THE UNIVERSITY OF TEXAS AT DALLAS

Chasing Market Growth and Matching Efficiency in Two-Sided Platforms: Evidence from the Lazy-Minting Policy in an NFT Marketplace

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Platform Growth Strategy

- "Get Big Fast" Growth Strategy
  - Growing big quickly at all costs (Cennamo and Santalo 2013)
  - ***Amazon Third-party vendors*** (Chen and Guo 2022); ***Uber Subsidized pricing*** (Parker and Van Alstyne 2005)

- "Get Big Fast" Fallacy (Yang et al. 2021, Sterman et al. 2007)
  - Thickness/congestion (Li and Netessine 2020)
  - Low-quality offerings (Geva et al. 2019)

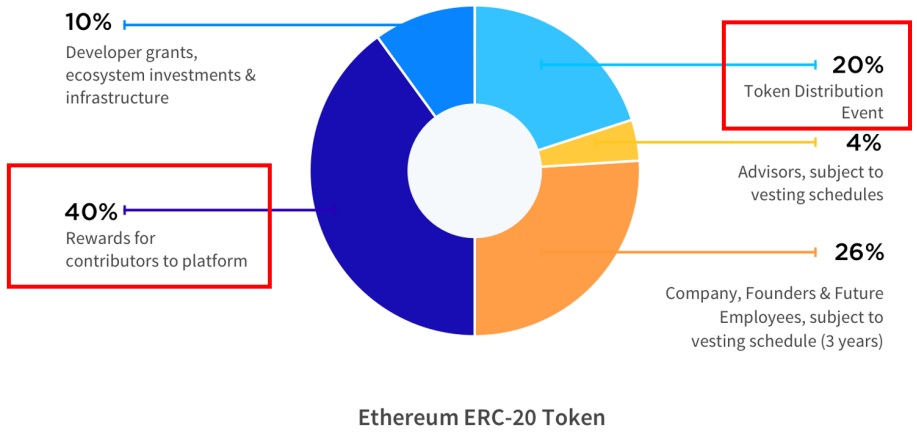
→ **Deteriorated Matching Efficiency** (Geva et al. 2019, Li and Netessine 2020)

Market Growth with Matching Efficiency

- Gaps:
  - Setting Participation Fees; Cost Borne by *Users*
    - **Limiting Market Growth**
  - Quality Certification; Cost Borne by *Platforms*
    - To Ensure High Matching Efficiency
    - **Costly to implement**
  - Control Quality by *Online Reviews*
    - **Quality Misrepresentation** (Pu et al. 2022); **Cold Start** (Burtch et al. 2021)
    - **Not informative or feasible** for unique and personalized products

Token Incentives to Grow Market

- Tradable Utility Token Issuance (Bakos and Halaburda 2022)
  - For capital-limited platforms to attract early adopters
  - Grant users access to future use of the platform
  - Share the increased value if platforms succeed



Ethereum ERC-20 Token

- Free Token Airdrop (Li et al. 2021)
  - Increase users' investment probability

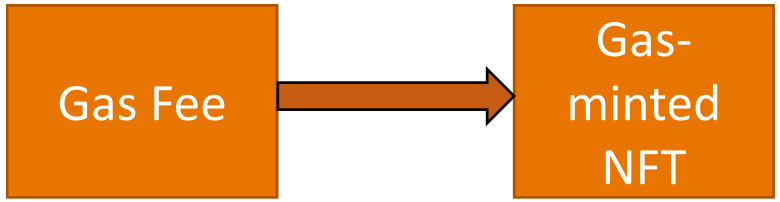
- Platform Governance Token (Tsoukalas and Falk 2020, Gao and Leung 2022)
  - Users earn tokens by engaging with the platform
  - Example: *RARI Token* (earn tokens by buying and selling on the Rarible market);
    Basic Attention Token (earn BAT by watching ads in browser)

- Drawbacks: Token issuance is costly

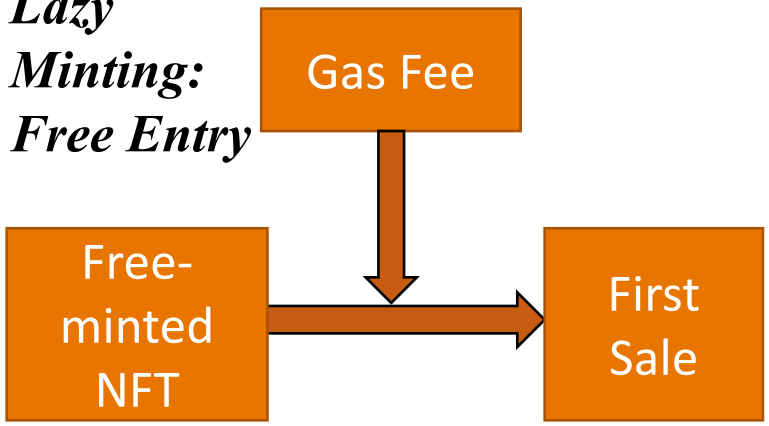
Lazy Minting in the Non-Fungible Token (NFT) Context

- NFT Market
  - ➢ Unique artworks, collectibles
  - ➢ Create NFTs, showcase inventory, and sell/purchase NFTs
- Ethereum Gas-Minting (Creation) Fee: $50~$200
- Rarible (An NFT market) Launched ***Lazy Minting***
  - ➢ *Postpone* upfront Ethereum gas fees to the first-sale time
  - ➢ *Remove the Entry Barrier:*
    - The No. of NFT supplies skyrocketed 36 times
  - ➢ *Two Entry Options*: *Both* gas and lazy minting

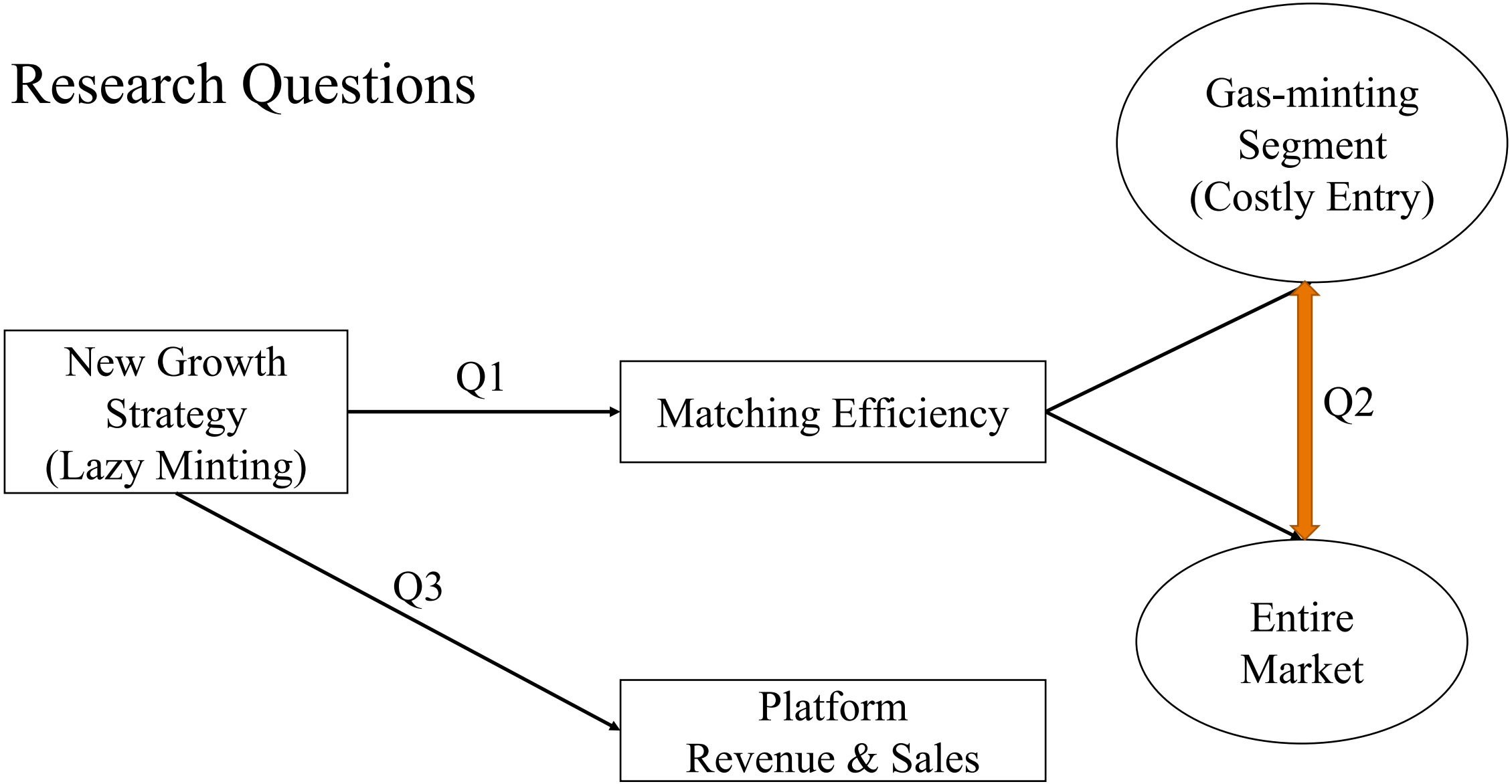
Gas Minting: Costly Entry



Lazy Minting: Free Entry

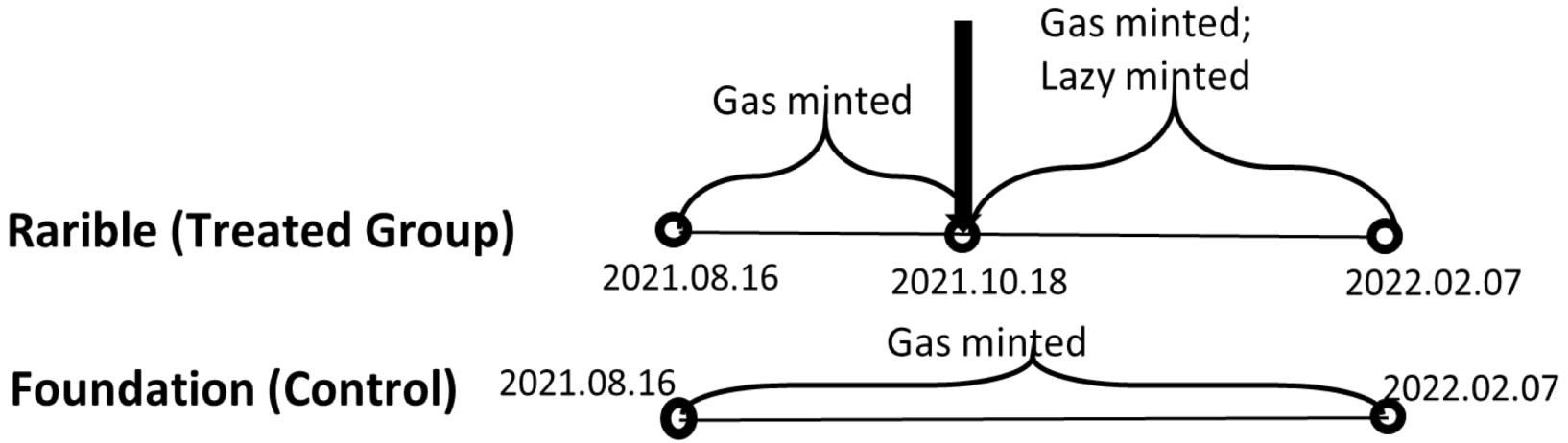


Research Questions



Two NFT Platforms

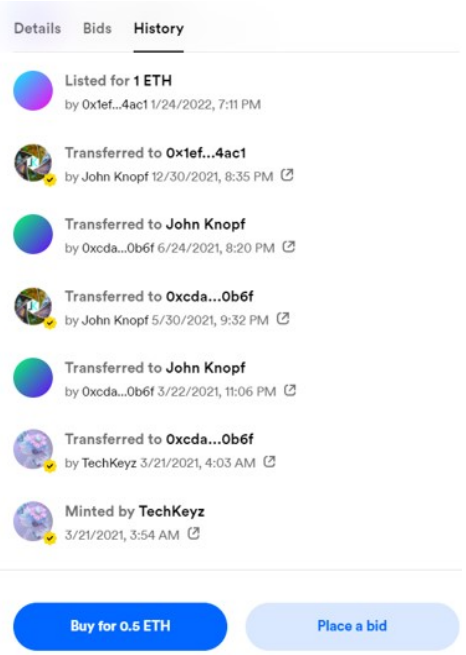
- **Treatment Platform:** Rarible (Introduce the lazy-minting policy)
- **Control Platform:** Foundation (Only gas minting)
- Closest NFT markets: Similar number of traders and trading volume, from Dappradar.com
- Remove multi-homing NFT creators



Empirical Context

- NFT Market: Two-sided market for NFT trading
  - ➢ Matching between creators and buyers
  - ➢ Transparent trading history

- NFT Market Data
  - ➢ Each NFT's characteristics
    - e.g., lazy or gas minting, video or image
  - ➢ Complete market activities
    - Minting, listing, bidding, buying, and selling activities



Empirical Model (DID)

NFT-level analysis: 1,355,640 NFTs created on the two platforms across 147 days (21 weeks)

Matching Efficiency

= 1 if NFT i is created on Rarible

$$Y_{ijt} = \beta_0 + \boldsymbol{\beta_1} Post_t \times Treated_{ij} + \beta_2 Fixed\ Sale_i + \beta_3 NFT\ Type_i + v_j + u_t + \epsilon_{ijt}$$

= 1 if the day of creation t is after the treatment

NFT Matching Efficiency (Dependent Variable)

- Matching Likelihood (binary)
  - Y = 1 if *the first sale* occurs within 30 days of creation; Otherwise, Y = 0

- First-Sale Price in USD (log-transformed)

Table 1. Summary Statistics

Variable	Pre-Treatment Gas-Minted NFTs		Post-Treatment ***Gas-Minted NFTs***		Post-Treatment ***Lazy-Minted NFTs***	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Matching Likelihood	0.077	0.266	0.131	0.338	0.001	0.034
Ln(First-Sale Price)	6.144	1.867	7.548	1.793	5.513	2.412

Main Result

- Matching Likelihood ↓
- First Sale Price →

- Matching Likelihood ↑
- First Sale Price ↑

Table 2. The Treatment Effect of Lazy-Minting Policy on Matching Efficiency

Variable	*Matching Likelihood*	*First-Sale Price (ln)*	*Matching Likelihood*	*First-Sale Price (ln)*
Sample	Entire Market		Gas-Minting Segment	
$Post_t \times Treated_{ij}$	-0.035*** (0.009)	-0.138 (0.140)	0.090*** (0.012)	1.265*** (0.157)

Notes: * $p<0.1$, ** $p<0.05$, *** $p<0.01$. Robust standard errors clustered at the day level in parentheses.

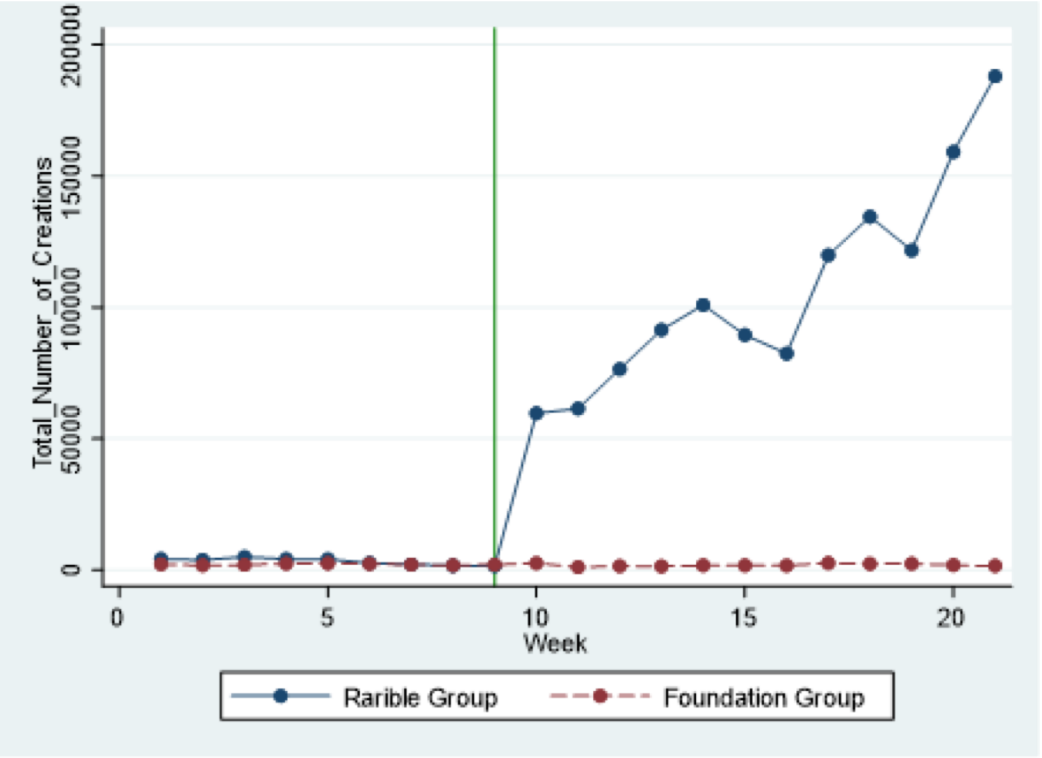
Two Mechanisms

- Market Thickness Effect
  - **Supply side**: Intensified price competition
  - **Demand side**: Intensified search frictions
  - **Drives down** matching efficiency

- Quality Signaling Effect by Gas Minting
  - A tiered market segmentation (gas minting vs. lazy minting):
    - **Supply side**: differentiated minting strategies
    - **Demand side**: differentiated valuations (bids)
    - **Improves** matching efficiency

Market Thickness Effect (Supply side)

Exponential Growth of Supply
(36 times increase)



- Supply Side: Fiercer Competition
  - Average lower asking price (WTA)
  - Number of price adjustment
  - Higher occurrences of markdown prices
  - Longer time to find a match

Table 4. Intensified Competition on the Supply Side

Variable	*Minimum Asking Price (ln)*	*Adjust Asking Price or Not*	*The Ratio of Markdown Adjustments*	*Number of Days to Match (ln)*
$Post_t$	-1.290***	-0.238***	0.053***	0.251***
$\times Treated_{ij}$	(0.049)	(0.011)	(0.012)	(0.066)

Market Thickness Effect (Demand side)

- Demand Side: Larger Search Frictions
  - Buyers place more bids per week ↑
  - Need to place more bids in order to find a match ↑

Table 5. Larger Search Friction on the Demand Side

Variable	*Number of Bids (ln)*	*Number of Bids Per Match (ln)*
$Post_t \times Treated_{ij}$	0.082*** (0.003)	0.335*** (0.072)

Quality Signaling Effect (Supply Side)

- Supply Side: NFT Quality
  - *Proxy:* The average # of likes per day
    - Gas-minting
    - Entire Market

- Supply Side: Posted Price
  - Gas-minting
  - Entire Market

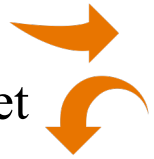


Table 6. Supply-Side Self-Selection into Gas Minting

Variable	*NFT Quality*	
Sample	Entire Market	Gas-Minting Segment
$Post_t \times Treated_{ij}$	-0.032*** (0.002)	0.050*** (0.008)

Variable	*Minimum Asking Price (ln)*	
Sample	Entire Market	Gas-Minting Segment
$Post_t \times Treated_{ij}$	-1.290*** (0.049)	0.063 (0.078)

Quality Signaling Effect (Demand Side)

- Demand Side: Max Bidding Price
  - Gas-minting
  - Entire Market

Table 7. Demand-Side Appreciation of Gas Minting

Variable	*Maximum Bidding Price (ln)*	
Sample	Entire Market	Gas-Minting Segment
$Post_t \times Treated_{ij}$	-0.093 (0.133)	1.981*** (0.252)

- Demand Side: Search Frictions
  - Gas-minting
  - Entire Market
  - Similar pattern is also observed for number of bids per match

Variable	*Number of Bids (ln)*	
Sample	Entire Market	Gas-Minting Segment
$Post_t \times Treated_{ij}$	0.082*** (0.003)	-0.032*** (0.006)

Quality Signaling Effect: The Separating Equilibrium

- Analysis Aim
  - ➢ Prove that low-quality ones cannot mimic high quality by gas minting
- Low-quality vs. High-quality Creators
  - ➢ By historical selling experience
  - ➢ Bottom 60% (never sell NFTs) vs. Top 25% (sell at least four NFTs)

Table 8. Heterogeneous Treatment Effect and Separating Equilibrium

Type	*Low-Quality Creators*		*High-Quality Creators*	
Sample	Gas-minted NFTs		Gas-minted NFTs	
Variable	*Matching Likelihood*	*First-Sale Price (ln)*	*Matching Likelihood*	*First-Sale Price (ln)*
$Post_t \times Treated_{ij}$	0.013 (0.019)	0.161 (0.136)	0.145*** (0.043)	0.370** (0.154)

A tiered market structure with the separating equilibrium

Platform-Level Performance

Does the Rarible platform benefit as a whole?

Yes!

Table 9. The Treatment Effect of Lazy-Minting Policy on Platform Performance

Variable	*Matching Ratio*	*Total Number of Sales*	*Revenue (ln)*
$Post_t \times Treated_j$	-0.038*** (0.009)	14.266*** (5.425)	0.488*** (0.178)

Robustness Checks

- Identification
  - Placebo Test
  - Coarsened Exact Matching
  - Doubly Robust DID
  - Heterogeneity-Robust Estimator
  - Random Shuffle Test

- Sensitivity Analysis
  - Alternative Time Windows of a Sale (14, 60 days, no restrictions)
  - Logit and Probit Model
  - First-Sale Price Adjusted by Gas Costs
  - Remove the last-month data of the pre-treatment period

Placebo Test: Rule Out Anticipatory Effects

- Three fake treatment before the treatment
- All insignificant treatment effects before the pre-treatment period
- No confounding events happened before lazy minting

Table 10. The Placebo Test

Variable	*Matching Likelihood*	*First-Sale Price (ln)*	*Matching Likelihood*	*First-Sale Price (ln)*	*Matching Likelihood*	*First-Sale Price (ln)*
Fake Treatment	Five Weeks Before the Policy Change		Three Weeks Before the Policy Change		One Week Before the Policy Change	
$Post_t \times Treated_{ij}$	0.002 (0.014)	0.251 (0.183)	-0.024 (0.015)	0.219 (0.181)	-0.004 (0.021)	0.309 (0.254)

Conclusions

- Highlights:
  - Realize market growth without compromising matching efficiency
  - Prove the presence of the ***separating equilibrium*** empirically
    - Mimicking behavior of low-quality creators does not work

- Practical Implications:
  - **Two-sided platforms:** A new growth strategy when supply side choices are credibly transparent to the demand side

Thank you

SSRN:
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4279215

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Rarible and Foundation: Similar Rankings

#	Market	Avg. price	Traders	Volume
1	OpenSea	$192.23 -14.62%	357,691 -4.45%	$315.77M -16.73%
2	X2Y2 ETH	$248.41 -2.97%	57,602 20.45%	$72.39M 5.85%
3	Element	- -100%	9,653 -5.39%	- -100%
4	LooksRare ETH	$1k -23.35%	6,583 1.48%	$11.09M -35.6%
5	The Sandbox Marketplace ETH	$14.04 -43.87%	3,764 -43.08%	$90.25k -75.15%
6	Foundation ETH	$530.69 12.69%	2,224 -13.87%	$1.16M -7.56%
7	Rarible ETH • Tezos	$342.97 -23.49%	1,433 -10.83%	$576.54k -21.82%

(a) NFT Marketplace Ranking by the Number of Traders

#	Market	Avg. price	Traders	Volume
1	OpenSea	$192.23 -14.62%	357,691 -4.45%	$315.77M -16.73%
2	X2Y2 ETH	$248.41 -2.97%	57,602 20.45%	$72.39M 5.85%
3	CryptoPunks ETH	$147.69k 27.72%	169 49.56%	$23.33M 92.2%
4	LooksRare ETH	$1k -23.35%	6,583 1.48%	$11.09M -35.6%
5	Foundation ETH	$530.69 12.69%	2,224 -13.87%	$1.16M -7.56%
6	Rarible ETH • Tezos	$342.97 -23.49%	1,433 -10.83%	$576.54k -21.82%
7	Decentraland ETH • Polygon	$5.88k -22.47%	107 -16.41%	$518.07k -25.02%

(b) NFT Marketplace Ranking by Total Market Volume

Figure A1. NFT Marketplace Ranking from Dappradar.com

Parallel Trends

Pre-trends

Post-effects

$$Y_{ijt} = \beta_0 + \boldsymbol{\beta_{-6}} Pre_t^{-6} \times Treated_{ij} + \sum_{\tau=-5}^{-2} \boldsymbol{\beta_{\tau}} Pre_t^{\tau} \times Treated_{ij} + \sum_{\tau=1}^{5} \boldsymbol{\beta_{\tau}} Post_t^{\tau} \times Treated_{ij}$$
$$+ \boldsymbol{\beta_6} Post_t^{6} \times Treated_{ij} + \beta_7 Fixed\ Sale_i + \beta_8 NFT\ Type_i + v_j + u_t + \epsilon_{ijt}$$

Table 3. Parallel Trends: Relative Time model

Variable	*Matching Likelihood*	*First-Sale Price (ln)*	*Matching Likelihood*	*First-Sale Price (ln)*
Sample	Full NFT Sample	Sold NFT Sample	Gas-Minted NFT Sample	Sold Gas-Minted NFT Sample
$Pre_t^{-6} \times Treated_{ij}$	0.006 (0.022)	-0.396 (0.260)	0.019 (0.022)	-0.411 (0.262)
$Pre_t^{-5} \times Treated_{ij}$	0.019 (0.022)	-0.041 (0.392)	0.025 (0.022)	-0.051 (0.396)
$Pre_t^{-4} \times Treated_{ij}$	-0.038 (0.025)	-0.272 (0.309)	-0.040 (0.024)	-0.277 (0.309)
$Pre_t^{-3} \times Treated_{ij}$	-0.014 (0.033)	-0.368 (0.364)	-0.013 (0.033)	-0.381 (0.365)
$Pre_t^{-2} \times Treated_{ij}$	-0.026 (0.026)	0.025 (0.318)	-0.032 (0.025)	0.021 (0.319)
$Pre_t^{-1} \times Treated_{ij}$	*baseline*			
$Post_t^{1} \times Treated_{ij}$	-0.062** (0.025)	-0.668* (0.393)	0.028 (0.023)	-0.338 (0.484)
$Post_t^{2} \times Treated_{ij}$	-0.129*** (0.041)	-0.399 (0.353)	-0.062 (0.060)	0.684 (0.427)
$Post_t^{3} \times Treated_{ij}$	-0.046 (0.029)	-0.666 (0.457)	0.051 (0.034)	-0.354 (0.943)
$Post_t^{4} \times Treated_{ij}$	-0.056** (0.026)	-0.069 (0.399)	0.099*** (0.031)	0.928** (0.388)
$Post_t^{5} \times Treated_{ij}$	-0.046** (0.022)	0.226 (0.414)	0.091** (0.042)	1.544*** (0.314)
$Post_t^{6} \times Treated_{ij}$	-0.020 (0.021)	-0.474* (0.270)	0.121*** (0.023)	1.179*** (0.260)