

## Clients heterogeneity and bilateral oligopoly in credit derivatives markets

**Laurence Daures**  
*ESSEC Business School*

joint with A. Fülöp (ESSEC Business School) & Y. Gündüz (Deutsche Bundesbank)

ESEM, August 26, 2024

## Disclaimer

The views expressed are those of the authors and not necessarily those of the Deutsche Bundesbank or the Eurosystem.

## Motivation

- This paper investigates how the market power of customers relative to dealers impact transaction costs.
- The ability of large customers to extract price improvement by dealers is also termed as customers' countervailing power. Concept coined by Galbraith (1952).
- While the market microstructure literature mainly focuses on dealers' market power, we investigate customers' market structure and bargaining power relative to dealers'.

## A unique setting

The single-name CDS market: a very controversial OTC market

- Opaque even after transparency and standardization efforts:
  - ▶ Requirement to report transactions to a repository (Dodd-Franck / EMIR)
  - ▶ but ...
  - ▶ ... no requirement to trade on SEFs: very little single-name CDS trading on SEFs (unlike index CDSs)
  - ▶ ... no requirement to be centrally cleared: around 50% SN-CDS are centrally cleared.
  - ▶ ... individual transaction prices and volumes are not publicly reported (unlike corporate bonds). Only regulators have access (with a delay of 2, 3 or 5 days) to detailed transaction data.
- Concentrated: a small number of very large bank-dealers intermediate nearly all trades (Brunnermeier et al., 2013; Abad et al., 2016)

Lack of transparency and concentration provide opportunities for bank-dealers to exert market power. However, dealers face **very specific customers**.

## A very specific buyside

- 1 The CDS buyside is sophisticated and presumably well-informed (asset managers, hedge funds, insurers, or banks). **Almost no retail traders.**
- 2 Non-banks institutions have grown in importance in the functioning of financial markets after the 2008 GFC.
  - ▶ The size of the corporate bond market has almost doubled between 2008 and 2018;
  - ▶ The market share of mutual funds and bond ETFs has more than doubled between 2006 and 2016 (from 7% to 18%)
  - ▶ Move to an “asset manager capitalism” (Braun, 2021). (The “Big Three” (BlackRock, Vanguard Group, and State Street Corp.) collectively own about 22% of the average S&P 500 company from 13.5% in 2008.)

### Research questions:

- Are institutional investors **in a position to counter the power** of large CDS dealers?
- What are the drivers of the countervailing bargaining power of clients?

## Main results

- 1 We show that customers' market structure matters and more buy-side concentration is associated with lower markups. Positive influence of the buy-side oligopsony on prices.
- 2 We also find evidence of price discrimination across customers:
  - ▶ More sophisticated customers (with more dealer connections) obtain better prices
  - ▶ More informed non-bank customers receive worse prices

## Related literature

- Role of bilateral dealer-client relationships on price formation and execution quality in OTC (Over-The-Counter) markets:
  - ▶ the corporate bond market: Di Maggio, Kermani and Song (2017), O'Hara, Wang and Zhou (2018), Hendershott et al (2020), Jurkatis et al (2022)
  - ▶ the FX derivatives market: Hau, Hoffman, Langfield and Timmer (2019)
- Market power in dealer markets:
  - ▶ the NASDAQ market: see, among others, Christie and Schultz (1994)
  - ▶ the Muni market: Green, Hollifield and Schürhoff (2007)
- Functioning of CDS markets
  - ▶ Qiu and Yu (2012), Loon and Zhong (2014), Gündüz et al (2015), Oehmke and Zawadowski (2016), Tang and Yan (2017), Collin-Dufresne et al (2020b) or Riggs et al (2020)

# Outline

1 Motivation

2 Hypotheses

3 Data and descriptive statistics

4 Empirical results

5 Conclusion and implications



## Hypotheses development

We develop 2 set of hypotheses about customers' market concentration and their ability to bargain price improvements.

- Prices in OTC markets are set by dealers, customers are price-takers and unable to negotiate better prices ([our null hypothesis](#)).
- However ongoing process of consolidation in the asset management industry: emergence of granular market participants which actively take part to the market (see, for instance, BlackRock leading the SIFMA's Asset Management group to voluntarily clear and revive the SN CDS market in March 2015.)

**H1:** Dealers and customers both exercise market power (bilateral oligopoly).

## Hypotheses development - cont'd

The possibility of no bargaining power (the null H2) is unlikely because

- the SN-CDS market is a non-anonymous OTC market in which interactions between market participants and dealers are frequent and repeated.
- price improvement is a pervasive feature of OTC markets.

Price improvements may result from **2 channels**

① **A market power/sophistication channel:**

- ▶ Larger customers have more bargaining power due to their **size** (Rhodes-Kropf, 2005).
- ▶ More regular customers also obtain better prices and submit in turn larger order - **Relationship discount** (Bernhardt et al, 2005).
- ▶ **Sophisticated** customers with **better “outside options”** expose dealers to “sequential competition” to obtain better prices (Duffie et al, 2005).

**H2-1:** Larger traders or more sophisticated customers obtain better prices due to more bargaining power.

## Hypotheses development - cont'd

### ② The motive to trade is the second channel:

- ▶ Customers **with less information** are rewarded (Seppi, 1990). When they are uninformed, customers who repeatedly interact with dealers and who can credibly signal that they are uninformed ask for price improvement.
- ▶ Dealer condition price improvements on the profitability of their past transactions with each customer (Desgranges and Foucault, 2005)

**H2-2(Adverse selection):** More informed customers receive worse prices.

- ▶ This view is challenged in totally opaque markets. Dealers might be willing to attract orders from informed customers in a first stage to make more trading profit in subsequent periods using this information (Madhavan, 1995, Bloomfield and O'Hara, 1999)
- ▶ Dealers might also chase informed traders to avoid winner's curse when trading later (Pinter et al, 2020)

**H2-2a(Information chasing):** Trading with an informed party is valuable. More informed customers obtain better prices.

# Outline

1 Motivation

2 Hypotheses

3 Data and descriptive statistics

4 Empirical results

5 Conclusion and implications

# Data

We exploit a unique **non-anonymous** trade-level data

- **Source**

- ▶ Secondary transactions about corporate single-name (SN) CDS from the Trade Information Warehouse (TIW), a service operated by the Depository Trust & Clearing Corporation
- ▶ Consists of transactions related to all corporate CDS transactions that include a **German** reference entity.

- **Characteristics of data**

- ▶ The data contains **identities of both counterparties** for each transaction
- ▶ Intra-daily time stamp of the data not reliable, we only use daily time stamp

- **Time span:** July, 2009 to December, 2016

- **Sample:** We keep new, confirmed, and standardized trades in EUR-denominated senior CDS, and only non-centrally cleared DTC trades. Final sample is made of 32,560 uncleared DTC trades. They took place between **492 customers and 22 dealers**.

## Main variables

We use:

- The absolute difference (in par spreads) between the trade price and benchmark price as our transaction costs measure:

$$Markup_{ij,t,d,c} = |TradePrice_{ij,t,d,c} - Market\_EOD\_Price_{j,t-1}|$$

A similar measure is used by Boyarchenko, Costello and Shachar (2019) or Rehse, Riordan, Rottke, and Zietz (2019). The EOD benchmark price is lagged to make sure it precedes the trade (as Market benchmarks are closing prices)

- Standard measures of market concentration:
  - ▶ Herfindahl-Hirschman Index (HHI)

$$HHI\_D_{q,m} = \sum_{d=1}^{N_{q,m}} (s_{d,q,m})^2 \times 10,000.$$

where  $s_{d,q,m}$  denote the market share of dealer  $d$  during quarter  $q$ .

- ▶ Four-(resp. Two-) firm concentration ratio (or “CR4”, resp. “CR2”) which combines the market share of the four (resp., two) largest dealers:

$$CR4_{q,m} = \sum_{d=1}^4 s_{d,q,m}.$$

## Additional control variables

We show that transaction costs are affected by:

- ① Transaction characteristics:
  - ▶ Size (notional amount)
  - ▶ Maturity (tenor)
  - ▶ Probability of default (proxied by the CDS Markit Spread)
- ② Time-varying CDS trading activity of the reference entity
  - ▶ Total trading activity over the quarter of the reference entity
  - ▶ CDS Volatility of the reference entity
- ③ Counterparty risk
  - ▶ German customers wishing to sell a CDS written on a German reference entity might pay extra costs (buyers of CDS tend to avoid wrong-way risk)
  - ▶ Therefore, we proxy counterparty risk by an interaction variable  $d\_German \times d\_Cust\_Sell$
- ④ Dealer funding costs

## Summary Statistics - Reference entities characteristics

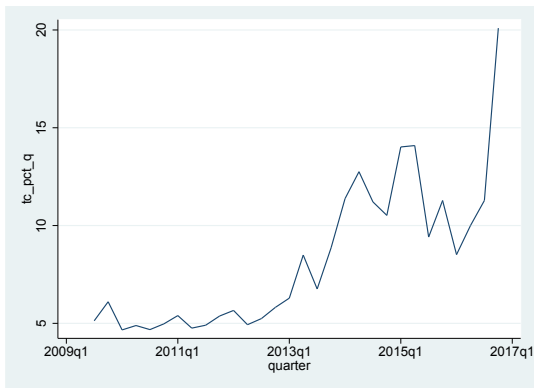
PANEL A						
Variable	N	mean	std. dev.	p50	p25	p75
Markup (in bps)	30,830	9.86	10.47	6.36	3.06	11.75
Markit CDS spread (in bps)	30,830	139	107	107	73	169
Notional Amount (in million EUR)	30,830	4	6	3	1	5
d_German	30,830	0.14	0.34	0.00	0.00	0.00
d_Cust_Sell	30,830	0.42	0.49	0.00	0.00	1.00
Maturity	30,830	4.9	1.3	5.1	5.0	5.2
Dealer CDS spread (in bps)	30,798	115	62	94	74	135

- Magnitude of average transaction costs, almost 10 bps: very similar to Boyarchenko et al (2019) (and anecdotally to what is reported in the New York Times of Dec 11, 2010).
- 42% of customers sell CDS
- Global market: only 14% of customers are German (2 dealers are German)
- Average 5-Y maturity (or tenor) and 4 mil Eur Notional amount are pretty standard.



## Empirical evidence: rise of transaction costs over our sample period

D2C markups (expressed in %) have increased over time:



## Concentration statistics

PANEL B						
variable	N	mean	std. dev.	p50	p25	p75
HHI_Dq	30	1,240	229	1,210	1,043	1,395
HHI_CUST_q	30	432	156	392	338	508
CR4_D_q	30	59	7	58	53	64
CR2_D_q	30	37	6	36	33	40
CR4_CUST_q	30	31	6	30	27	35
Nb_Dealers_q	30	9	3	9	8	11
Nb_Cust_q	30	23	19	20	13	29

- Concentrated market with only 9 different dealers each quarter, on average (over a total of 22 dealers in our sample).
- The two largest dealers capture a market share of 37% on average.
- Customers **rather concentrated**: only 23 different customers each quarter on average across reference entities (over a total of 492 customers). The two largest customers capture a market share of 20% on average.

# Increase in dealers' and customers' concentration during our sample period

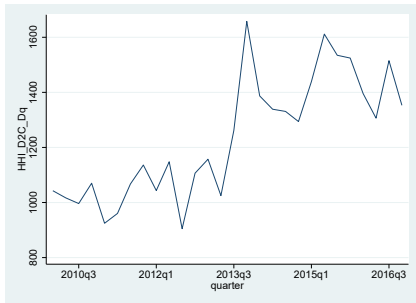


Figure: Dealers' concentration

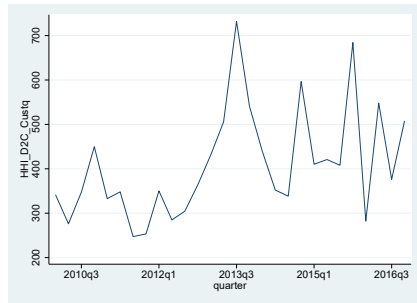


Figure: Customers' concentration

(Decomposition between European and US dealers)

# Outline

1 Motivation

2 Hypotheses

3 Data and descriptive statistics

**4 Empirical results**

5 Conclusion and implications

## Does customers' market structure matter?

- We run the following panel regression to test our bilateral oligopoly hypothesis H1 :

$$\text{Markup}_{i,c,d,t} = a + b \times \text{HHI\_D}_{i,q} + c \times \text{HHI\_Cust}_{i,q} + \mathbf{d} \times \mathbf{W}_{i,c,d,t} + u_i (+\delta_c + \gamma_d) + v_{i,c,d,t},$$

where *Markup* is our measure of markups, and *HHI\_D* is the right-hand side variable of interest.

- **W** contains all control variables that could affect markups (CDS characteristics, trading activity, counterparty risk related to customer *c*, and funding costs of dealer *d*).

## Does customers' market structure matter? Results

Determinants	log(Markup)				
	(1)	(2)	(3)	(4)	(5)
HHI_D2C_Dq	8.594*** (6.84)	7.314*** (7.03)	9.092*** (8.50)		
HHI_D2C_Custq	-4.608 *** (-3.89)	-3.787*** (-3.38)	-6.064*** (-5.20)		
CR4_D_q				0.025*** (7.71)	
CR4_CUST_q				-0.005** (-2.00)	
CR2_D_q					0.023*** (5.95)
CR2_CUST_q					-0.005* (-1.88)
Control Variables	Yes	Yes	Yes	Yes	Yes
Dealer & Customer FE	No	Yes	Yes	Yes	Yes
Ref. Ent. FE	Yes	Yes	Yes	Yes	Yes
N	30830	30830	24484	30830	30830
R-squared	0.2	0.24	0.24	0.25	0.24

- Bilateral oligopoly: Higher dealers' concentration is related to higher markups, while higher customers' concentration is related to lower markups. **Rejecting the null hypothesis H1.**

## Customers categories

- 492 institutional customers in our sample, classified into 4 groups:
  - ▶ **Asset Managers (AM)**: 38% of all customers, representing around 36% of total trading volume, and with very different sizes (measured in AUM expressed in trillions USD)
  - ▶ **Hedge funds (HF)**: 36% of all customers and counterparty of 36% of the total trading volume
  - ▶ **Banks (Banks)**: 24% of all customers and 26% of all trades, with very different sizes (measured by the size of the balance sheet expressed in trillions USD)
  - ▶ **OTHER customers** are rather small and trade infrequently: around 2% of all customers and 2% of the total trading volume

N	Asset Managers 15,567		Hedge Funds 8,909		Banks 5,755		Other 599	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Markup	8.96	5.82	11.93	7.40	8.75	6.46	13.32	9.23
Notional amount	3.23	1.14	5.46	4.20	5.87	5.00	4.97	4.4
Size (AUM in trillions USD)	1.96	1.28	0.05	0.01	0.37	0.28	0.14	0.07

- ▶ Asset managers and banks seem to receive better execution. Hedge funds and other small customers are charged higher markups.

## Customers' trading behavior

We use 2 types of characteristics for exploring customers' trading behavior :

- 1 the degree of “sophistication”, or market power
  - ▶ Total number of dealers (or counterparties) with whom the client trades
  - ▶ The trading fragmentation index of the customer (the inverse HHI for each client computed based on the client's trading volume across different dealers) - not all dealers are equally important for the execution of trades.
  - ▶ Customer's activity (overall trading activity in the German SN-CDS market)
  - ▶ A variable proxying for the dealer-client relationship the year before:

$$s_{d,c,y-1} = \frac{Vol_{d,c,y-1}}{Vol_{d,y-1} \times 100}$$

- ▶ Size (AUM)
- 2 the degree of informativeness

- ▶ We define a measure of price impact for each transaction at 3- and 5-days:

$$PI_{j,c,t+D} = d_{i,c} \times (\ln(\text{Markit\_EOD\_Price}_{j,t+D}) - \ln(\text{Markit\_EOD\_Price}_{j,t-1})), \quad (1)$$

where  $D$  is the horizon ( $D=3$ -day, 5-day) and  $d$  is an indicator variable that takes 1 if the customer  $c$  is buyer of the transaction  $i$  and -1 if she is a seller.

- ▶ Similar to the “anticipation” component in Kondor and Pinter (2022).



## Descriptive statistics by customers' category

Variable	Asset Managers		Hedge Funds		Banks		Other	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Trading fragmentation index	6.10	6.44	4.85	3.09	8.66	9.44	2.36	1.00
Total # dealers	10.76	12.00	9.17	10.00	14.75	16.00	3.03	1.00
Total customer activity	4,754	1,727	2,134	1,815	3,909	2,453	1,081	1,638
Price Impact (3 days)	2.90	1.17	4.35	2.16	1.25	0.42	1.29	0.65
Price Impact (5 days)	3.13	1.38	4.65	2.17	1.93	0.70	-0.47	0.23
Trading frag. index	6.15	6.62	4.85	3.09	8.28	9.44	1.56	1.00
Total # dealers	10.76	12.00	9.17	10.00	13.94	15.00	2.15	1.00

- Asset managers are very active. But divergence between the mean and the median: presence of very small asset managers that trade CDSs infrequently.
- Asset managers and banks have larger dealer network.
- OTHER are less informed have less outside options, and trade less.
- Customers' transactions with higher price impact tend to have less dealer connections: Hedge funds vs. banks
  - ▶ More informed customers (Hedge Funds) seem to trade, on average, with a smaller dealer network, presumably to avoid information leakage.
  - ▶ In line with the findings of Collin-Dufresne et al (2020) in the FX derivatives market but unlike Kondor and Pinter (2022) in the gilt market.

## Pooling all characteristics

	log(Markup)			
	(1)	(2)	(3)	(4)
Relationship_ClientDealer	0.139*** (2.94)	0.143*** (3.03)	0.148*** (3.17)	0.1*** (2.08)
Size	-0.012 (-1.58)	-0.012 (-1.55)	-0.011 (-1.56)	-0.011 (-1.52)
Total # dealers		-0.016*** (-3.89)	-0.017*** (-3.98)	-0.017*** (-4.04)
Price Impact_3d			0.005*** (2.89)	0.005*** (2.81)
HHI_D2C_Dq				5.855*** (4.89)
HHI_D2C_Custq				0.916 (0.67)
Notional Amount	-0.005*** (-2.71)	-0.005*** (-2.94)	-0.005*** (-2.89)	-0.004** (-2.19)
d_German X d_Cust_Sell	0.127* (1.95)	0.111* (1.69)	0.12* (1.82)	0.125* (1.89)
Control Variables	Yes	Yes	Yes	Yes
Dealer FE	Yes	Yes	Yes	Yes
Ref. Ent. FE	Yes	Yes	Yes	Yes
N	24,308	24,308	24,308	24,308
R-squared	0.22	0.22	0.22	0.23

- More informed customers receive worse prices.
- Sophisticated customers with more outside option receive better prices
- Size is not significant
- We have a relationship client-dealer premium, unlike Jurkatis et al (2022) in the corporate bond market. Close to Pinter et al. (2024).

## Disparities between groups

	log(Markup)				
	AM (1)	HF (2)	(3)	Banks (3b)	Other (4)
Relationship_ClientDealer	0.208*** (2.78)	-0.091 (-1.35)	0.13 (0.49)	0.254 (0.34)	-0.278 (-0.51)
Total # dealers	-0.015* (-1.77)	-0.021*** (-3.57)	0.01 (0.95)	0.003 (0.14)	-0.186** (-2.27)
Price Impact_3d	0.008** (2.2)	0.004** (2.17)	0.001 (0.52)	-0.001 (-0.67)	0 (-0.05)
d_relationship_lender	0 (.)	0 (.)	-0.057 (-1.10)	-0.234** (-1.98)	0 (.)
HHI_D2C_Custq	2.688 (1.34)	-1.712 (-0.87)	1.217 (0.72)	-1.687 (-0.47)	0.727 (0.08)
HHI_D2C_Dq	5.841*** (2.96)	6.299*** (3.64)	7.07*** (5.62)	2.725 (1.09)	9.108** (2.01)
Dealer FE	Yes	Yes	Yes	Yes	Yes
Ref. Ent. FE	Yes	Yes	Yes	Yes	Yes
N	12,545	6,453	4,882	1,008	428
R-squared	0.26	0.26	0.14	0.21	0.42

- More informed asset managers or hedge funds receive worse prices
- Better prices are received if more dealers are contacted for non-bank customers.
- Banks are a specific group. We use credit-registry data to build a relationship-lender dummy. There is a discount when the reference entity is in financial distress.
- Dealers' market power has a significant negative impact on every group.

# Outline

1 Motivation

2 Hypotheses

3 Data and descriptive statistics

4 Empirical results

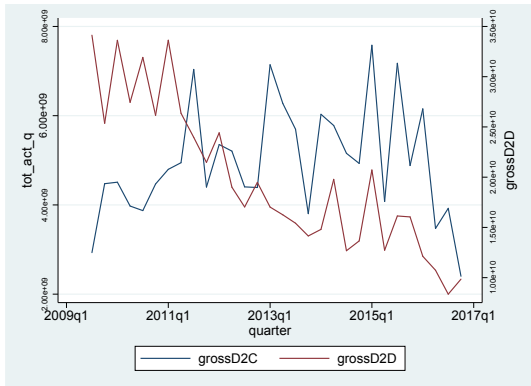
5 Conclusion and implications

## Conclusion

- Institutional investors are more aware of potential anticompetitive practices of dealers and have also grown in importance and in bargaining power. We find evidence that the CDS market structure is that of a bilateral oligopoly.
- Less informed non-bank customers or non-bank sophisticated customers with more outside options obtain better prices.
- However, despite the positive effect of customers' concentration, We find that dealers' market concentration is always significantly related to higher markups, in accordance with dealers enjoying market power.
- Regulators should push towards more competition or more transparency (for instance by developing SEFs trading) to limit dealers' market power.

# Appendices

## Trend in overall trading activity during our sample period

[Back](#)

## Evolution of the market share of European vs. U.S. dealers during our sample period

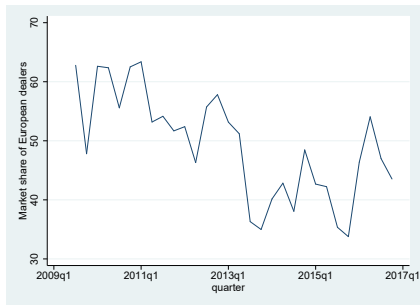


Figure: European dealers

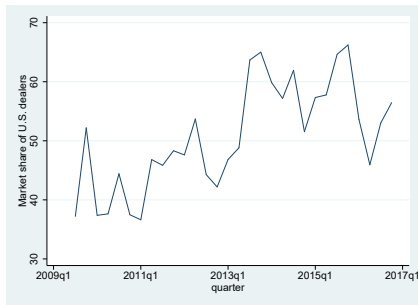


Figure: U.S. dealers

Back



## Dealer concentration and markups

Determinants	log(Markup)			
	(1)	(2)	(3)	(4)
HHI_Dq	7.598*** (6.49)	6.503*** (6.64)		
CR4_D.q			0.025*** (7.69)	
CR2_D.q				0.022*** (5.70)
CDS Markit Spread	0.133** (2.07)	0.117** (2.03)	0.083 (1.50)	0.095* (1.67)
Maturity	-0.022 (-1.62)	-0.015 (-1.18)	-0.009 (-0.68)	-0.011 (-0.83)
Notional Amount	-0.003* (-1.96)	-0.004*** (-3.12)	-0.003*** (-2.76)	-0.004*** (-3.40)
Lagged Trading Activity	0.054 (0.71)	0.012 (0.17)	0.017 (0.24)	0.009 (0.12)
Lagged Volatility	51.953** (2.05)	59.948*** (3.12)	50.413*** (2.60)	69.463*** (3.68)
d_German X d_Cust_Sell	0.223*** (3.65)	0.2*** (3.24)	0.202*** (3.29)	0.209*** (3.39)
d_Cust_Sell	0.034 (0.93)	0.068* (1.88)	0.082** (2.29)	0.069* (1.91)
d_German	-0.*087 (-1.78)	-0.941** (-2.09)	-0.845** (-2.02)	-0.995** (-2.17)
Lagged Dealer CDS	0.073* (1.66)	0.06 (1.05)	0.087 (1.57)	0.02 (0.36)
Dealer & Customer FE	No	Yes	Yes	Yes
Ref. Ent. FE	Yes	Yes	Yes	Yes
N	30830	30830	30830	30830
R-squared	0.2	0.24	0.25	0.24

- Higher dealer concentration is related to higher markups, **consistent with H1**.
- Robust to other IO concentration measures. (HHI at the reference entity level) (Multi-Market Contact)

## Dealers' market concentration at the reference entity level: impact on markups

### Multivariate analysis

variable	log(Markup)			
	(1)	(2)	(3)	(4)
HHI_D2C_Diq	0.729*** (4.64)	0.525*** (3.57)	0.382*** (2.68)	0.357** (2.43)
Control variables	Yes	Yes	Yes	Yes
Dealer & Customer FE	No	Yes	Yes	Yes
Time FE	No	No	Yes	Yes
Ref. Ent. FE	Yes	Yes	Yes	Yes
N	30830	30830	30830	24484
R-squared	0.19	0.24	0.26	0.25

- Higher dealer concentration is related to higher markups, corroborating previous results and H1.

Back

## Preliminary regression

Determinants	(log) Markup							
	(1)		(2)		(3)		(4)	
Notional Amount	-0.024	*	-0.022	*	-0.022	*	-0.026	***
	(-1.80)		(-1.83)		(-1.83)		(-2.89)	
Maturity	0.008		-0.008		-0.011		-0.004	
	(0.69)		(-0.59)		(-0.84)		(-0.31)	
CDS Markit Spread	0.043		0.097		0.082		0.078	
	(0.99)		(1.59)		(1.30)		(1.32)	
Lagged Trading Activity	0.162	**	0.134	*	0.142	*	0.092	
	(2.17)		(1.80)		(1.90)		(1.30)	
Lagged Volatility	50.1	*	51.083	*	51.854	*	65.445	***
	(1.84)		(1.87)		(1.90)		(3.37)	
d_German			0.118	***	-0.071		-0.058	
			(4.47)		(-1.45)		(-0.93)	
d_German × d_Cust_Sell					0.217	***	0.196	***
					(3.59)		(3.24)	
d_Cust_Sell					0.039		0.06	*
					(1.05)		(1.75)	
Lagged Dealer CDS			-0.096	*	-0.09	*	-0.049	
			(-1.94)		(-1.79)		(-0.81)	
Intercept	1.734	***	1.961	***	2.007	***	1.906	***
	(7.89)		(7.61)		(7.73)		(7.69)	
Ref. Ent. FE	Yes		Yes		Yes		Yes	
Dealer / Customer FE	No		No		No		Yes	
N	32,560		30,830		30,830		30,830	
R-squared	0.19		0.19		0.19		0.22	

- Counterparty risk of the customer strongly and significantly related to markups.
- Trade size negatively related to transaction costs, consistent with existing evidence on OTC markets (Hansh et al, 1999, Bernhardt et al, 2005). Also consistent with H2-1. O'Hara et al (2018) and Hau et al (2020) also finds that smaller trades obtain worse prices
- Higher trading activity related to higher transaction costs, consistent with the CDS market being an event-driven market

## Dealers' market power and multi-market contact

Dealers engaged in **multi-market competition** to provide liquidity.

- From the IO banking literature: multi-market contact (*MMC*) is a device for lessening competition. Less incentives to compete aggressively in a given reference entity if dealers fear rival's retaliation in others.
- In our sample,  $MMC_d = 11$  : on average, dealer  $d$  meets the same competitor in 11 markets (among 35).

Determinants	(log) Markup			
	(1)		(2)	
Lagged MultiMarketContact	0.036	***	0.033	***
	(5.55)		(4.88)	
Control Variables	Yes		Yes	
Ref. Ent. FE	Yes		Yes	
Dealer / Customer FE	No		Yes	
N	30,808		30,808	
R-squared	0.2		0.23	

- Markups significantly worsen when dealers have more contacts, corroborating multi-market strategic behavior of dealers and H1.

## Dealers' market power and the cross-sectional heterogeneity of trading activity

We expect higher markups in more illiquid and concentrated CDSs, as dealers enjoy a larger degree of market power (Lagos and Rocheteau, 2009)

- we split the trading activity of the reference entity into tertile. The highest tertile corresponds to more liquid names.

Determinants	(log) Markup	
	(1)	(2)
Lagged $d_{[0,33]} \times$ Lagged $HHL D_{oq}$	2.964 (1.32)	2.627 (1.19)
Lagged $d_{[0,33]}$	-0.397 (-1.36)	-0.366 (-1.27)
Lagged $d_{[66,100]} \times$ Lagged $HHL D_{oq}$	-5.023 *** (-3.06)	-4.984 *** (-3.11)
Lagged $d_{[66,100]}$	0.465 ** (2.23)	0.472 ** (2.33)
Lagged $HHL D_{oq}$	9.805 *** (7.60)	9.864 *** (7.69)
Control Variables	Yes	Yes
Ref. Ent. FE	Yes	Yes
Dealer / Customer FE	No	Yes
N	30830	30830
R-squared	0.21	0.22

- Relationship between higher dealers' concentration and markups is significantly weaker for more liquid names. [Corroborating H1.](#)

# Markups and groups of customers

## Multivariate setting

	log(Markup)		
	(1)	(2)	(3)
d_AM	-0.108*	-0.126*	-0.141**
	(-1.66)	(-1.91)	(-1.99)
d_HF	-0.07	-0.083	-0.099
	(-1.01)	(-1.24)	(-1.42)
d_Banks	-0.122*	-0.112	-0.121*
	(-1.71)	(-1.58)	(-1.65)
HHI_D <sub>q</sub>		8.203***	10.169***
		(6.82)	(8.42)
HHI_Cust <sub>q</sub>		-4.54***	-7.131***
		(-3.80)	(-5.78)
Intercept	1.68***	0.05	-0.309
	(7.72)	(0.15)	(-0.90)
Control Variables	Yes	Yes	Yes
Dealer FE	Yes	Yes	Yes
Ref. Ent. FE	Yes	Yes	Yes
N	30,787	30,787	24,441
R-squared	0.2	0.21	0.20

- AM and banks receive better execution.

## Relation between clients' sophistication and transaction costs

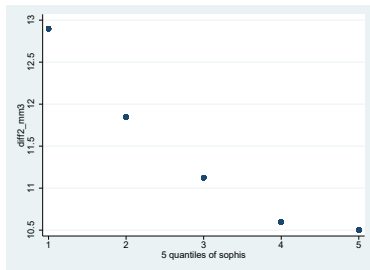


Figure: Trading fragmentation index

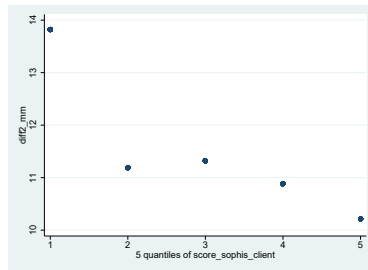


Figure: Sophistication score

## Markups and customers' sophistication

	log(Markup)			
	(1)	(2)	(3)	(4)
Trading fragmentation index	-0.011** (-2.18)			
Total # dealers		-0.011*** (-3.00)		
log_Total_customer_activity			-0.01 (-1.09)	
Score_sophistication				-0.561** (-2.30)
HHI_Dq	8.059*** (6.64)	8.12*** (6.76)	8.176*** (6.85)	8.116*** (6.74)
HHI_Custq	-4.564*** (-3.84)	-4.513*** (-3.80)	-4.575*** (-3.86)	-4.527*** (-3.81)
Control variables	Yes	Yes	Yes	Yes
Dealer FE	Yes	Yes	Yes	Yes
Ref. Ent. FE	Yes	Yes	Yes	Yes
N	30830	30830	30830	30830
R-squared	0.21	0.21	0.21	0.21

- More sophisticated customers receive better execution. **Corroborating hypothesis H2-1.**