Du et al. (2024), excluding trades from the pricing analysis if the absolute difference between

[1] These procedures are described in detail in Appendix A.

[2] A reference entity is deemed eligible for clearing if it is associated with at least one cleared transaction; we assign the earliest such date as the clearing eligibility date.

Table 1: Reference Entity and Market Participant Counts

	Single-name	Index
Reference Entities		
All Entities	1,002	338
Eligible Entities	341	298
Market Participants		
Dealers	33	32
Clearing Members	16	16
Clearing Agents	12	15
Clients	1,289	1,479
Clearing Clients	291	944

Note: This table presents counts of the number of reference entities and market participants that appear in our sample. Of the 1,885 total clients, the table shows the number that trade single-name and/or index CDS (row labeled 'Clients') and the number that clear at least one such trade (row labeled 'Clearing Clients'). Clearing agents are clearing members who provide access to a CCP for their clients, enabling them to clear and settle trades.
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

the S&P end-of-day upfront points and the observed DTCC transaction upfront points exceeds the 97th percentile.

Summary statistics are reported in Table 2. To preserve confidentiality, we first compute equal-weighted averages of key variables—such as spreads, trading volume, and notional outstanding—across reference entities within each month, and then calculate summary statistics across months. The top row of the table indicates that, on average, nearly 360 single-name reference entities trade each month, compared to just 25 indices. Index contracts exhibit greater liquidity, as reflected in higher trade counts, transaction volumes, and notional amounts outstanding. While interdealer trades are more prevalent in the single-name segment, dealer-to-client transactions are more common in the index market. For both segments, notional outstanding is significantly larger for underlyings that are eligible or mandated for central clearing.

Table 3 summarizes the number of trading relationships across different types of market participants. The interdealer network is relatively small and concentrated, while dealers maintain significantly more connections with clients. In both the single-name and index segments, the average dealer transacts with only 17 other dealers but several hundred clients. The largest dealers are more likely to serve as clearing members, as evidenced by their higher counts of both dealer and client relationships. Nonetheless, clearing members act as agents for only a subset of their clearing clients—approximately 28% (= 41.40/146.92) in the single-name segment and 23% (=

Table 2: Trading Activity Statistics

	Single-name					Index				
	Mean	SD	Min	Median	Max	Mean	SD	Min	Median	Max
Number	359.12	111.45	219.00	331.00	642.00	24.70	5.33	16.00	23.00	48.00
Spread	217.05	101.29	114.99	197.05	986.97	175.80	77.65	102.54	148.36	589.89
# Trades										
Interdealer	22.63	10.35	7.05	20.12	48.10	116.99	51.91	13.06	103.89	392.05
Dealer-Client	12.47	3.85	5.34	11.69	26.60	356.09	216.62	44.32	315.31	1,159.43
Volume										
Interdealer	115.59	68.90	29.22	91.60	287.83	7,714.38	5,987.30	816.37	5,226.12	33,002.27
Dealer-Client	93.04	38.04	39.64	82.41	237.08	20,401.72	12,958.05	3,872.41	17,253.09	78,015.79
Gross Outstanding										
Eligible/Mandated	7.85	5.57	2.76	5.35	20.12	106.68	57.95	46.94	84.37	365.13
Ineligible	4.19	3.64	0.34	3.53	11.68	41.62	18.52	5.82	39.15	101.04
Net Outstanding										
Eligible/Mandated	1.53	0.54	1.02	1.26	2.94	33.66	12.51	19.19	29.13	98.07
Ineligible	0.73	0.45	0.17	0.63	1.99	19.93	9.90	2.20	19.32	41.68

Notes: The reported metrics are computed by first taking the equal-weighted average of the listed variable within each month, then calculating summary statistics across months. Only reference entities that trade in a given month are considered.
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

97.86/418.60) in the index segment.

Table 3: Trading Relationship Statistics

	Single-name			Index		
	Mean	Median	SD	Mean	Median	SD
Dealer Relationships						
# Dealers	17.15	16.00	9.03	17.19	17.00	8.74
# Clients	273.62	100.50	307.60	355.64	231.00	362.47
Clearing Member Relationships						
# Dealers	25.33	27.00	4.01	24.80	26.00	3.86
# Clients	436.00	507.00	283.02	566.47	656.00	319.23
# Clearing Clients	146.92	178.00	88.54	418.60	519.00	244.67
# Agented Clearing Clients	41.40	43.00	32.17	97.86	77.50	93.15
Client Relationships						
# Dealers	5.10	4.00	3.80	6.08	5.00	4.45
Clearing Client Relationships						
# Dealers	6.74	7.00	3.20	7.38	7.00	4.39
# Clearing Agents	1.52	1.00	1.00	1.73	1.00	1.17

Note: This table reports summary statistics on participants' trading relationships by their role in the clearing network. The statistics are based on all trades, whether cleared or uncleared. "Agented Clearing Clients" refers to the number of clearing clients for whom the member is a clearing agent.
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

In the single-name CDS market, clients trade with an average of five dealers, compared with six in the index market. Clients that centrally clear tend to maintain more dealer relationships, with just over half using at least seven dealers. Despite the breadth of trading partners, most clients rely on a single clearing agent. This tendency likely reflects the fixed costs of establishing clearing relationships and the margin benefits of concentrating clearing activity arising from greater netting efficiency. As a result, we find that 87% of cleared client trades are cleared through an agent that is unaffiliated with the client's executing dealer. Only the largest clients use multiple clearing agents, suggesting that they encounter position limitations at individual members and may seek to mitigate operational dependencies through diversification.

4 What are the Incentives to Clear?

In this section, we exploit the voluntary nature of single-name clearing to explore the incentives of both dealers and clients to centrally clear transactions. A potential advantage of clearing is that it promotes margin efficiency by enabling the netting of offsetting contracts (Duffie et al.,

2015; Onur et al., 2024). This benefit is likely to be more pronounced for dealers than for clients, because the former typically maintain large gross positions relative to their net exposure and face regulatory capital charges based on gross exposures (Kubitza et al., 2024). The partial uptake of single-name CDS clearing depicted in Figure 2 may curb the margin reductions available to dealers as well, however, by limiting their opportunities for multilateral netting (Duffie and Zhu, 2011). Evidence from Treausry repo markets similarly suggests collateral demands may be relatively unaffected by clearing, as dealers are adept at offsetting trades even without the full adoption of CCPs (Bowman et al., 2024).

A second purported benefit of clearing is that it mitigates counterparty credit risk. By entering contracts facing a well-capitalized CCP instead of a dealer, clients might lessen the likelihood that their counterparty will fail to meet its obligations. It follows that, like dealers (Bellia et al., 2024), clients may be more inclined to clear when their trading partner is riskier. Alternatively, the option to clear may render clients less sensitive to the credit quality of their trading partners (Du et al., 2019), as contracts may be cleared at a later date should a counterparty's credit deteriorate.

The expansion of clearing might also alter the network structure of intermediation. By mitigating counterparty risk, the use of CCPs could, for example, reduce barriers to entry for new market makers (Carapella and Monnet, 2020; Vuillemey, 2020). Incumbent dealers may be hesitant to embrace clearing if increased competition reduces their profits. Clients, in contrast, stand to benefit from the entry of new dealers as it could lead to lower transaction costs. Yet because the netting benefits of clearing accrue disproportionately to large dealers (Duffie et al., 2015), the broader use of CCPs may actually reinforce concentration. By reducing margin requirements for the most active market makers, clearing could enhance their capacity to intermediate and allow them to displace more peripheral dealers.

4.1 Does Client Clearing Provide Margin Benefits for Dealers?

We begin by formally testing whether central clearing enhances dealers' ability to net transactions. To this end, we restrict the sample to single-name underlyings eligible for clearing and

estimate panel regressions of the form:

$$\begin{aligned}\Delta\text{Gross Outstanding}_{d,r,t} =& \beta_1 \text{Transaction Volume}_{d,r,t} + \beta_2 \text{Cleared Share}_{d,r,t} + \\ & \beta_3 \text{Transaction Volume}_{d,r,t} \times \text{Cleared Share}_{d,r,t} + \alpha_{d,t} + \alpha_r + \epsilon_{d,r,t} \quad (1)\end{aligned}$$

where $\Delta\text{Gross Outstanding}_{d,r,t}$ denotes the change in gross notional outstanding for dealer d on reference entity r between weeks t and $t-1$, $\text{Transaction Volume}_{d,r,t}$ is the total notional volume traded by the dealer on a given reference entity in that week, $\text{Cleared Share}_{d,r,t}$ is the fraction of the transaction volume centrally cleared in that week, $\alpha_{d,t}$ is a dealer-week fixed effect, and α_r is a reference entity fixed effect. The gross outstanding and transaction volume measures are expressed in millions US dollars and winsorized at the 1- and 99-percent levels to limit the influence of data errors and outliers. Standard errors are clustered at the dealer-week level.

In the absence of netting, higher transaction volume should mechanically translate into higher gross notional outstanding, implying a positive β_1. If clearing indeed facilitates netting, then β_3 will be negative as higher rates of clearing should weaken the association between trading volume and gross outstanding. The inclusion of dealer-week fixed effects ensure that our coefficient estimates are not driven by heterogeneity in dealers' netting capabilities and clearing propensity. The reference entity fixed effects further control for characteristics of the underlying, such as liquidity, that may affect netting potential.

Results are presented in Table 4. Columns (1) and (3) confirm a positive association between transaction volume and changes in gross notional outstanding, as expected. The estimate in Column (3) implies that each dollar of traded notional volume results in more than four cents of additional gross exposure at the end of the week. Consistent with the netting hypothesis, the coefficient on the interaction between *Transaction Volume* and *Cleared Share* is negative and statistically significant. To our knowledge, these results provide the first direct evidence, based on transaction-level data, that central clearing enhances netting efficiency. Moreover, they allow us to quantify the magnitude of the effect. As shown in Column (4), an additional dollar of transaction volume translates to approximately six cents of gross notional when a dealer does not clear any trades on a given reference entity, compared to just three cents when it centrally clears all trades.

Table 4: Netting Incentives for Clearing

	(1)	(2)	(3)	(4)
Transaction Volume	0.039***	0.057***	0.043***	0.062***
	(0.004)	(0.007)	(0.003)	(0.007)
Cleared Share		0.030		−0.124
		(0.175)		(0.175)
Transaction Volume x Cleared Share		−0.031***		−0.033***
		(0.009)		(0.009)
Dealer x Week FE	Y	Y	Y	Y
Ref. Entity FE			Y	Y
Num. obs.	454,595	454,595	454,595	454,595
Adj. R^2	0.301	0.301	0.302	0.303

Note: Results from regressions of changes in gross notional outstanding on weekly transaction volume, share of transaction volume cleared, and the interaction of these two terms. All variables are computed at the dealer-week-reference entity level. The gross outstanding and transaction volume measures are expressed in millions and winsorized at the 1- and 99-percent levels to limit the influence of data errors and outliers. Standard errors are clustered at the dealer-week level. $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

4.2 Do Dealers Incentivize Client Use of CCPs?

Given that central clearing promotes multilateral netting and, by extension, improves margin efficiency, dealers may have incentives to encourage clearing by offering more favorable pricing on centrally cleared transactions. To examine this possibility, we estimate the following model using the same sample of single-name reference entities eligible for voluntary clearing:

$$\text{Upfront Points}_{n,t} = \beta_1 \text{Cleared Trade}_{n,t} + \beta_2 \text{Log Notional}_{n,t} + \alpha_{\iota(n),t} + \epsilon_{n,t} \tag{2}$$

where $\text{Upfront Points}_{n,t}$ is the price of trade n on date t in clean upfront points, $\text{Cleared Trade}_{n,t}$ is an indicator equal to one if the trade is cleared and zero otherwise, $\text{Log Notional}_{n,t}$ is the log of the transaction notional, and $\alpha_{\iota(n),t}$ is a contract-date fixed effect, where the contract is defined by the reference entity, tenor, currency, and seniority combination. We employ the pricing filter described in Section 3 and winsorize the notional variable at the 1st and 99th percentiles. Heteroskedasticty robust standard errors are used across specifications. The inclusion of contract-date fixed effects ensures that β_1 captures pricing differences between cleared and uncleared trades. In some specifications, we additionally control for buyer and seller fixed effects to account for heterogeneity in pricing across market participants.

Columns (1) and (2) of Table 5 report results for dealer-to-client transactions where the client buys protection. The coefficient on the cleared trade indicator is negative and statistically significant, indicating that clients pay less—i.e., receive better pricing—when transactions are centrally cleared. This effect persists, though with a reduced magnitude, when seller fixed effects are included in Column (2). The estimated discount, 0.88 upfront points, is economically modest relative to the average single-name effective half-spread of approximately 14 basis points documented in Biswas et al. (2015). Our findings are broadly consistent with Du et al. (2024), who report similar pricing benefits for clients on cleared trades, albeit using a less saturated fixed effects specification. In contrast, our results differ from those of Loon and Zhong (2014), who argue that central clearing increases CDS spreads due to reduced counterparty risk.

Table 5: Clearing Pricing: Dealer-to-Client

	Client Buys		**Client Sells**	
	(1)	(2)	(3)	(4)
Cleared Trade	-2.77^{***}	-0.88^{**}	0.50^{*}	0.71^{**}
	(0.32)	(0.36)	(0.28)	(0.34)
Log Notional	0.07^{**}	0.11^{***}	-0.02	-0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Contract x Date FE	Y	Y	Y	Y
Buyer FE		Y		
Seller FE				Y
Num. obs.	323,171	323,171	288,674	288,674
R^2	0.85	0.86	0.87	0.87
Adj. R^2	0.74	0.75	0.78	0.79

Note: Results from regressions of traded upfront points on an indicator equal to one if the trade is cleared and zero otherwise, the log of the transaction notional, and contract-date fixed effects, where the contract is defined by the reference entity, tenor, currency, and seniority combination. The transaction notional is winsorized at the 1- and 99-percent levels to limit the influence of data errors and outliers. Standard errors are clustered at the dealer-week level. $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

Columns (3) and (4) examine dealer-to-client trades where the client is the seller of protection. As before, clearing is associated with more favorable pricing—clients earn more for selling protection when the trade is cleared. This symmetric effect contrasts with results from Cenedese et al. (2020), who find that clients receive pricing benefits for clearing interest rate swaps only when paying fixed. One possible explanation is that the authors' sample predates the introduction of UMR, so the regulatory costs associated with uncleared trades are more pronounced in our setting.

4.3 Did the UMR Affect Client Participation in Clearing?

As discussed in Section 2.3, clearing rates for both dealer-to-client and interdealer single-name CDS transactions rose sharply following the implementation of uncleared margin rules (UMR) in 2016. The first phase of UMR applied directly only to the largest market participants, suggesting that the broader uptake of central clearing reflects dealers more actively encouraging clients to use CCPs. Given the substantial fixed costs associated with clearing, such as onboarding, technology investment, and collateral management, this shift may have prompted some clients to exit the single-name CDS market altogether. We test this hypothesis by estimating the following logistic regression model at the client level:

$$\begin{aligned}\text{Exited}_c =& \beta_1 \text{CDX User}_c + \beta_3 \text{Log Pre-UMR Notional}_c + \\ & \beta_2 \text{Log Pre-UMR Num Trans}_c + \beta_4 \text{Trade Directionality}_c + \epsilon_c \end{aligned} \tag{3}$$

where Exited_c is an indicator equal to one if client c made no single-name trades in the immediate post-UMR period and zero otherwise, CDX User_c is an indicator equal to one if the client had any open CDX contracts at the beginning of the pre-UMR period and zero otherwise, $\text{Log Pre-UMR Notional}_c$ is the log of the client's traded notional on single-name contracts during the pre-UMR period, Log Pre-UMR Num Trans is the log of the number of single-name trades made by the client in the pre-UMR period, and Trade Directionality is defined as the absolute value of one-half minus the share of the client's single-name trades during the Pre-UMR period in which it bought protection. We define the pre-UMR period as January 2015 through August 2016 and the post-UMR period as September 2016 through December 2017 in our primary specifications, but our results are robust to modifying the lengths of these windows. To avoid spurious exits, we consider only clients with at least five trades in the pre-UMR period, but our findings are again robust to varying this threshold.

Regression results are presented in Columns (1) and (2) of Table 6. Of the 393 clients active prior to UMR, nearly a quarter ceased trading single-name CDS in the period following the reform. The strongest predictor of exit is trading intensity: clients with more transactions in the pre-UMR period were significantly more likely to remain active post-UMR. This finding is consistent with a

fixed-cost framework in which marginal participants find the increased operational and collateral burdens of clearing too costly to justify continued participation.

Table 6: Client Clearing Participation

	Exited		**Cleared**	
	(1)	(2)	(3)	(4)
Constant	-1.143^{***}	4.020^{*}	-0.759^{***}	-4.280
	(0.118)	(2.352)	(0.125)	(2.914)
CDX User		0.113		1.822^{***}
		(0.296)		(0.531)
		[0.017]		[0.264]
Log Pre-UMR Notional		-0.141		0.025
		(0.151)		(0.182)
		[-0.022]		[0.004]
Log Pre-UMR Num Trans		-0.651^{***}		0.388^{**}
		(0.168)		(0.197)
		[-0.100]		[0.068]
Trade Directionality		-0.662		-1.238
		(0.860)		(0.923)
		[-0.102]		[-0.218]
Num. obs.	393	393	298	298
Log Likelihood	-217.355	-184.138	-186.535	-155.335
Pseudo R^2	0.000	0.134	0.000	0.145

Note: This table presents results from logistic regressions for the decision to exit the single-name CDS market (columns (1) and (2)) and the decision to begin clearing single-name CDS conditional on continuing to trade in this segment after the implementation of UMR (columns (3) and (4)). Heteroskedasticity robust standard errors appear in parentheses directly below each coefficient estimate, followed by average marginal effects in brackets. $^{*}p < .1, ^{**}p < .05, ^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

Among the clients who remained active in the single-name segment, not all embraced central clearing. To examine the determinants of clearing adoption, we re-estimate equation (3) on the subset of clients with post-UMR activity, replacing the dependent variable with an indicator equal to one if the client cleared at least one trade in the post-UMR period. Results, shown in Columns (3) and (4) of Table 6, reveal that prior engagement with cleared products is a strong predictor of clearing adoption. Clients with open CDX positions before UMR were 26 percentage points more likely to clear single-name CDS than those without. As in the exit analysis, clients with greater pre-UMR trading activity were more likely to clear. These results suggest that clearing adoption is concentrated among clients for whom the fixed costs of CCP participation are less prohibitive—either because they already clear other products or because they trade frequently

enough to realize meaningful netting and pricing benefits.

4.4 Which Client Trades Tend to be Cleared?

Although a number of market participants began voluntarily clearing single-name CDS transactions around the implementation of UMR, a substantial share of trades remained uncleared. We therefore examine the factors influencing clients' decisions to clear specific transactions by restricting the sample to clients who have previously cleared and estimating the following logistic regression model on protection-buy trades:

$$\begin{aligned}\text{Cleared}_{n,c,d,t} =& \beta_1 \text{Log Dealer CDS}_{d,t} + \beta_2 \text{Buyer Net Seller wrt CCP}_{n,c,t} + \\ & \beta_3 \text{Seller Net Buyer wrt CCP}_{n,d,t} + \beta_4 \text{Log Ref Entity Spread}_{n,t} + \\ & \beta_5 \text{Log Notional}_n + \alpha_{m(t)} + \epsilon_{n,c,d,t}\end{aligned} \tag{4}$$

where $\text{Cleared}_{n,c,d,t}$ is an indicator equal to one if trade n between client c and dealer d on date t was centrally cleared. Log Dealer $\text{CDS}_{d,t}$ is the log of the dealer's CDS spread at time t and serves as a proxy for dealer credit risk. Buyer Net Seller wrt $\text{CCP}_{n,c,t}$ equals one if the client is a net seller of protection on the same reference entity (relative to ICE Clear Credit) on the Friday prior to the trade; analogously, Seller Net Buyer wrt CCPn, d, t equals one if the dealer is a net buyer. Log Ref Entity $\text{Spread}_{n,t}$ captures the log of the reference entity's CDS spread, and Log Notional_n is the log of transaction size. All regressions include month fixed effects ($\alpha_{m(t)}$), and selected specifications also include client-by-month and reference entity-by-month fixed effects. As before, notional amounts are winsorized at the 1st and 99th percentiles to reduce the influence of outliers.

Columns (1) through (3) of Table 7 present coefficient estimates along with heteroskedasticity-robust standard errors and average marginal effects. The coefficient on *Log Dealer CDS* is positive and significant in all specifications, indicating that clients are more likely to clear trades when the dealer is riskier. This effect grows stronger when client fixed effects are included in Columns (2) and (3), suggesting that the relationship is not driven by cross-sectional differences in client behavior. These results, made possible by our ability to match the two CCP-facing legs of cleared contracts, contribute to the literature on counterparty risk management by non-dealers. Du et al. (2024) find that clients choose safer dealers when contracts are ineligible for clearing, but not when clearing is

an option. Our findings suggest that the null result in their setting may be driven by selection, as we demonstrate that clearing clients continue to respond to dealer credit risk.

We also find that margin considerations influence clearing decisions. The coefficient on *Buyer Net Seller wrt CCP* is positive and statistically significant across specifications. Marginal effect estimates in Columns (2) and (3) suggest that clients are roughly 10 percentage points more likely to clear a protection-buy transaction when they already hold a net sold position with the CCP. This result, enabled by our ability to observe clients' full positions, indicates that clients actively manage their exposure and associated margin requirements when deciding whether to clear.

Table 7: Clearing Choice: Dealer-to-Client

	Client Buys			**Client Sells**		
	(1)	(2)	(3)	(4)	(5)	(6)
Log Dealer CDS	0.503^{***}	0.246^{***}	0.409^{***}	0.965^{***}	0.258^{***}	0.620^{***}
	(0.026)	(0.054)	(0.106)	(0.024)	(0.047)	(0.087)
	[0.077]	[0.023]	[0.023]	[0.155]	[0.026]	[0.038]
Buyer Net Seller wrt CCP	2.220^{***}	1.095^{***}	1.721^{***}	0.065^{***}	-0.048^{**}	-0.066
	(0.017)	(0.034)	(0.092)	(0.011)	(0.021)	(0.042)
	[0.340]	[0.109]	[0.102]	[0.010]	[-0.005]	[-0.004]
Seller Net Buyer wrt CCP	-0.210^{***}	-0.166^{***}	-0.008	1.277^{***}	1.933^{***}	2.041^{***}
	(0.012)	(0.024)	(0.049)	(0.012)	(0.027)	(0.071)
	[-0.032]	[-0.016]	[-0.000]	[0.203]	[0.211]	[0.132]
Log Ref Entity Spread	0.208^{***}	0.136^{***}	0.439^{***}	0.040^{***}	-0.075^{***}	-0.869^{***}
	(0.005)	(0.013)	(0.092)	(0.005)	(0.011)	(0.088)
	[0.032]	[0.013]	[0.024]	[0.006]	[-0.008]	[-0.053]
Log Notional	0.549^{***}	0.589^{***}	0.709^{***}	0.089^{***}	0.090^{***}	0.058^{***}
	(0.004)	(0.011)	(0.020)	(0.004)	(0.010)	(0.016)
	[0.084]	[0.055]	[0.040]	[0.014]	[0.009]	[0.004]
Month FE	Y			Y		
Client x Month FE		Y	Y		Y	Y
Ref. Entity x Month FE			Y			Y
Num. obs.	201,718	84,838	71,156	230,717	102,042	84,934
Log Likelihood	$-93,951.844$	$-25,654.245$	$-12,739.692$	$-113,072.367$	$-32,810.072$	$-16,642.147$
Pseudo R^2	0.324	0.540	0.559	0.233	0.500	0.568

Note: This table presents results from logistic regressions for the decision to clear a single-name CDS transaction, using the sample of dealer-to-client trades. Columns (1)-(3) consider dealer-to-client trades where the client is the buyer; columns (4)-(6) analogously uses trades where the client is the seller. $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

Columns (4) through (6) present analogous results for trades in which the client is the seller of protection. The findings are broadly symmetric. Clients are again more likely to clear when their counterparty is riskier, as reflected by the positive and significant coefficients on *Log Dealer CDS*. The significance of *Buyer Net Seller* varies, but the coefficient on *Seller Net Buyer wrt CCP* is consistently positive and significant. Overall, our results suggest that clients clear transactions when it is in their economic interest to do so—based on both counterparty risk and

margin considerations.[3] While dealers may encourage the use of CCPs, the decision to clear appears to be primarily driven by clients.

4.5 How does Clients Clearing impact Dealer Competition?

Our results in prior sections yield mixed implications regarding the effect of central clearing on dealer competition. On one hand, Table 5 shows that clients receive more favorable pricing on cleared trades, suggesting enhanced competition. On the other hand, we have shown that clearing improves dealers' netting efficiency, potentially increasing the intermediation capacity of individual CCP members and leading to market concentration. To reconcile these competing effects, we examine whether clients alter the number or concentration of their dealer relationships after they begin clearing single-name CDS transactions. Specifically, we estimate the following client-level regression:

$$\text{Dealer Usage}_{c,t} = \beta_1 \text{Post Clearing}_{c,t} + \alpha_c + \alpha_t^{\bar{c}} + \epsilon_{c,t} \tag{5}$$

where, depending on the specification, Dealer $\text{Usage}_{c,t}$ is either the number of distinct dealers with whom client c trades in month t or a Herfindahl index measuring dealer concentration. The right-hand side includes an indicator, Post $\text{Clearing}_{c,t}$, equal to one if client c has begun clearing by month t, a client fixed effect α_c, and the notional-weighted average of the dependent variable, $\alpha_t^{\bar{c}}$, taken across all clients excluding the focal client. The inclusion of this final term yields a generalized difference-in-differences specification by controlling for secular trends in dealer usage. We define an event window of 24 months centered on the client's first cleared trade, with 12-month pre- and post-periods. Standard errors are clustered at the client level.

Results are reported in Table 8. Column (1) shows that clients trade with more dealers after adopting clearing. The coefficient on *Post Clearing* is 0.509, which is economically meaningful relative to a sample median of four total dealers per client. This estimate accords with central clearing promoting flexibility in dealer selection by mitigating counterparty risk constraints and centralizing margin management. In Column (2), we replace the dependent variable with the Herfindahl index of client-level dealer usage. The coefficient estimate is negative and significant,

[3]The findings are similar for interdealer trades, which we analyze in Appendix B.

confirming that dealer concentration declines after clients begin to clear. Unlike prior work that relies on bid-ask spreads and in which clearing adoption coincides with the introduction of SEF mandates (e.g., Loon and Zhong, 2016), our approach leverages direct observations of trading relationships in a setting where clearing is voluntary and trading mechanisms are unchanged. These results provide concrete evidence that clearing promotes dealer competition.

Table 8: Effects of Clearing on Dealer Usage

	Number of Dealers	**Dealer Concentration**
	(1)	(2)
Post Clearing	0.509^{***}	-0.074^{***}
	(0.134)	(0.017)
Client FE	Y	Y
Num. obs.	3,441	3,441
Adj. R^2	0.693	0.525

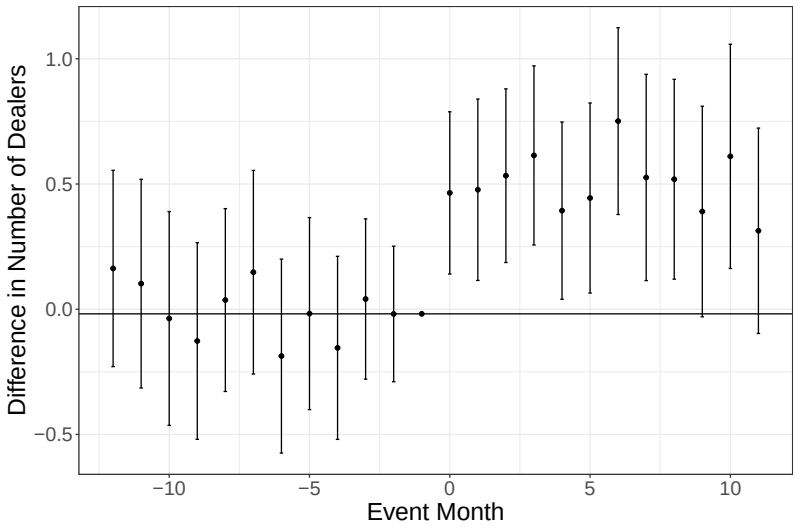
Note: This table presents results from estimation of equation (5), where the dependent variable is either the number of dealers used by client c in calendar month t (column (1)) or a Herfindahl index measuring dealer concentration (column (2)). $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

To assess robustness and dynamic effects, we re-estimate Equation (5) using an event study specification that omits the month immediately preceding clearing and includes separate indicators for each event month. The resulting coefficient paths are plotted in Figure 3, with 95% confidence intervals based on client-clustered standard errors. In both panels, the estimates are stable prior to adoption and shift sharply and persistently following the client's first cleared trade, supporting the parallel trends assumption. To address a further concern about the staggered timing of clearing adoption (e.g., Sun and Abraham, 2021), we re-estimate the model, excluding from the market-wide notional-weighted average term on the left-hand side those clients who have already cleared. Untabulated results from this alternative specification are nearly identical, reinforcing the conclusion that the adoption of central clearing facilitates broader access to liquidity and intensifies dealer competition.

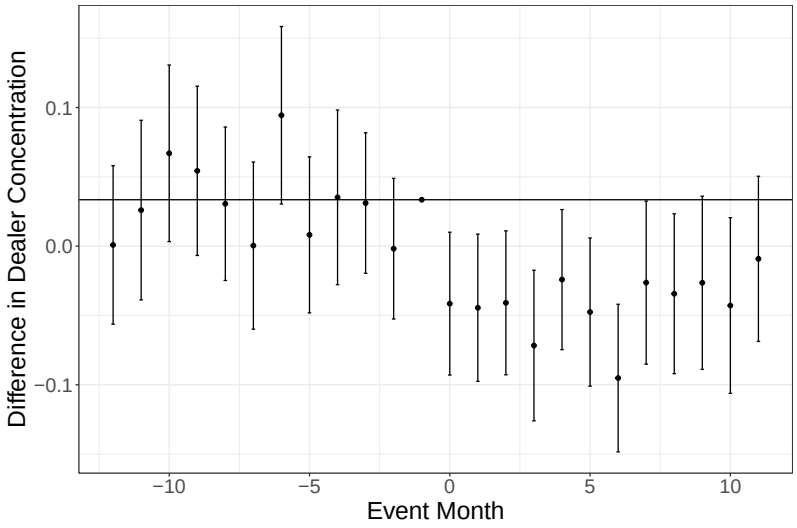
4.6 Summary of Clearing Incentive Results

This section has examined client clearing incentives from multiple perspectives. We find compelling evidence that clearing enables dealers to reduce margin demands and that they, in turn, pass efficiency gains to clients via improved pricing. Our analysis also highlights the influence of

Figure 3: Dealer Competition after Client Clearing



(a) Number of Dealers



(b) Client's Dealer Concentration (HHI)

Note: Coefficient estimates from a dynamic specification of Equation (5) that omits the month prior to clearing adoption and includes separate indicator variables for each of the remaining event months. The vertical lines extending from each point represent 95% confidence intervals based on standard errors clustered by client. Panel (a) shows estimates from the specification where the number of dealers is the dependent variable; panel (b) uses the Herfindahl index as a measure of dealer concentration.
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

regulatory reform by showing that the introduction of UMR prompted client exit from the single-name CDS market. For clients willing to bear the fixed costs required to access CCPs, clearing eases counterparty risk constraints and centralizes collateral management. Together, the efficiency gains from clearing have intensified competitive dynamics among dealers and reshaped intermediation

networks. The next section investigates the strategic incentives underpinning dealers' provision of clearing services. In particular, we examine how clearing agent relationships influence client behavior, trading flows, and market structure.

5 What are the Incentives of Client Clearing Service?

As discussed in Section 2.2, clients require a CCP member to act as a clearing agent in order to access central clearing. While agents earn fee income for providing this service, industry participants have noted that the associated regulatory capital charges often outweigh these revenues (Contiguglia, 2015). Moreover, clearing agents generally bear the liability for client margin shortfalls, raising the question of what incentives exist for firms to act in this role. One potential benefit is that providing clearing services strengthens the relationship between the client and the dealer affiliated with the agent. A stronger relationship may lead the client to route more trading volume through the dealer, enabling the dealer to extract greater pricing concessions. This channel aligns with findings from the banking literature. Yasuda (2005) shows, for example, that firms are more likely to procure underwriting services from prior loan arrangers, while Hellmann et al. (2008) find that companies prefer to borrow from banks that previously provided them venture capital.

We also examine the determinants of relationship formation between clients and clearing agents. Clients may prefer agents affiliated with dealers with whom they have an established trading history. Alternatively, the clearing transition may offer an opportunity to initiate relationships with new CCP members. Counterparty risk may also play a role. Although CCPs have established protocols for porting client positions in the event of an agent default (BCBS-IOSCO, 2022), some market participants have expressed skepticism about the operational viability of these procedures (Smith, 2015). Given that agents serve as custodians for client margin, clients may prefer to select safer clearing members. This concern is particularly salient because most clients maintain only a single agent relationship (see Table 3), implying that the failure of a chosen member could disrupt their access to the CCP entirely.

Beyond the question of whom clients choose as clearing agents, we next investigate why some clients opt to maintain multiple clearing relationships. Because CCPs apply portfolio margin models, clients generally achieve greater collateral efficiency by concentrating positions with a single

agent. Splitting positions across multiple agents reduces netting opportunities and increases margin requirements. As a result, we posit that clients expand their agent networks primarily in response to clearing capacity constraints. These constraints may emerge when clients increase trading activity or during periods of market stress that prompt CCPs to call for additional margin. Maintaining multiple agent relationships may also serve as a precautionary measure, allowing clients to preserve market access if one of their agents becomes impaired.

5.1 What are the Member Benefits for Providing Agent Services?

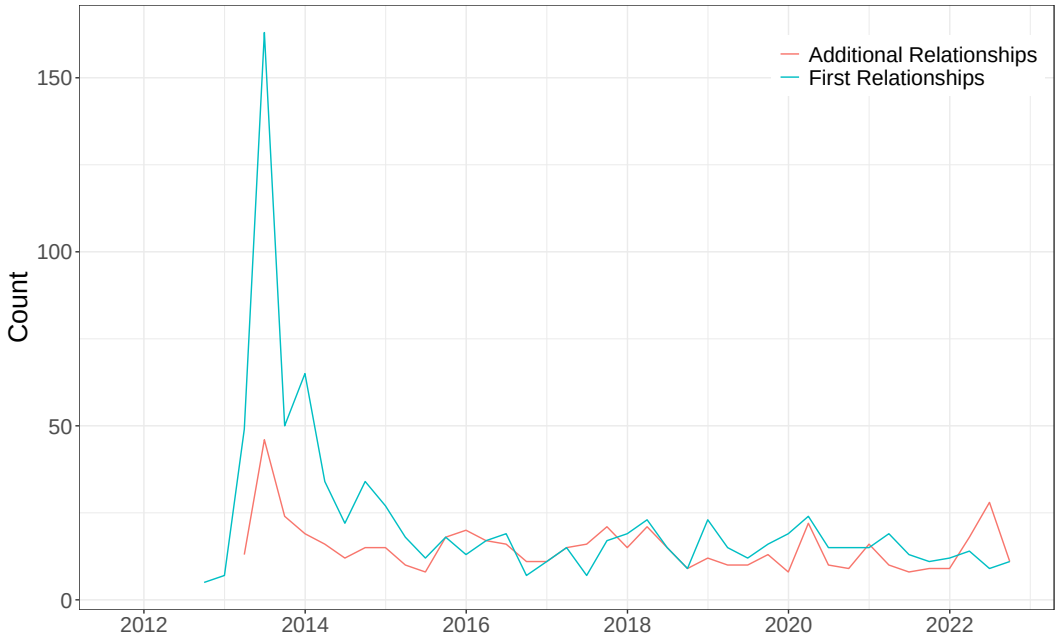
We begin by examining whether providing clearing agent services enables dealers to better retain trading relationships following a client's adoption of central clearing. As shown in Figure 4, which plots the number of client-agent relationships formed by quarter, most clients initiated a clearing relationship around the introduction of index clearing mandates in 2013. Accordingly, we pool both single-name and index CDS transactions and estimate the following regression using event windows centered on the month in which each client first clears:

$$\begin{aligned}\text{Notional Share}_{c,d,t} =& \beta_1 \text{Post Clearing}_{c,t} + \beta_2 \text{Post Clearing}_{c,t} \times \text{Clearing Agent}_{c,d} + \\ & \alpha_{c,d} + \alpha^{\bar{c}}_{d,t} + \epsilon_{c,d,t} \end{aligned} \tag{6}$$

where $\text{Notional Share}_{c,d,t}$ is the share of client c's trading volume in month t done with dealer d, $\text{Post Clearing}_{c,t}$ is an indicator that equals one if the client initiated clearing in or before month t, $\text{Clearing Agent}_{c,d}$ is an indicator that equals one if dealer d was selected as the client's clearing agent in the month it first cleared, $\alpha_{c,d}$ is a client-dealer fixed effect, and $\alpha^{\bar{c}}_{d,t}$ is the share of aggregate client volume excluding the focal client that is intermediated by the dealer. We use 24-month event windows, comprised of the 12 months before and after each client's initial cleared trade. Standard errors are clustered at the client level.

This specification is equivalent to a generalized difference-in-differences design, where the $\alpha^{\bar{c}}_{d,t}$ term accounts for secular shifts in the dealer's overall intermediation activity over time. A positive estimate of β_2 indicates that clients allocate a greater share of trading volume to dealers affiliated with their clearing agents after clearing begins. As established in Section 4.5, clients tend to expand the number of dealers they engage with after adopting clearing. Here, we restrict

Figure 4: Relationship Formations by Quarter



Note: This figure shows the number of new client-agent relationships formed per quarter.
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

the sample to dealers with whom the client traded prior to clearing, in order to assess changes in preexisting relationships. Regression (6) is therefore an unbalanced panel, with the number of rows per client equal to the number of preexisting relationships.

Results are presented in Table 9. The positive and statistically significant coefficient on the interaction term in Column (1) indicates that clients direct a greater share of volume to agent-affiliated dealers following the initiation of clearing. To rule out bias from overlapping relationship formations, Column (2) limits the sample to clients who form no further dealer relationships in the 12-month post-clearing period. The estimated effect is larger in this restricted sample: relative to other pre-clearing dealers, the client's chosen clearing agent captures an additional 5.6 percentage points of trading volume. These findings highlight an important benefit of providing agent services and offer new evidence of cross-business-line synergies within dealer banks.

To test for pre-trends and assess dynamics, we estimate a fully flexible version of Equation (6) that excludes the month prior to clearing and includes separate event-time indicators. Figure 5 plots the resulting coefficients and 95% confidence intervals. The estimates exhibit no systematic trend prior to clearing adoption, supporting the parallel trends assumption. After clearing begins,

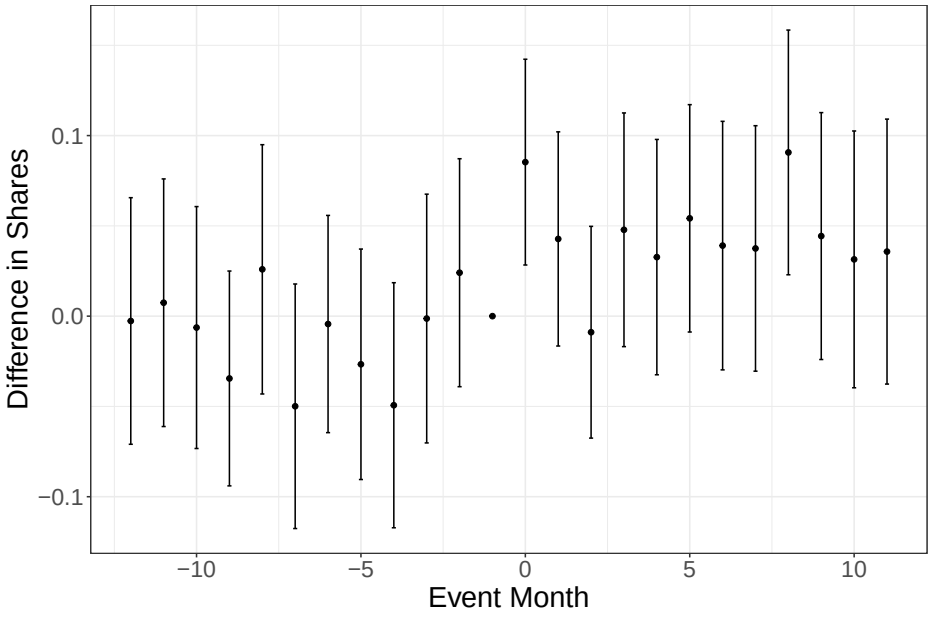
Table 9: Effects of Providing Agent Services

	All Events	**Non-Confounded Events**
	(1)	(2)
Post Clearing	-0.004^{**}	-0.007^{***}
	(0.002)	(0.003)
Post Clearing x Clearing Agent	0.038^{***}	0.056^{***}
	(0.012)	(0.016)
Client x Dealer FE	Y	Y
Num. obs.	53,221	26,493
Adj. R^2	0.430	0.449

Note: This table presents results from estimation of equation (6), where the dependent variable is a measure of the share of client c's trading volume in month t done with dealer d, adjusted for the dealer's share of aggregate volume with all other clients. For each client, the sample of dealers consists of those with whom the client conducted at least one trade before the client began clearing. Column (2) reports results when we limit the sample to clients who form no further dealer relationships in the 12-month post-clearing period. $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

the coefficients rise and remain elevated, reinforcing the conclusion that agent affiliation helps dealers preserve and deepen client trading relationships.

Figure 5: Provision of Agent Services and Preservation of Market Share



Note: Coefficient estimates from a dynamic specification of Equation (6) that omits the month prior to clearing adoption and includes separate indicator variables for each of the remaining event months. The vertical lines extending from each point represent 95% confidence intervals based on standard errors clustered by client.
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

5.2 Does Clearing Enable Dealers to Extract Pricing Concessions from Clients?

Given that clients typically rely on a small number of clearing agents and tend to trade more frequently with dealers affiliated with those agents, CCP members that provide clearing services may gain additional bargaining power in their client relationships. Dealers might therefore be able to extract pricing concessions when they serve both as the executing counterparty and the client's clearing agent. To test this hypothesis, we estimate the following model using centrally cleared dealer-to-client transactions:

$$\text{Upfront Points}_{n,t} = \beta_1 \text{Dealer is Agent}_{n,t} + \beta_2 \text{Log Notional}_{n,t} + \alpha_{\iota(n),t} + \epsilon_{n,t} \tag{7}$$

where $\text{Upfront Points}_{n,t}$ is the clean upfront price of trade n on date t. The indicator $\text{Dealer is Agent}_{n,t}$ equals one if the client's clearing agent is also the executing dealer, and zero otherwise. $\text{Log Notional}_{n,t}$ is the log of the transaction notional, and $\alpha_{\iota(n),t}$ denotes a contract-date fixed effect, where contracts are defined by reference entity, tenor, currency, and seniority. As in prior specifications, we apply the pricing filter described in Section 3, winsorize notional values at the 1st and 99th percentiles, and use heteroskedasticity-robust standard errors.

Results are presented in Table 10. Columns (1) and (2) report estimates for pooled single-name and index trades in which the client is the buyer of protection. The positive and significant coefficients indicate that clients pay more when trading with their clearing agent. Similarly, the negative coefficients in Columns (3) and (4) show that clients receive worse terms when selling protection to the dealer affiliated with their clearing agent.

To account for differences in transaction costs across market segments, we next examine single-name and index trades separately. In Columns (5) through (8), which isolate single-name transactions, we find economically meaningful point estimates of approximately 3 upfront points, though statistical significance emerges only for trades in which the client is the protection seller. A similar pattern appears in Columns (9) through (12) for index trades. The estimates remain economically significant despite being appreciably smaller, as average bid-ask spreads are an order of magnitude lower for index transactions (Loon and Zhong, 2016). In both cases, the results suggest that pricing asymmetries are most pronounced when clients are selling protection, potentially due

to their reduced bargaining power in such contexts.

5.3 How do Clients Choose their Clearing Agent?

We next examine the factors that influence a client's choice of clearing agent. To do so, we estimate a multinomial conditional logit model based on clients' selection among the 13 CCP members that collectively handle over 99.9% of client clearing activity. The probability that client c selects member m conditional on characteristics x_m is given by:

$$\Pr(y_{c_i} = m|x_m) = \frac{\exp(x_m\beta)}{\sum_{\hat{m}}^{M_{c_i}} \exp(x_{\hat{m}}\beta)}, \quad m = 1, ..., M_{c_i} \tag{8}$$

For a client's first agent choice, the set of alternatives includes all 13 members ($M_{c_1} = 13$). For subsequent selections, the choice set is restricted to the remaining $13 - i$ members with whom the client has not previously established a clearing relationship. The regressors include the log CDS spread of the member as a proxy for credit risk, the share of the client's uncleared gross notional outstanding that faces the dealer affiliated with the member, and the share of the client's trading volume over the prior month conducted with the dealer affiliated with the member. If the client has done fewer than 30 transactions in the past month, we extend the window used to compute trading volume shares until it includes 30 trades. Member fixed effects are included to account for baseline differences in market share, but the estimated coefficients on these dummies are excluded from the discussion to preserve data confidentiality.

Table 11 summarizes the results. Coefficient estimates are accompanied by heteroskedasticity-robust standard errors (in parentheses) and average marginal effects (in brackets). In Column (1), which includes all observed relationship formations, both the *Trade Share* and *Outstanding Share* enter positively and significantly. The coefficient on *Trade Share* implies that a client is 9 percentage points more likely to choose a clearing member affiliated with a dealer that accounts for all of its recent trading activity relative to a dealer with whom it has no trading relationship. By contrast, the *Log CDS* spread of the member is not statistically significant, suggesting that relationship-based factors, rather than credit risk, are the primary drivers of agent selection.

Column (2) reports results using only the first clearing relationship formed by each client. The findings are qualitatively similar, with both trading and outstanding exposures predicting agent

Table 10: Pricing Effects of Providing Clearing Services

	Pooled				**Single-name**				**Index**			
	Client Buys		Client Sells		Client Buys		Client Sells		Client Buys		Client Sells	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dealer is Agent	0.43^{***}	0.20^{*}	-0.69^{***}	-0.56^{***}	3.11	2.71	-2.91^{**}	-3.34^{**}	0.36^{***}	0.12	-0.59^{***}	-0.46^{***}
	(0.11)	(0.12)	(0.11)	(0.12)	(3.37)	(3.51)	(1.37)	(1.45)	(0.10)	(0.10)	(0.11)	(0.11)
Log Notional	-0.18^{***}	0.06	-0.09^{***}	-0.28^{***}	0.16	-0.27	-0.05	-0.20^{**}	-0.18^{***}	0.06	-0.09^{***}	-0.29^{***}
	(0.04)	(0.04)	(0.03)	(0.03)	(0.40)	(0.50)	(0.10)	(0.10)	(0.04)	(0.04)	(0.03)	(0.03)
Contract x Date FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Buyer FE		Y				Y				Y		
Seller FE				Y				Y				Y
Num. obs.	802,056	802,056	1,007,642	1,007,642	73,943	73,943	130,233	130,233	728,113	728,113	877,409	877,409
Adj. R^2	1.00	1.00	1.00	1.00	0.58	0.58	0.87	0.87	1.00	1.00	1.00	1.00

Note: This table presents results from estimation of equation (7), where the dependent variable is the price of trade n on date t in clean upfront points. We present separate results for transactions where the client is the buyer and where the client is the seller. The Pooled results (columns (1)-(4)) combine single-name and index transactions; columns (5)-(8) and (9)-(12) present separate results for single-name and index transactions, respectively. The notional variable is winsorized at the 1st and 99th percentiles. Heteroskedasticity robust standard errors are reported in parentheses. $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

Table 11: Clearing Member Choice

	All Relationships	**First Relationships**	**Additional Relationships**
	(1)	(2)	(3)
Log CDS	-0.222	0.360	-0.587**
	(0.194)	(0.354)	(0.259)
	[-0.015]	[0.024]	[-0.040]
Trade Share	1.428***	1.599***	1.036***
	(0.149)	(0.185)	(0.258)
	[0.095]	[0.105]	[0.070]
Outstanding Share	1.096***	0.910***	1.457***
	(0.184)	(0.209)	(0.486)
	[0.073]	[0.060]	[0.098]
Num. obs.	14,356	7,752	6,604
Log Likelihood	-2,382.3	-1,172.7	-1,188.3
Pseudo R^2	0.43	0.46	0.41

Note: This table presents results from multinomial conditional logit models for the choice of clearing agent by a client. For each client choice, the set of alternatives is limited to the clearing agents with whom the customer does not already have a clearing relationship. Columns (2) and (3) explore these effects separately for the establishment of a first clearing relationship versus the commencement of additional relationships. $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

choice, while counterparty risk remains insignificant. In Column (3), which restricts the sample to second and subsequent relationships, the coefficient on the log CDS spread becomes negative and statistically significant. This result suggests that non-members who form multiple clearing relationships prefer safer agents, possibly because these clients are more sophisticated or manage larger, more risk-sensitive portfolios.

5.4 Why Do Clients Seek Multiple Clearing Agents?

The preceding analysis sheds light on clients' selection of clearing agents but leaves open the question of why clients engage multiple CCP members. To investigate this, we construct a monthly panel of all transactions executed by clients that formed at least two clearing agent relationships during the sample period. We then estimate the following logistic regression model:

$$\begin{aligned}\text{Formation}_{c,t} =& \beta_1 \text{Avg Agent Arcsinh Gross Notional}_{c,t} + \beta_2 \text{Log CDX Spread}_t + \\ & \beta_3 \text{Arcsinh Num Transactions}_{c,t} + \alpha_c + \epsilon_{c,t} \end{aligned} \tag{9}$$

where $\text{Formation}_{c,t}$ is an indicator equal to one if client c establishes a new clearing agent relationship in month t, and zero otherwise. Avg Agent Arcsinh Gross $\text{Notional}_{c,t}$ is the inverse hyperbolic sine of the client's gross cleared notional scaled by its number of existing agent relationships, Log CDX Spread_t denotes the log of the maximum CDX.NA.IG spread during the month, and Arcsinh Num $\text{Transactions}_{c,t}$ is the inverse hyperbolic sine of the client's transaction count. Some specifications include a client fixed effect α_c. We winsorize notional and transaction count variables at the 99th percentile and apply the inverse hyperbolic sine transformation to mitigate skewness and accommodate zero-valued observations. Because a substantial number of agent relationships were formed in response to the 2013 index clearing mandate, we begin our panel in January 2014.

Table 12 reports coefficient estimates, heteroskedasticity-robust standard errors in parentheses, and average marginal effects in brackets. In Column (1), which omits client fixed effects, all three variables enter positively. The coefficients suggest that larger and more active clients are more likely to expand their agent networks. Column (2) includes client fixed effects to account for time-invariant heterogeneity across non-members. The coefficient on transaction count remains positive and statistically significant, consistent with the view that clearing demand increases with trading intensity. The positive and significant estimate on *Log CDX Spread* further indicates that agent relationship formation is more likely in periods of heightened systemic stress, when CCPs impose tighter collateral requirements. Together, these findings support the hypothesis that clients pursue additional member relationships to address margin constraints and maintain clearing access when aggregate volatility is high.

5.5 How do Clients Choose Among their Agents for Specific Transactions?

Building on our analysis of agent relationship formation, we next examine how clients with multiple established clearing agents allocate individual trades across those agents. To do so, we estimate a multinomial conditional logit model. The probability that client selects agent m for trade n at time t, conditional on agent characteristics x_m, is given by:

$$\Pr(y_{c,n,t} = m | x_{m,t}) = \frac{\exp(x_{m,t}\beta)}{\sum_{\hat{m}}^{M_c} \exp(x_{\hat{m},t}\beta)}, \quad m = 1, ..., M_c \tag{10}$$

Table 12: Clearing Agent Relationship Formation Timing

	(1)	(2)
Constant	-6.975^{***}	
	(0.762)	
Avg. Agent Arcsinh Gross Notional	0.014^{***}	0.012
	(0.005)	(0.010)
	[0.0003]	[0.0002]
Log CDX Spread	0.619^{***}	0.544^{***}
	(0.181)	(0.174)
	[0.0134]	[0.0115]
Arcsinh Num. Transactions	0.174^{***}	0.378^{***}
	(0.013)	(0.036)
	[0.0038]	[0.0080]
Client FE		Y
Num. obs.	28,463	28,463
Log Likelihood	$-2,970.041$	$-2,802.572$
Pseudo R^2	0.019	-0.032

Note: Results from a logistic regression model where the dependent variable is equal to one if client c forms a clearing agent relationship in month t and zero otherwise. Avg. Agent Arcsinh Gross Notional and Arcsinh Num. Transactions are the inverse hyperbolic sine of the client's gross cleared notional outstanding divided by the number of existing agent relationships it has at the beginning of the month and the client's monthly transaction count, repectively; Log CDX Spread is the log of the highest CDXNAIG spread during the month. We winsorize the notional and transaction count variables at the 99th percentile. The monthly panel for this analysis begins in January 2014. $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

where M_c denotes the number of clearing agent relationships formed by client c as of date t. The covariates include: the log CDS spread of the member as a proxy for counterparty risk, the share of the client's cleared trading volume over the prior month serviced by the member, the share of client's cleared gross notional outstanding serviced by the member, and an indicator equal to one if the member is also the transacting dealer. If the client has done fewer than 30 transactions in the past month, we extend the window used to compute trading volume shares until it includes 30 trades. Member fixed effects are included to control for baseline differences in market share, but the corresponding coefficient estimates are again omitted for brevity and confidentiality.

Table 13 reports coefficient estimates, heteroskedasticity-robust standard errors (in parentheses), and member-specific average marginal effects (in brackets). In Column (1), which pools client buy and sell transactions, *Log CDS Spread* is negative and significant, indicating that clients tend to avoid riskier agents. Both the trade and outstanding share variables are positive and significant, confirming that clients are more likely to reselect agents with whom they have previously

engaged. The marginal effect of *Trade Share* suggests a 16.8 percentage point higher probability of choosing an agent that handled all of the client's recent trades, relative to one it did not utilize. The coefficient on the indicator, *Member is Dealer*, for whether the member is also the transacting dealer is positive but economically modest, implying limited influence of execution-clearing integration in trade routing.

Columns (2) and (3) disaggregate the sample by client role. While the overall patterns persist, the *Member is Dealer* variable is only significant when the client is the seller of protection. This asymmetry is consistent with earlier findings in Section 5.2 that dealers extract pricing concessions in such trades, underscoring the strategic value of offering clearing services when negotiating prices with clients.

Table 13: Trade-Level Clearing Member Choice

	All Trades	**Client Buys**	**Client Sells**
	(1)	(2)	(3)
Log CDS Spread	-0.140***	-0.119***	-0.159***
	(0.008)	(0.012)	(0.011)
	[-0.010]	[-0.009]	[-0.012]
Trade Share	2.260***	2.254***	2.268***
	(0.005)	(0.008)	(0.007)
	[0.168]	[0.167]	[0.168]
Outstanding Share	1.313***	1.223***	1.380***
	(0.006)	(0.009)	(0.008)
	[0.097]	[0.091]	[0.102]
Member is Dealer	0.0244***	0.00586	0.0417***
	(0.004)	(0.005)	(0.005)
	[0.002]	[0.000]	[0.003]
Num. obs.	8,922,303	4,100,470	4,821,833
Log Likelihood	-1,755,216.9	-829,504.0	-925,227.8
Pseudo R^2	0.65	0.63	0.66

Note: Results from a multinomial conditional logit regression where the dependent variable is equal to one if client c chooses to clear transaction n with agent m at time t and zero otherwise. The regression includes member fixed effects, the log CDS spread of the member, the share of the client's cleared trading volume over the past month for which the member served as the clearing agent (Trade Share), the share of the client's cleared gross notional outstanding for which the member is the clearing agent (Outstanding Share), and an indicator equal to one if the member is also the transacting dealer (Member is Dealer) and zero otherwise. The notional and transaction count variables are winsorized at the 99th percentile. The monthly panel for this analysis begins in January 2014. $^{*}p < .1, ^{**}p < .05, ^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

5.6 How do Clearing Member Constraints affect Clients?

The preceding results emphasize the salience of counterparty risk in clients' selection of clearing agents. Although CCPs maintain porting protocols to facilitate the transfer of client positions in the event of member default, clients' persistent aversion to riskier agents suggests limited confidence in these safeguards. To assess the impact CCP member distress has on clients, we examine the sudden collapse of Archegos Capital Management in March 2021. The family office's failure to meet margin calls from its prime brokers—including Credit Suisse, Nomura, Morgan Stanley, and UBS—triggered substantial losses across these institutions. If adverse shocks to clearing member institutions impede their ability to offer clearing services or prompt clients to shift to other agents, we should observe a decline in margin posted through the affected members.

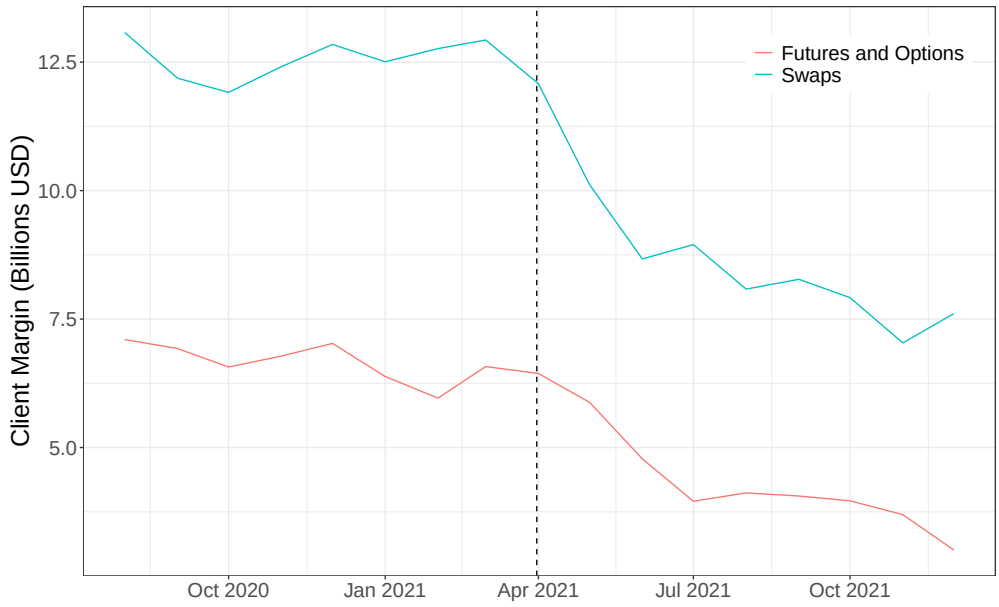
Using data from the Commodity Futures Trading Commission, Figure 6 plots client margin overseen by Credit Suisse, the most severely impacted member with reported losses of $4.7 billion in April 2021. The dashed vertical line indicates the timing of the Archegos collapse. In both the futures and options and swaps segments, margin volumes fall sharply following the event. The declines are notable, but it remains unclear whether they reflect voluntary client reallocation or binding constraints imposed by the former investment bank. If clients transitioned to alternative agents of their own accord, the disruption may have posed little threat to clearing access. If clearing capacity was rationed by the member and clients were unable to find other agents to handle their positions, however, clients may have experienced difficulty maintaining their desired exposures.

We estimate the following regression model to formally assess whether CCP member constraints impair clients' ability to access clearing services:

$$\begin{aligned}\Delta\text{Gross Outstanding}_{c,r} =& \beta_1 \text{Shock Share}_{c,r} + \beta_2 \text{Num Agents}_{c,r} + \\ & \beta_3 \text{Shock Share}_{c,r} \times \text{Num Agents}_{c,r} + \alpha_c + \alpha_r + \epsilon_{c,r} \end{aligned} \tag{11}$$

where $\Delta\text{Gross Outstanding}_{c,r}$ denotes the percentage change in client c's cleared gross notional outstanding on reference entity r between the onset of the Archegos collapse (March 2021) and the final weekly snapshot of August 2021. $\text{Shock Share}_{c,r}$ is the share of the client's cleared gross notional exposure on reference entity r that was cleared through Credit Suisse in March 2021, and

Figure 6: Client Margin Overseen by Credit Suisse



Note: This figure shows the amount of client margin overseen by Credit Suisse as a clearing agent. The dashed line marks the date of the Archegos collapse.
Source: CFTC, Authors' analysis.

Num Agents$_{c,r}$ is the number of clearing agents used by the client at that time. Fixed effects α_c and α_r capture client- and reference entity-specific heterogeneity. The dependent variable is winsorized at the 99th percentile to mitigate the influence of outliers, and standard errors are double-clustered by client and reference entity.

If clearing capacity was restricted due to the member's constraint and clients were unable to replicate their positions using other clearing agents, we should obtain a negative coefficient on *Shock Share*. A positive coefficient on the interaction term would suggest that clients with broader agent networks were better able to offset the constraint, highlighting the importance of multi-agent relationships as a hedge against member-specific distress.

Table 14 presents the results. Column (1) reports estimates from a baseline specification without fixed effects. The negative and statistically significant coefficient on *Shock Share* suggests that clients reliant on Credit Suisse experienced difficulty maintaining cleared positions. Column (2), which adds reference entity fixed effects, yields a similar estimate. The coefficient implies that clients who exclusively cleared with the former investment bank on a given reference entity reduced their gross positions by nearly 20% relative to those using other CCP members. This result provides

compelling evidence that distress at a clearing member can restrict client access to the CCP and reinforces the counterparty risk concerns identified earlier.

Table 14: Position Changes in Response to Archegos Shock

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.047					
	(0.059)					
Shock Share	-0.160^{***}	-0.196^{***}	-0.216^{*}	-0.206^{*}	-0.442^{***}	-0.414^{***}
	(0.058)	(0.070)	(0.118)	(0.110)	(0.151)	(0.135)
Num. Agents					-0.062	-0.105^{**}
					(0.053)	(0.051)
Shock Share x Num. Agents					0.172^{**}	0.159^{***}
					(0.071)	(0.061)
Client FE			Y	Y	Y	Y
Ref. Entity FE		Y		Y		Y
Num. obs.	9,133	9,133	9,133	9,133	9,133	9,133
Adj. R^2	0.001	0.069	0.074	0.143	0.074	0.144

Note: Results from estimation of Equation (11), where the dependent variable is the percentage change in a client's cleared gross notional outstanding on a particular reference entity between the final weekly position snapshot of August 2021 and the onset of Archegos' collapse at the end of March 2021. The gross notional outstanding variable is winsorized at the 99th percentile. Standard errors are double clustered by reference entity and client. $^{*}p < .1,^{**}p < .05,^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.

To address the possibility that these declines reflect reduced client demand rather than binding constraints, Columns (3) and (4) introduce client fixed effects. Although the associated t-statistics fall just below conventional thresholds, the point estimates remain negative and closely aligned with earlier results. These results indicate that individual clients reduced their cleared positions more on reference entities for which they relied heavily on Credit Suisse for clearing services.

Columns (5) and (6) examine whether clients with broader clearing agent networks were better insulated from the Archegos shock. While *Shock Share* has a negative base effect, its interaction with *Num Agents* enters positively and significantly, indicating that cleared positions managed through multiple agents experienced attenuated declines. These results highlight the strategic value of agent diversification in preserving clearing access during periods of stress. They further suggest that smaller or less sophisticated clients-who tend to rely on a single agent—may be more vulnerable to member-specific constraints.

5.7 Summary of Clearing Service Provision Results

This section has examined the incentives underlying dealers' provision of clearing services and clients' agent selection decisions. The results underscore the central role of relationships in shaping both dynamics. Sections 5.1 and 5.2 highlight the strategic value of offering clearing services, showing that doing so enables dealers to extract pricing concessions and capture a greater share of client transaction volume. Section 5.4 establishes that relationship formation is driven by collateral demands, as clients are more likely to seek additional agents when trading activity increases or when margin requirements tighten during periods of systemic stress. Sections 5.3 and 5.5 show that clients tend to select clearing members that are affiliated with their most used dealers and that pose less counterparty risk. The concerns about credit quality are particularly salient, given that member distress can impair a client's access to the CCP. Taken together, these findings demonstrate that while dealers have strong incentives to offer clearing services, clients actively shape clearing network structure through their allocations of agent relationships and exposures.

6 Conclusion

This paper investigates the incentives and consequences of client clearing in centrally cleared derivatives markets. Using regulatory data from the U.S. credit default swap market, we analyze how central clearing reshapes intermediation and risk-sharing between dealers and clients. While prior research has largely focused on clearing members, our findings highlight the economically significant yet underexplored role of clients in driving clearing adoption and influencing market structure.

We show that clearing improves netting efficiency for dealers and is associated with better pricing outcomes for clients. Clients that incur the fixed costs required to access CCPs expand their trading networks, suggesting that clearing enhances dealer competition. While client clearing generates durable shifts in intermediation patterns, it also introduces new constraints. Most clients are reliant on a small number of clearing members, selected based on existing relationships and credit quality, to provide clearing services. These concentrated agent relationships help dealers retain intermediation share, but also generate operational dependencies that may become systemically relevant during periods of stress.

Our results identify several frictions in derivatives markets, including prohibitive fixed costs, limited contract portability, and member concentration, that create significant barriers to clearing. These findings have important implications for the design of client clearing services and the regulation of CCP access. As clearing mandates expand into new asset classes, including U.S. Treasuries, facilitating client access to CCPs becomes increasingly critical to preserving both the functioning and systemic resilience of financial markets.

References

BCBS-IOSCO (2022). Client clearing: access and portability. Bank for International Settlements and International Organization of Securities Commissions.

Bellia, M., Girardi, G., Panzica, R., Pelizzon, L., and Peltonen, T. (2024). The demand for central clearing: To clear or not to clear, that is the question! *Journal of Financial Stability*, 72:101247.

Benos, E., Huang, W., Menkveld, A., and Vasios, M. (2024). The cost of clearing fragmentation. *Management Science*, 70(6):3581–3596.

Biais, B., Heider, F., and Hoerova, M. (2016). Risk-sharing or risk-taking? counterparty risk, incentives, and margins. *The Journal of Finance*, 71(4):1669–1698.

Bignon, V. and Vuillemey, G. (2020). The failure of a clearinghouse: Empirical evidence. *Review of Finance*, 24(1):99–128.

Biswas, G., Nikolova, S., and Stahel, C. W. (2015). The transaction costs of trading corporate credit. *Working Paper*.

Boissel, C., Derrien, F., Ors, E., and Thesmar, D. (2017). Systemic risk in clearing houses: Evidence from the european repo market. *Journal of Financial Economics*, 125(3):511–536.

Bowman, D., Huh, Y., and Infante, S. (2024). Balance-sheet netting in US Treasury markets and central clearing. *FEDS Working Paper*.

Carapella, F. and Monnet, C. (2020). Dealers' insurance, market structure, and liquidity. *Journal of Financial Economics*, 138(3):725–753.

Cenedese, G., Ranaldo, A., and Vasios, M. (2020). OTC premia. *Journal of Financial Economics*, 136(1):86–105.

Contiguglia, C. (2015). JP Morgan warns on swaps clearing. *Risk.net*.

CPMI-IOSCO (2021). Central counterparty default management auctions – issues for consideration. (210). Bank for International Settlements.

Du, W., Gadgil, S., Gordy, M. B., and Vega, C. (2019). Counterparty risk and counterparty choice in the credit default swap market. Finance and Economics Discussion Series 2016-087, Board of Governors of the Federal Reserve System.

Du, W., Gadgil, S., Gordy, M. B., and Vega, C. (2024). Counterparty risk and counterparty choice in the credit default swap market. *Management Science*, 70(6):3808–3826.

Duffie, D., Scheicher, M., and Vuillemey, G. (2015). Central clearing and collateral demand. *Journal of Financial Economics*, 116(2):237–256.

Duffie, D. and Zhu, H. (2011). Does a central clearing counterparty reduce counterparty risk? *The Review of Asset Pricing Studies*, 1(1):74–95.

Eisfeldt, A. L., Herskovic, B., Rajan, S., and Siriwardane, E. (2023). OTC intermediaries. *The Review of Financial Studies*, 36(2):615–677.

Ghamami, S., Paddrik, M., and Zhang, S. (2023). Central counterparty defaufllt waterfalls and systemic loss. *Journal of Financial and Quantitative Analysis*, 58(8):3577–3612.

Heilbron, J. (2024). Central clearing and trade cancellation: The case of london metal exchange nickel contracts on march 8, 2022. *Journal of Financial Market Infrastructures*.

Hellmann, T., Lindsey, L., and Puri, M. (2008). Building relationships early: Banks in venture capital. *The Review of Financial Studies*, 21(2):513–541.

Huang, W., Menkveld, A. J., and Yu, S. (2021). Central counterparty exposure in stressed markets. *Management Science*, 67(6):3596–3617.

Kubitza, C., Pelizzon, L., and Sherman, M. G. (2024). Loss sharing in central clearinghouses: Winners and losers. *The Review of Asset Pricing Studies*, 14(2):237–273.

Loon, Y. C. and Zhong, Z. K. (2014). The impact of central clearing on counterparty risk, liquidity, and trading: Evidence from the credit default swap market. *Journal of Financial Economics*, 112(1):91–115.

Loon, Y. C. and Zhong, Z. K. (2016). Does Dodd-Frank affect OTC transaction costs and liquidity? Evidence from real-time CDS trade reports. *Journal of Financial Economics*, 119(3):645–672.

Lopez, J. A. C., Harris, J. H., Hurlin, C., and Pérignon, C. (2017). Comargin. *Journal of Financial and Quantitative Analysis*, 52(5):2183–2215.

Menkveld, A. J. (2017). Crowded positions: An overlooked systemic risk for central clearing parties. *The Review of Asset Pricing Studies*, 7(2):209–242.

Menkveld, A. J. and Vuillemey, G. (2021). The economics of central clearing. *Annual Review of Financial Economics*, 13:153–178.

Onur, E., Reiffen, D., and Sharma, R. (2024). The impact of margin requirements on voluntary clearing decisions. *Journal of Financial Markets*, 68:100892.

Paddrik, M., Rajan, S., and Young, H. P. (2020). Contagion in derivatives markets. *Management Science*, 66(8):3603–3616.

Paddrik, M. and Young, H. P. (2021). How safe are central counterparties in credit default swap markets? *Mathematics and Financial Economics*, 15(1):41–57.

Rennison, J. (2015). Hurdles remain in reviving single-name CDS. *Financial Times*.

Smith, R. M. (2015). Fears mount over CCP client porting. *Risk.net*.

Sun, L. and Abraham, S. (2021). Estimating dynamic treatment effects in event studies with heterogeneous treatment effects. *Journal of Econometrics*, 225(2):175–199.

Vuillemey, G. (2020). The value of central clearing. *The Journal of Finance*, 75(4):2021–2053.

Yasuda, A. (2005). Do bank relationships affect the firm's underwriter choice in the corporate-bond underwriting market? *The Journal of Finance*, 60(3):1259–1292.

Clearing Market Incentives and Competition

Supplemental Appendices

Salil Gadgil

Robin L. Lumsdaine

Mark Paddrik

Appendix A Data Cleaning

A.1 Clearing Member Accounts

Steps to identifying member firms and the clients they clear for with ICE Clear Credit.

1. Use the new transactions data to extract information on clearing agents. To do so, subset down to trades where the 'counterparty_org_id' is ICE Clear Credit and then look at 'clearing_agent' (this is an account identity), 'post_cntra_firm_org_id' (this is an organization identity), 'post_cntra_firm_accnt_nm' (this is a firm name), and 'post_cntra_fund_long_nm' (this is finer classification than firm name). This method gives us 30 clearing agents that map 1-1 onto the 30 clearing members listed on ICE's website (https://www.ice.com/clear-credit/participants).

2. For old positions and transactions, clearing agent information can be pulled from 'counterparty_block_account_id' for records where ICE Clear Credit is the counterparty. The 'clearing_agent' ID is embedded in 'counterparty_block_account_id' immediately after eight characters that form a date. This method allows us to identify the clearing agent for 95% of the roughly seven million positions based on information extracted in step 1. There are five unidentified clearing agents IDs that account for all but roughly one thousand positions of the remaining 5%. Note that these five unidentified agents stopped appearing in the data at some point before DTCC transitioned to their new portal at the end of 2022.

3. Four of the five unidentified agents were identified because all of the trades were done with same dealer bank who is a current member.

4. To get the funds full name for these four previously unidentified agents, we first figure out the first and last date that each of the 35 clearing agents clears a trade. The last trade dates for the four previously unidentified agents correspond closely to the first trade dates of four agents that do appear in the new data. It seems reasonable to assume, therefore, that the 'clearing_agent' account numbers just changed at some point. We confirm that these current funds full name also existed in the past by verifying that they appear in an old ICE press release: https://www.prnewswire.com/news-releases/ice-trust-to-transition-to-ice-clear-credit-

under-dodd-frank-fcmbd-clearing-members-added-total-cds-cleared-by-ice-exceeds-20-trillion-milestone-125629193.html

5. We also use the press release in step 4 to figure out the unidentified clearing agent. All of the members listed in the release are accounted for in steps 1-4, with the exception of Deutsche Bank Securities Inc. The last trade date for this final agent also happens to be in 2017, which aligns with Deutsche Bank scaling down their CDS business starting at the end of 2015.

Appendix B Interdealer Clearing Choice

Table B.1 presents results when we investigate the decision to clear dealer-to-dealer trades. The seller's CDS spread enters positively when buyer fixed effects are included in Columns 2 and 3 and the buyer's CDS spread enters positively when we use seller fixed effects in Columns 4 and 5. These estimates accord with our earlier results showing that customers are sensitive to counterparty risk. They are also consistent with those of Bellia et al. (2024), who consider a narrower sample of interdealer trades referencing three sovereign reference entities prior to the adoption of UMR. The positive coefficients for Buyer Net Seller wrt CCP when the buyer's identity is held fixed and on Seller Net Buyer wrt CCP when the seller's identity is held fixed affirm that dealers seek to optimize their collateral burden. These estimates are also qualitatively similar to those from Onur et al. (2024), who study the behavior of clearing members in exchange rate derivatives markets, and Bellia et al. (2024).

Table B.1: Clearing Choice: Interdealer

	Interdealer Trades				
	(1)	(2)	(3)	(4)	(5)
Log Seller CDS	0.136^{***}	0.324^{***}	0.400^{***}	-0.473^{***}	-0.173^{**}
	(0.015)	(0.017)	(0.020)	(0.054)	(0.069)
	[0.021]	[0.048]	[0.063]	[-0.068]	[-0.027]
Log Buyer CDS	0.217^{***}	-0.436^{***}	-0.208^{***}	0.428^{***}	0.504^{***}
	(0.015)	(0.054)	(0.069)	(0.017)	(0.020)
	[0.034]	[-0.064]	[-0.033]	[0.062]	[0.078]
Buyer Net Seller wrt CCP	0.174^{***}	0.031^{***}	0.016^{*}	0.201^{***}	0.202^{***}
	(0.007)	(0.008)	(0.010)	(0.008)	(0.009)
	[0.027]	[0.005]	[0.003]	[0.029]	[0.031]
Seller Net Buyer wrt CCP	-0.014^{**}	-0.037^{***}	-0.059^{***}	0.081^{***}	0.074^{***}
	(0.007)	(0.008)	(0.009)	(0.008)	(0.010)
	[-0.002]	[-0.005]	[-0.009]	[0.012]	[0.011]
Log Reference Entity Spread	-0.299^{***}	-0.326^{***}	-0.423^{***}	-0.313^{***}	-0.386^{***}
	(0.003)	(0.004)	(0.009)	(0.004)	(0.009)
	[-0.047]	[-0.048]	[-0.067]	[-0.045]	[-0.059]
Log Notional	-0.315^{***}	-0.315^{***}	-0.333^{***}	-0.332^{***}	-0.357^{***}
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
	[-0.050]	[-0.046]	[-0.052]	[-0.048]	[-0.055]
Month FE	Y				
Buyer x Month FE		Y	Y		
Seller x Month FE				Y	Y
Ref. Entity x Month FE			Y		Y
Num. obs.	508,925	498,198	382,986	500,583	384805
Log Likelihood	$-239,187.038$	$-219,804.072$	$-181,625.802$	$-217,721.109$	-179414.049
Pseudo R^2	0.235	0.279	0.225	0.289	0.237

Note: This table presents results from logistic regressions for the decision to clear a single-name CDS transaction, using the sample of interdealer trades. Column (1) contains results from the baseline regression; columns (2)-(3) incrementally add buyer x month fixed effects and reference entity x month fixed effects; columns (4)-(5) analogously incrementally add seller x month fixed effects and reference entity x month fixed effects. $^{*}p < .1, ^{**}p < .05, ^{***}p < .01$
Source: The Depository Trust & Clearing Corporation, Authors' analysis.