The Paradox of Conservative Haircuts

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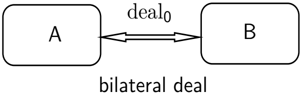

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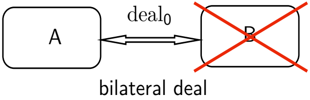

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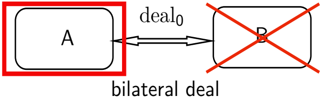

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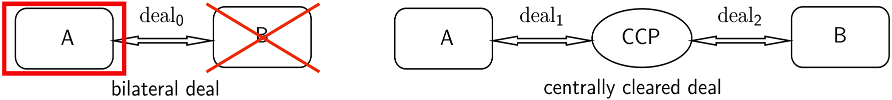

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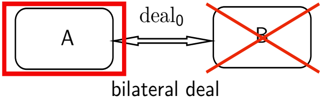

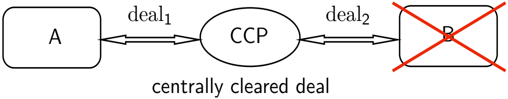

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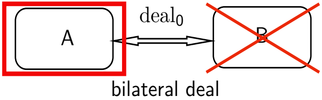

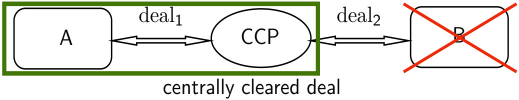

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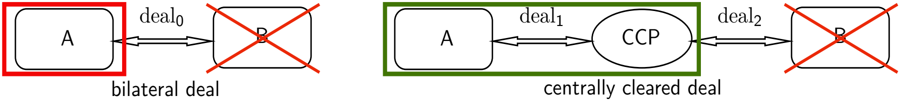

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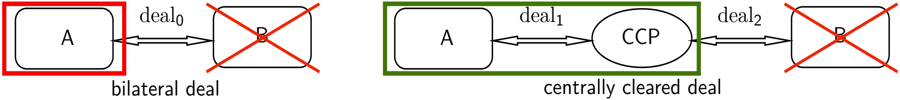

- CCPs concentrate risks and, therefore, are systemically important.
- Centralized clearing is spreading across contract types.

"...it is an understatement that it would be a disaster if a clearing house failed." (Paul Tucker, Deputy Governor for Financial Stability at the Bank of England)

Stability of CCPs

Are CCPs financially stable?

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How well are CCPs protected by their risk-management systems?

The role of collateral

CCPs have multi-layer risk-management systems:

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Is there a **downside** to excessive collateral requirements?

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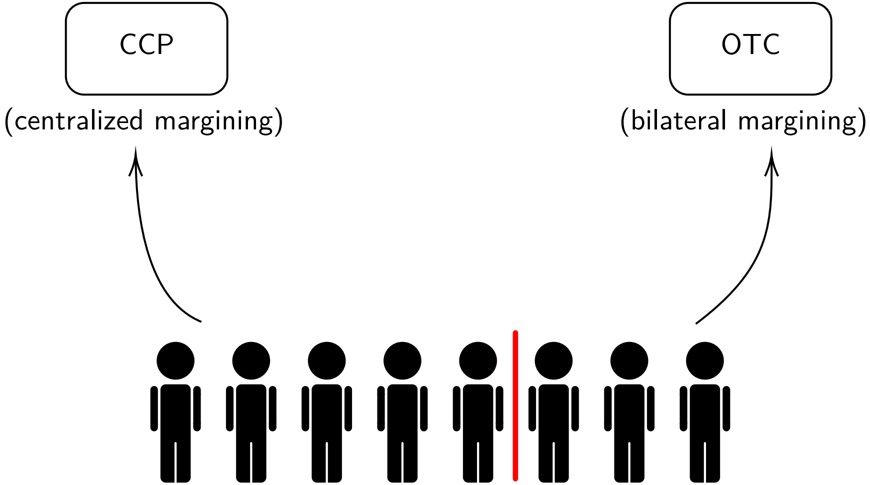
Answer (this paper)

Selection effect: Higher collateral requirements push the safest agents out of the CCP market, affecting risk mutualization and threatening the CCP’s stability.

Mechanism



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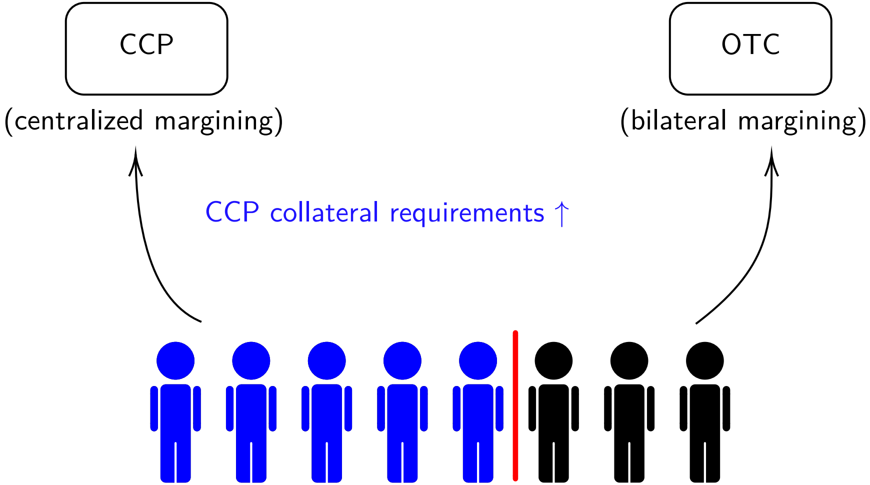
CCP
(centralized margining)
OTC
(bilateral margining)
CCP collateral requirements ↑

Mechanism

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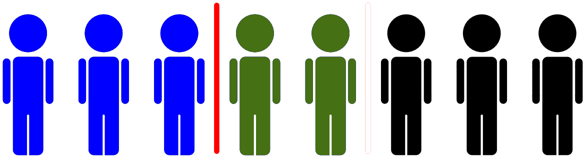
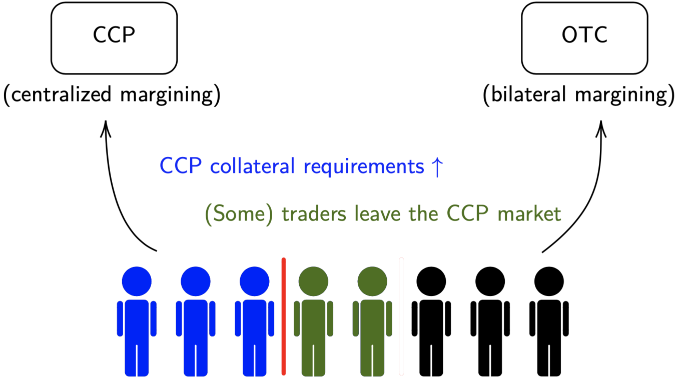
CCP collateral requirements $\uparrow$

(Some) traders leave the CCP market



Collateral Trade-off



CCP's risk-management systems:

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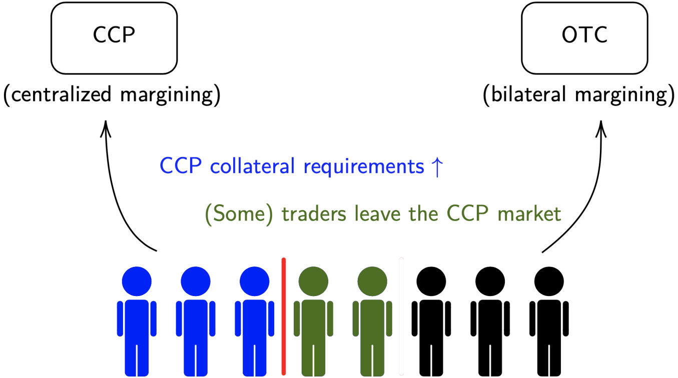

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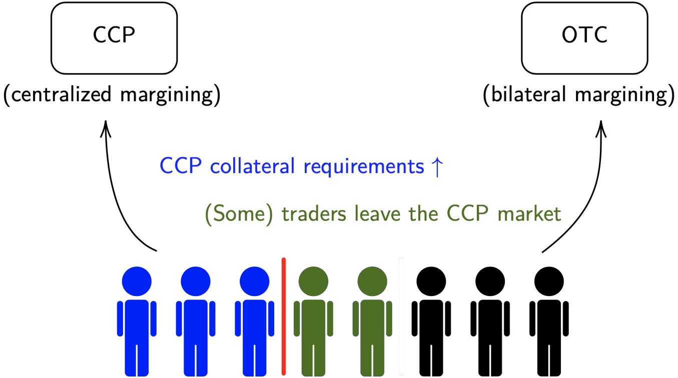

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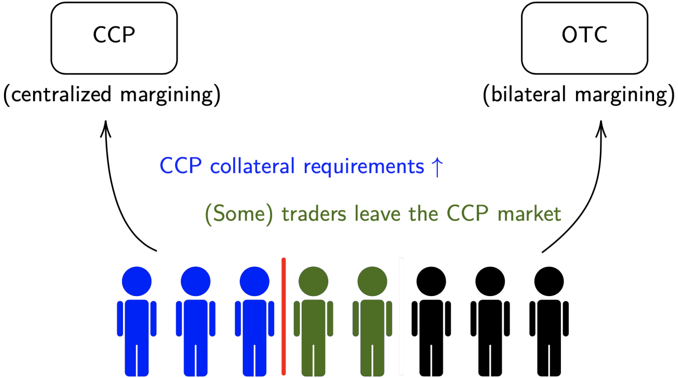

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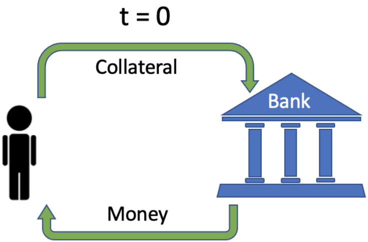
Strengthening **individual** collateral, the CCP weakens **mutual** collateral.

Interbank repo

Repurchase agreement (repo) is a type of collateralized lending, where the collateral is a portfolio of securities (typically stocks or bonds).



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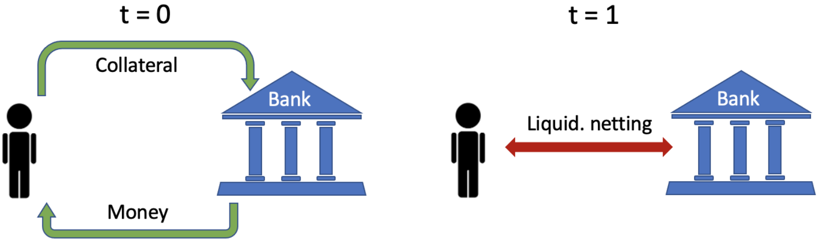

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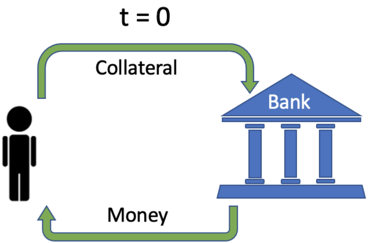
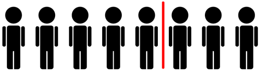


Haircut - a measure of (over)collateralization of the deal, measured as

$$\frac{\text{Collateral value} - \text{Principal amount}}{\text{Collateral value}}.$$

Results

(1) Risky borrowers are more likely to borrow in the CCP repo market.
Lenders' risk preferences affect the borrowers' allocation across markets.



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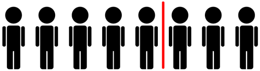
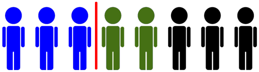


(2) Higher CCP collateral requirements (as compared to OTC) induce safer borrowers to trade over the counter.



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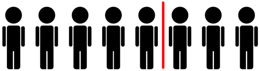

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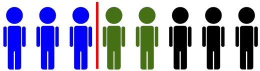
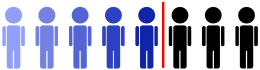


(3) Collateral-constrained borrowers are more sensitive to changes in collateral requirements.



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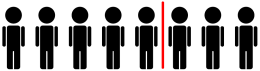

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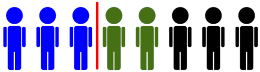

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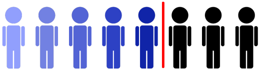

(4) Theoretically, an increase in CCP collateral requirements may increase its default probability (Appendix).

Related literature

- Centralized clearing:
  - (T): Biais et al. (2016), Wang et al. (2020), Kuong & Maurin (2023).
  - (E): Mancini et al. (2015), Boissel et al. (2017), Vuillemey (2020), etc.

  Contribution: The selection effect of collateral requirements
- Market selection and clearing incentives:
  - (T): Lee & Wang (2018), Dieler et al. (2021), etc.
  - (E): Bellia et al. (2019) and Cenedese et al. (2020).

  Contribution: Novel dataset, identification, results
- Regulatory and practical literature:
  - BIS (2012), Capponi et al. (2020), ISDA (2021), etc.

  Contribution: Highlight a drawback of conservative collateral requirements

Data: Summary Statistics

1. **Repo market deal-level data**.
   From Jan 2013 to July 2016, individual repo deals: counterparty identities, term, rate, haircut, date, security, loan amount.
   Source: Moscow Exchange (remote access).
2. **Banks' financial reports**.
   Monthly intermediate balance sheets, monthly regulatory ratios.
   Source: the Central Bank of Russia (CBR) webpage.
3. **Historical credit ratings**.
   Source: bankodrom.ru.

	OTC			**Bilateral CCP**			**Exchange traded CCP**		
	mean	std	median	mean	std	median	mean	std	median
haircut, %	4.65	6.85	2.00	8.21	6.18	8.00	10.37	4.54	10.00
repo_rate, %	13.00	4.71	15.00	11.59	2.57	11.30	10.76	2.34	11.00
lend_assets	2 190	2 228	1 207	2 969	6 120	458	691	2 527	97
borr_assets	3 204	4 151	3 189	1 322	3 017	300	520	1 808	55
credit_risk	4.33	1.93	4.00	6.73	1.44	7.00	6.72	1.90	7.00
sample size	1 043 333			179 680			162 017		

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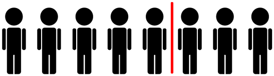

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Credit risk effect

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Dependent on the degree of IA:

1. CCP as a costly signal (Bester'85):
   - Posting collateral is costlier for risky borrowers.
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1. CCP as a costly signal (Bester'85):
   - Posting collateral is costlier for risky borrowers.
   - In a separating equilibrium, safer borrowers choose contracts with higher collateral.
2. CCP as an insurance device (Biais et al.'12):
   - Best borrowers are able to trade in the OTC market.
   - Risky borrowers decrease idiosyncratic risk by mutual insurance.

Credit risk effect

Q: What is the effect of the credit risk on the allocation of borrowers across markets?

$$OTC_i = \beta * Cred\_risk_{b,t} + C_i + \gamma_b + \nu_{c,m} + \epsilon_i,$$

Dep.Variable	**OTC**
cred_risk_tercile	-0.155**
	(-2.68)
Controls	✓
Borrower fe	✓
Secur x month fe	✓
No. Observations	795229
R-squared	0.079

- Risky borrowers are more likely to borrow in the CCP market.
- Consistent with lenders reducing monitoring efforts when lending through the CCP (Kuong & Maurin' 23).
- The effect is strongest for the non-anonymous (bilateral) segment.
- The effect decays with the age of the credit rating.

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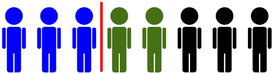

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The selection effect of the haircuts

Q: What is the effect of the CCP haircut methodology on trader's choice where to trade?

Two possible answers:

1. (common view) CCP's collateral requirements uniformly affect all traders.
2. (alternative view) Higher CCP's collateral requirements can affect the selection of counterparties in the CCP market.

Effect of haircuts on the selection

Identification: the difference in haircuts.

$$hctdiff_{c,m} = hct\_CCP_{c,m} - hct\_OTC_{c,m}.$$

Idea:

1. CCP haircuts are ***collateral-specific***,
2. OTC haircuts are collateral- and borrower-specific,
3. Both CCP and OTC react to security-specific events,
4. CCP commits to the officially disclosed methodology, while OTC does not have a unified methodology.

Data: *credit_risk* and *hct* aggregated at collateral-month level in each market.

Effect of haircuts on the market choice-1

Dep. Var.	Cr_risk_diff
hctdiff	0.050**
	(2.447)
avhct_CCP	
avhct_OTC	
Security fe	✓
Month fe	✓
No. Observations	1106
R-squared	0.0125

- When the difference $hctdiff = h_{CCP} - h_{OTC}$ increases, credit risk difference between the OTC and CCP markets increases ($Cr\_risk\_diff = Cr\_risk_{CCP} - Cr\_risk_{OTC}$).

Effect of haircuts on the market choice-1

Dep. Var.	Cr_risk_diff	Cr_risk_diff
hctdiff	0.050**	
	(2.447)	
avhct_CCP		0.118***
		(2.949)
avhct_OTC		-0.003
		(-0.141)
Security fe	✓	✓
Month fe	✓	✓
No. Observations	1106	1106
R-squared	0.0125	0.0330

- When the difference $hctdiff = h_{CCP} - h_{OTC}$ increases, credit risk difference between the OTC and CCP markets increases ($Cr\_risk\_diff = Cr\_risk_{CCP} - Cr\_risk_{OTC}$).

Effect of haircuts on the market choice-1

Dep. Var.	Cr_risk_diff	Cr_risk_diff	Cr_risk_diff	Cr_risk_diff
hctdiff	0.050**			
	(2.447)			
avhct_CCP		0.118***	0.089***	
		(2.949)	(2.642)	
avhct_OTC		-0.003		0.009
		(-0.141)		(0.456)
Security fe	✓	✓	✓	✓
Month fe	✓	✓	✓	✓
No. Observations	1106	1106	1525	1124
R-squared	0.0125	0.0330	0.0216	0.0003

- When the difference $hctdiff = h_{CCP} - h_{OTC}$ increases, credit risk difference between the OTC and CCP markets increases ($Cr\_risk\_diff = Cr\_risk_{CCP} - Cr\_risk_{OTC}$).

Effect of haircuts on the market choice-2

By repo market segment:

Dep. Var.	Cr_risk_CCP
avhct_CCP	0.067**
	(2.116)
avhct_OTC	-0.021
	(-1.237)
hctdiff	
Security fe	✓
Month fe	✓
Num Obs.	1122
R-squared	0.016

- The effect is coming mostly from the CCP market.

Effect of haircuts on the market choice-2

By repo market segment:

Dep. Var.	Cr_risk_CCP	Cr_risk_OTC
avhct_CCP	0.067**	-0.040**
	(2.116)	(-2.089)
avhct_OTC	-0.021	-0.014
	(-1.237)	(-1.292)
hctdiff		
Security fe	✓	✓
Month fe	✓	✓
Num Obs.	1122	1727
R-squared	0.016	0.018

- The effect is coming mostly from the CCP market.

Effect of haircuts on the market choice-2

By repo market segment:

Dep. Var.	Cr_risk_CCP	Cr_risk_OTC	Cr_risk_diff
avhct_CCP	0.067**	-0.040**	0.118***
	(2.116)	(-2.089)	(2.949)
avhct_OTC	-0.021	-0.014	-0.003
	(-1.237)	(-1.292)	(-0.141)
hctdiff			
Security fe	✓	✓	✓
Month fe	✓	✓	✓
Num Obs.	1122	1727	1106
R-squared	0.016	0.018	0.033

- The effect is coming mostly from the CCP market.

Effect of haircuts on the market choice-2

By repo market segment:

Dep. Var.	Cr_risk_CCP	Cr_risk_OTC	Cr_risk_diff	Cr_risk_CCP	Cr_risk_OTC
avhct_CCP	0.067**	-0.040**	0.118***		
	(2.116)	(-2.089)	(2.949)		
avhct_OTC	-0.021	-0.014	-0.003		
	(-1.237)	(-1.292)	(-0.141)		
hctdiff				0.039**	-0.007
				(2.245)	(-0.992)
Security fe	✓	✓	✓	✓	✓
Month fe	✓	✓	✓	✓	✓
Num Obs.	1122	1727	1106	1122	1727
R-squared	0.016	0.018	0.033	0.011	0.001

- The effect is coming mostly from the CCP market.

Effect of haircuts on the market choice-3: 2SLS

Idea: isolate the variation coming from hct_{CCP}.

$$hct_{OTC} = \rho \times hct_{CCP} + \epsilon,$$

$$\text{then } hctdiff = (1 - \rho) \times hct_{CCP} + \epsilon.$$

Stage		
Dep. Var.		
avhct_CCP		
hct_fitted		
Security fe		
Month fe		
Num Obs.		
R-squared		

Effect of haircuts on the market choice-3: 2SLS

Idea: isolate the variation coming from hct_{CCP}.

$$hct_{OTC} = \rho \times hct_{CCP} + \epsilon,$$

$$\text{then } hctdiff = (1 - \rho) \times hct_{CCP} + \epsilon.$$

Stage	(1)		(2)	
Dep. Var.	hctdiff	Cr_risk_CCP	Cr_risk_OTC	Cr_risk_diff
avhct_CCP	0.570***			
	(34.36)			
hct_fitted				
Security fe				
Month fe				
Num Obs.	1794			
R-squared	0.387			

Effect of haircuts on the market choice-3: 2SLS

Idea: isolate the variation coming from hct_{CCP}.

$$hct_{OTC} = \rho \times hct_{CCP} + \epsilon,$$

$$\text{then } hctdiff = (1 - \rho) \times hct_{CCP} + \epsilon.$$

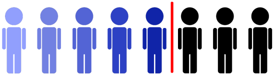
Stage	(1)	(2)		
Dep. Var.	hctdiff	Cr_risk_CCP	Cr_risk_OTC	Cr_risk_diff
avhct_CCP	0.570***			
	(34.36)			
hct_fitted		0.113**	-0.074**	0.207***
		(1.995)	(-2.095)	(2.902)
Security fe		✓	✓	✓
Month fe		✓	✓	✓
Num Obs.	1794	1122	1727	1106
R-squared	0.387	0.014	0.015	0.033

Results

(1) Risky borrowers are more likely to borrow in the CCP repo market. Lenders' risk preferences affect the borrowers' allocation across markets.

(2) Higher CCP collateral requirements (as compared to OTC) induce safer borrowers to trade over the counter.

(3) Collateral-constrained borrowers are more sensitive to changes in collateral requirements.



Financial constraints

Idea: $hct \uparrow \Rightarrow$ less funding for the same collateral.

Definition: A borrower is collateral-constrained when most of her available collateral is pledged.

Questions:

Q1: Do collateral-constrained borrowers display stronger preferences for lower haircuts?

Q2: Is the effect of CCP haircuts on the borrower's repo venue choice stronger for collateral-constrained borrowers?

Financial constraints

Q1: Do collateral-constrained borrowers display stronger preferences for lower haircuts?

Dep.Variable	**repo rate**	**haircut**
col_con	0.224	-5.111***
	(0.26)	(-2.75)
col_con $\in [0.25, 0.5]$		
col_con $\in [0.5, 0.75]$		
col_con $\in [0.75, 1]$		
Controls	✓	✓
Borrower fe	✓	✓
Col x month fe	✓	✓
Num Obs	707117	707117
$\mathbf{R^2}$	0.247	0.057

Sample: OTC interbank repo market.

Financial constraints

Q1: Do collateral-constrained borrowers display stronger preferences for lower haircuts?

Dep.Variable	**repo rate**	**haircut**	**repo rate**	**haircut**
col_con	0.224	-5.111***		
	(0.26)	(-2.75)		
col_con $\in [0.25, 0.5]$			-0.984*	-1.610**
			(-1.94)	(-2.12)
col_con $\in [0.5, 0.75]$			-0.627	-3.378***
			(-1.34)	(-3.17)
col_con $\in [0.75, 1]$			1.03*	-5.965***
			(1.73)	(-3.34)
Controls	✓	✓	✓	✓
Borrower fe	✓	✓	✓	✓
Col x month fe	✓	✓	✓	✓
Num Obs	707117	707117	707117	707117
$\mathbf{R^2}$	0.247	0.057	0.249	0.070

Sample: OTC interbank repo market.

Effect of haircuts on the selection: deal level

Q2: Is the effect of CCP haircuts on the borrower's repo venue choice stronger for collateral-constrained borrowers?

Dep.Variable
hctdiff × constr_safe
hctdiff × midconstr_safe
hctdiff × unconstr_safe
Controls
Borrower fe
Security fe
Month fe
Num Obs
R^2

- Among safe borrowers, collateral-constrained borrowers are most likely to borrow in the OTC market.
- Collateral-constrained (safe) borrowers are most sensitive to changes in collateral requirements.

Effect of haircuts on the selection: deal level

Q2: Is the effect of CCP haircuts on the borrower's repo venue choice stronger for collateral-constrained borrowers?

Dep.Variable	*OTC*
hctdiff × **constr_safe**	0.014**
	(2.54)
hctdiff × **midconstr_safe**	-0.004
	(-1.04)
hctdiff × **unconstr_safe**	-0.003
	(-1.44)
Controls	✓
Borrower fe	✓
Security fe	✓
Month fe	✓
Num Obs	531590
$\mathbf{R^2}$	0.190

- Among safe borrowers, collateral-constrained borrowers are most likely to borrow in the OTC market.
- Collateral-constrained (safe) borrowers are most sensitive to changes in collateral requirements.

Conclusion

- Higher CCP margins induce the best traders to quit the centrally cleared market and to trade over-the-counter.
- Lenders prefer to trade over-the-counter with safer borrowers, while riskier borrowers are more likely to borrow through the CCP.
- Collateral-constrained traders are more sensitive to changes in collateral requirements.
- Relevance:
  1. Evidence of CCP creating moral hazard for market participants.
  2. Selection effect provides a reason for the mandatory clearing of repos and standardized derivatives.
  3. Selection effect should be taken into account when calculating collateral requirements and become a part of the policy debate.
  4. The ways to address the effect:
     - conditioning CCP haircuts on trader's credit risk,
     - incentives to trade through CCPs,
     - regulation of the OTC market.