

Credit Cycles in Tokenized Real Estate Markets

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Motivation

This Paper

- ▶ We exploit high-frequency transaction data from a unique blockchain ecosystem to study how leverage influences trading behavior and price dynamics in tokenized real estate assets

Why is it relevant?

- ▶ tokenization of traditional assets projected to reach \$16 trillion by 2030 ([BCG, 2024](#))
- ▶ integration with DeFi lending allows investors to use real asset-backed tokens as collateral for customized leverage
- ▶ no analysis on transmission mechanisms between lending and tokenized assets, particularly on stability implications

Findings

- ▶ borrowing activity is associated with increased trading volume and higher token prices on DEX liquidity pools and on the peer-to-peer (P2P) exchange platform for real estate-backed tokens
- ▶ we identify leverage loops, which can lead to temporary upward price pressures during trading days, with significant price premiums and price impact on liquidity pools
- ▶ feedback effect: appreciation in collateral value leads to increased borrowing activity

Motivation

Contribution

- ▶ traditional finance literature relates looser credit conditions to house price increases ([Favara and Imbs, 2015](#); [Di Maggio and Kermani, 2017](#); [Landvoigt, 2017](#); [Adelino et al., 2025](#))
- ▶ we document the credit channel in DeFi as a potential source of price fluctuations in tokenized asset markets
- ▶ we build on papers on stability implications of DEXs and lending platforms ([Harvey et al., 2025](#); [Lehar and Parlour, 2022](#)) as well as DeFi leverage in non-asset-backed tokens ([Heimbach and Huang, 2023](#); [Cornelli et al., 2025](#))
- ▶ we help to better understand transmission mechanisms between lending and prices on tokenized asset exchanges
 - ⇒ essential for prudential safeguards and blockchain infrastructures to channel market dynamics

Motivation

We develop a theoretical framework

- ▶ Key mechanisms
 - ▶ real estate tokens i) generate rental income and ii) can be pledged as collateral, borrowing interest is accrued over time
 - ▶ when real estate token has higher rental yield than the borrowing costs, DeFi investors can borrow stablecoins to buy more real estate tokens (increase leverage)
- ▶ Testable implications:
 - (1) *When an investor borrows stablecoins, compared to a non-borrower, she will purchase more real estate tokens at a higher price.*
 - (2) *When a borrower leverages up (down), she will purchase more (sell or purchase fewer) real estate tokens, pushing up (lowering) the price.*

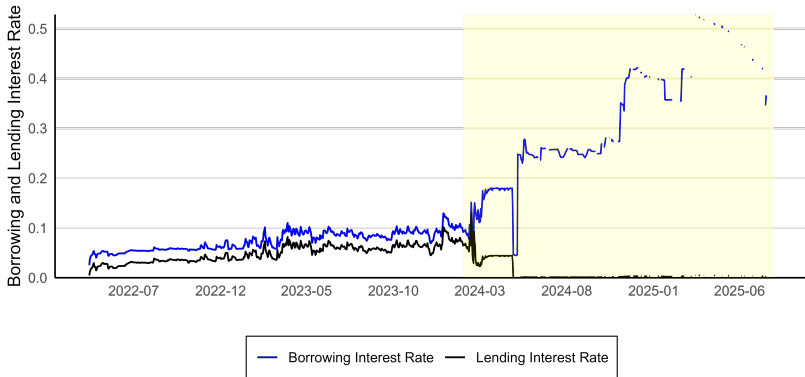
First step: Data Collection

- ▶ investor-level transaction history for **more than 700 tokenized U.S. properties** (**RealT**), merged with borrowing, lending, and collateral deposit data from RealT Money Market (RMM)
- ▶ price and order flow on secondary markets
 - ▶ swaps from DEX liquidity pools: prices adjusted through AMM
 - ▶ peer-to-peer trades on offer-driven (You-and-Me) marketplace
 - ▶ also: issuer's buyback price on primary market
- ▶ borrowing, lending, and collateral on lending platforms **show**
 - ▶ first RMM version: **53 real tokens as collateral** to borrow stablecoins (overcollateralisation rate of 120-150%)
 - ▶ collateral value depends on property appraisal
 - ▶ launch of updated RMM (February 2024): **all real tokens eligible as collateral**

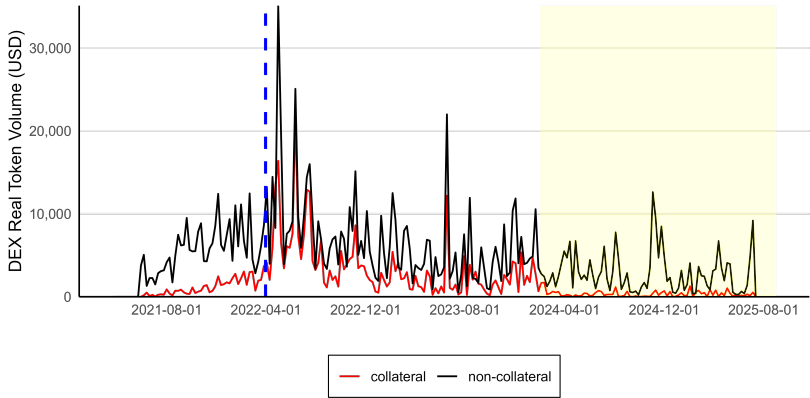
descriptive summary

Interest Rates on RMM Lending Platform

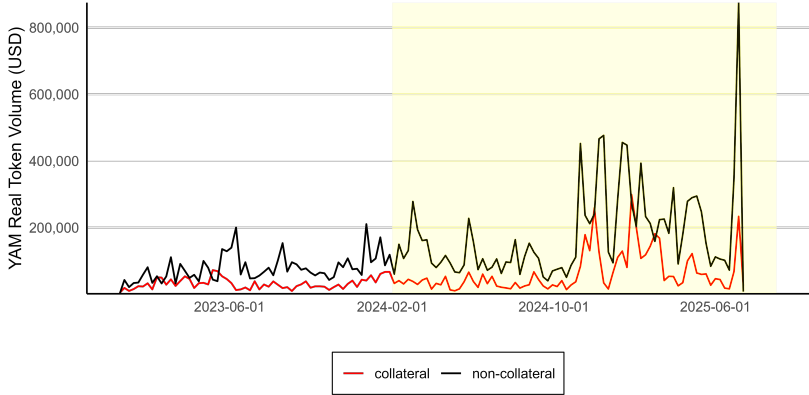
- ▶ we track borrowing and lending interest rates for wxDAI lending pool before launch of updated version (wxDAI,USDC)



Real Token Volume on DEX Liquidity Pools

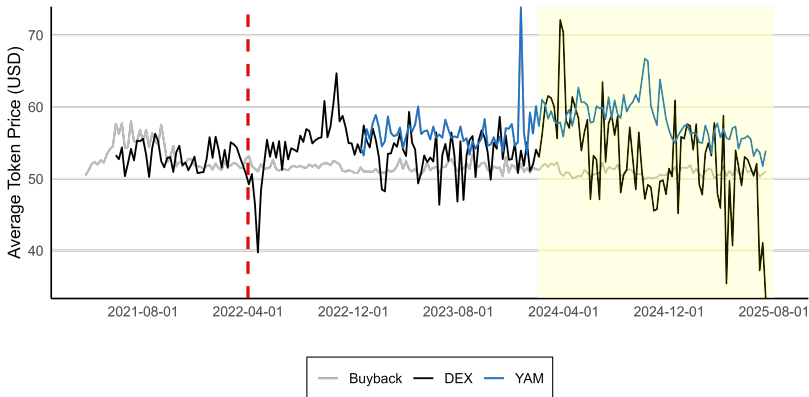


Real Token Volume on Peer-to-Peer (P2P) Marketplace



Average Real Token Price Dynamics over Time

- ▶ secondary market prices compared to issuer's buyback prices



(De)Leverage Loops

- ▶ we identify (de)leverage loops as specific sequences of recurring trading patterns within a 24-hour window
- ▶ 70% of loops observed after launch of updated RMM pools

	# loops	% Borrowers	Mean	SD	Min	Q1	Median	Q3	Max
Repeated Transaction Pattern of "<i>Borrow - Buy - Deposit Collateral</i>"									
Repetition	902	0.08	2.92	1.62	2.00	2.00	2.00	3.00	15.00
Repeated Transaction Pattern of "<i>Borrow - Buy</i>"									
Repetition	1986	0.13	3.01	1.83	2.00	2.00	2.00	3.00	22.00
Repeated Transaction Pattern of "<i>Sell - Repay - Withdraw Collateral</i>"									
Repetition	145	0.03	3.48	3.27	2.00	2.00	2.00	4.00	32.00
Repeated Transaction Pattern of "<i>Sell-Repay</i>"									
Repetition	346	0.04	3.25	2.96	2.00	2.00	2.00	3.00	34.00

Empirical Results

Leverage on Trading Volume and Token Prices

- ▶ we test the impact of investor's leverage activity on i) trading volume, ii) token price, iii) premium to issuer's buyback price, and iv) pool price impact by estimating:

$$\text{Trading Outcome}_{ijt} = \beta_0 + \beta_1 \cdot \text{Leverage}_{it} + \mu_j + \delta_d + \varepsilon_{ijt}.$$

- ▶ categorical variable captures how borrowing behavior of investor i changes on date d prior to its real estate token trade at timestamp t :

$$\text{Leverage}_{it} = \begin{cases} +1 & \text{if investor } i \text{ borrowed more than repaid (leveraging up)} \\ -1 & \text{if investor } i \text{ repaid more than borrowed (deleveraging)} \\ 0 & \text{otherwise} \end{cases}$$

Leverage on DEXs Trading Volume and Token Prices

	Token Volume (in \$)	log Token Price (in \$)		Token Price Premium (in%)		Price Impact (in %)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Leverage	3.604*** (0.222)	0.008* (0.005)	0.009* (0.005)	0.686*** (0.236)	1.343*** (0.460)	0.545*** (0.065)	0.545*** (0.065)
Pool Liquidity (in log)	-0.395 (0.334)		0.054 (0.047)		3.755 (3.450)		-0.142 (0.124)
Token FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	439,775	440,439	439,775	439,634	439,021	440,393	439,730
Adjusted R ²	0.028	0.501	0.515	0.438	0.447	0.021	0.023

Standard errors clustered at token level: *p<0.1; **p<0.05; ***p<0.01.

Leverage on P2P Trading Volume and Purchase Prices

	Token Volume (in \$)	log Token Price (in \$)		Token Price Premium (in %)	
	(1)	(2)	(3)	(4)	(5)
Leverage	47.960*** (5.680)	0.017*** (0.003)	0.020*** (0.003)	0.434*** (0.072)	0.654*** (0.066)
Token Volume (in log)			-0.007*** (0.001)		-0.510*** (0.049)
Token FE	Yes	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes
Observations	151,160	151,160	151,160	151,156	151,156
Adjusted R ²	0.028	0.238	0.239	0.488	0.495

Standard errors clustered at token level: *p<0.1; **p<0.05; ***p<0.01.

Empirical Results

Comparison of Real Token Prices: DEX vs P2P

- ▶ we track the borrowing buildup of investor i over time prior to a trade in token j at blocktime t (DEX price impact)
- ▶ average wallet-level cumulative borrowing of \$4000 during first RMM version

$$\text{Trading Outcome}_{ijt} = \beta_0 + \beta_1 \cdot \text{Cumulative Borrowing}_{it} \times \text{DEX} + \mu_j + \delta_d + \varepsilon_{ijt},$$

	Token Volume (in \$)	log Token Price (in \$)		Token Price Premium (in %)	
	(1)	(2)	(3)	(4)	(5)
Cumulative Borrowing	22.874*** (2.973)	0.001 (0.001)	0.002* (0.001)	0.070 (0.064)	0.125** (0.061)
DEX	-147.999*** (10.065)	-0.029*** (0.007)	-0.050*** (0.009)	-5.049*** (0.362)	-6.331*** (0.423)
Cumulative Borrowing $\times$ DEX	-13.704*** (3.647)	0.034*** (0.013)	0.039*** (0.014)	3.037*** (0.726)	3.385*** (0.746)
Token Volume (in log)			-0.008*** (0.002)		-0.503*** (0.091)
Token FE	Yes	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes
Observations	381,153	381,153	381,153	380,564	380,564
Adjusted R ²	0.044	0.275	0.277	0.440	0.443

Standard errors clustered at token level: *p<0.1; **p<0.05; ***p<0.01.

Empirical Results

Effect of Appraisal Change on Borrowing Activity

- ▶ we exploit the increase in collateral value from the re-appraisal of the underlying property
- ▶ we estimate the following regression

$$\text{Borrowing}_{it} = \beta_0 + \beta \cdot \text{Appraisal}_{it} + \mu_t + \varepsilon_{it},$$

with Appraisal_{it} equal to 1 if investor i , holding a top quartile collateral portfolio, observes positive re-appraisal on date t

	All Borrowers		Real Token Depositors	
	(1)	(2)	(3)	(4)
Appraisal	342.262*** (109.529)	250.312*** (69.708)	338.854*** (107.573)	246.439*** (69.640)
Lagged Borrowing Rate		-474.817*** (121.540)		-476.023*** (121.699)
Lagged Repayment		0.445*** (0.098)		0.445*** (0.098)
Date FE	Yes	Yes	Yes	Yes
Observations	20,283	18,041	20,162	18,001
Adjusted R ²	0.008	0.059	0.008	0.059

Clustered Standard errors at the date level: *p<0.1; **p<0.05; ***p<0.01.

Conclusion

- ▶ This paper documents the credit channel in tokenized real estate asset markets.
- ▶ We show that higher leverage leads to increased trading volume and higher token prices, with significant price premiums (relative to issuer's buyback price) and price impact on DEX liquidity pools.
- ▶ An increase in the value of deposited collateral leads to higher borrowing activity $\Rightarrow$ real economy to enter feedback loop

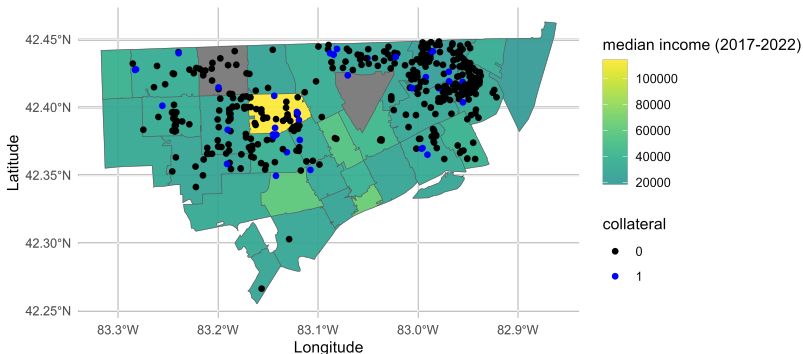
Thank you for your attention!

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Geographic Location of Tokenized Real Estate

- most tokenized properties are located in Detroit [Back](#)



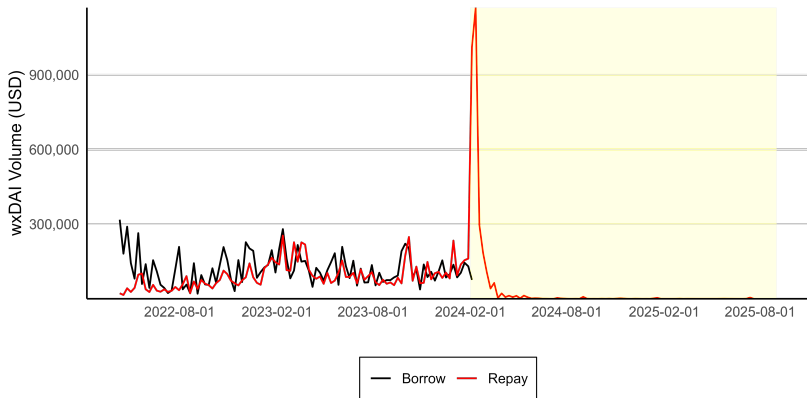
Descriptive Summary [Back](#)

Variable	Obs	Mean	SD	Min	P25	Median	P75	Max
A. Transactions on all DEX Liquidity Pools (launch: June 2021)								
Token Price (in \$)	440,439	53.61	10.08	0.00	50.29	53.10	56.68	590.67
Token Amount (in \$)	440,439	0.02	12.23	-987.32	-0.64	0.47	0.86	599.94
Rent Yield	438,701	0.10	0.03	0.00	0.10	0.11	0.11	0.23
Buyback Price (in \$)	439,634	51.24	3.15	41.50	50.06	50.71	51.63	185.80
Token Pool Price (in \$)	440,439	53.63	10.51	0.00	50.25	53.08	56.69	728.80
Pool Liquidity (in \$)	439,775	1133.33	1013.09	0.00	804.39	1031.82	1270.34	8777.24
B. Transactions on YAM (P2P) Marketplace (launch: January 2023)								
Token Price (in \$)	151,160	57.20	17.30	0.00	50.85	53.00	59.01	515.00
Token Amount (in \$)	151,160	163.42	845.50	0.00	10.96	51.78	113.59	89982.21
Rent Yield	152,588	0.10	0.02	0.00	0.09	0.10	0.11	0.21
Buyback Price (in \$)	152,615	52.78	13.15	41.50	50.26	50.62	51.70	185.80
C. Lending Pools								
First RMM Version (launch: April 2022)								
Borrowing Interest Rate (wxDAI)	120,821	0.08	0.03	0.00	0.06	0.08	0.09	0.53
Cumulative Net Borrowing wxDAI (in \$)	65,744	3,926.52	13,925.65	0.00	161.90	665.86	2,581.28	208,633.80
Updated RMM Version (launch: February 2024)								
Borrowing Interest Rate (wxDAI)	90,411	0.11	0.02	0.00	0.09	0.11	0.12	0.27
Cumulative Net Borrowing wxDAI (in \$)	46,483	9,139.62	27,891.67	0.00	332.15	1,437.48	5,762.82	359,222.68
Borrowing Interest Rate (USDC)	120,472	0.11	0.02	0.00	0.10	0.11	0.12	0.27
Cumulative Net Borrowing USDC (in \$)	65,105	9,026.07	29,627.26	0.00	435.34	2,001.02	6,756.11	623,192.62

Appendix

Borrowing and Lending Activity on RMM Lending Pool

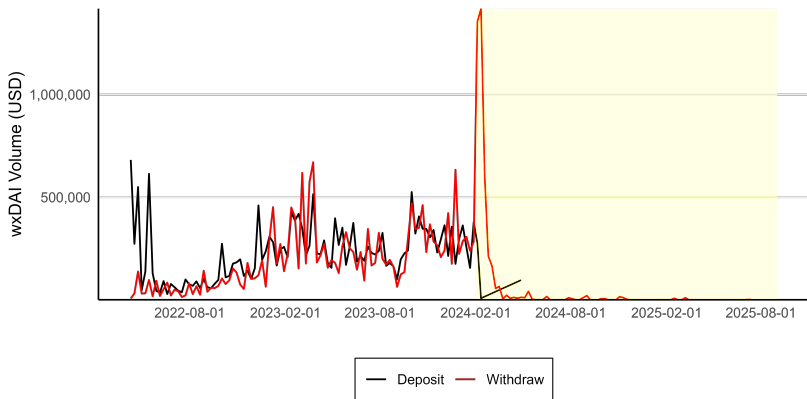
- ▶ amount of borrowed and repaid wxDAI stablecoins (first version of RMM) [Back](#)



Appendix

Borrowing and Lending Activity on RMM Lending Pool

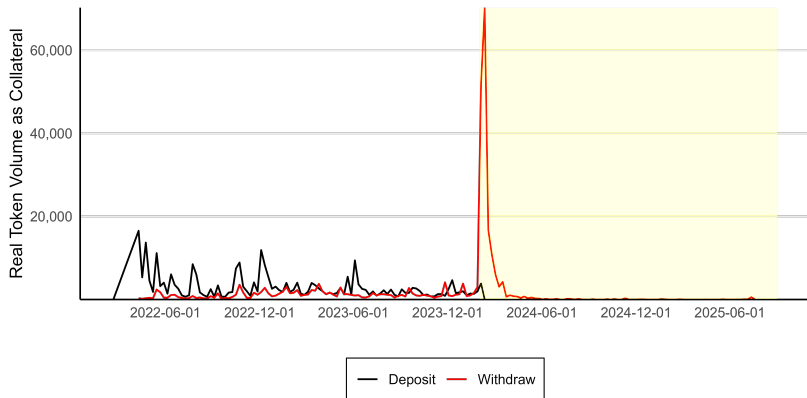
- ▶ amount of deposited and withdrawn wxDAI stablecoins (first version of RMM) [Back](#)



Appendix

Collateral Deposits on RMM Lending Pool

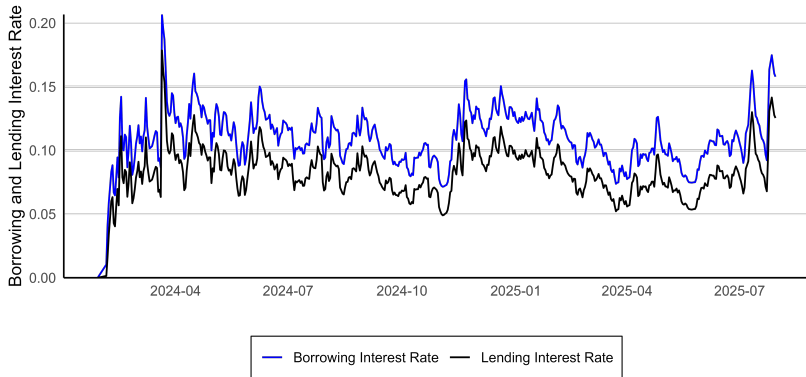
- amount of deposited collateral (first version of RMM) [Back](#)



Appendix

Interest Rates on RMM Lending Platform

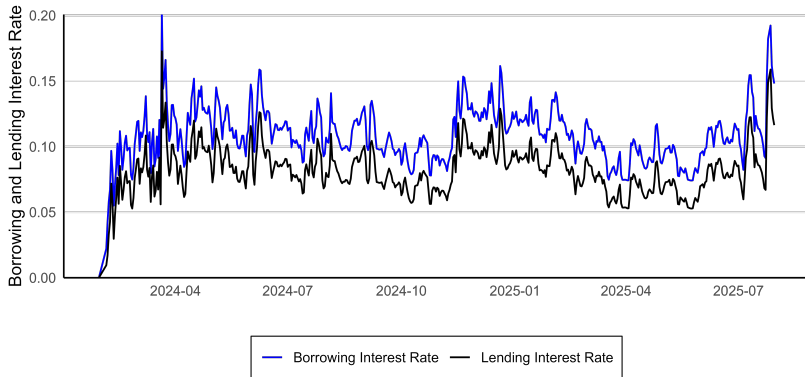
- ▶ we track borrowing and lending interest rate for updated wxDAI lending pool after launch in February 2024



Appendix

Interest Rates on RMM Lending Platform

- ▶ we track borrowing and lending interest rate for USDC lending pool after launch in February 2024 [Back](#)



Cumulative Borrowing on DEXs Real Token Prices

- ▶ we track the borrowing buildup of investor i over time prior to a trade in token j at blocktime t [Back](#)

$$\text{Trading Outcome}_{ijt} = \beta_0 + \beta_1 \cdot \text{Cumulative Borrowing}_{it} + \mu_j + \delta_d + \varepsilon_{ijt},$$

	Token Volume (in \$)	log Token Price (in \$)	Token Price Premium (in %)	Price Impact (in %)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cumulative Borrowing	4.830*** (0.234)	0.015** (0.006)	0.015** (0.006)	2.081** (1.039)	2.047** (1.029)	0.574*** (0.057)	0.571*** (0.056)
Pool Liquidity (in log)	-0.428 (0.352)		0.053 (0.047)		3.741 (3.441)		-0.146 (0.126)
Token FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	439,775	440,439	439,775	439,634	439,021	440,393	439,730
Adjusted R ²	0.039	0.502	0.516	0.440	0.448	0.025	0.026

Standard errors clustered at token level: *p<0.1; **p<0.05; ***p<0.01.