



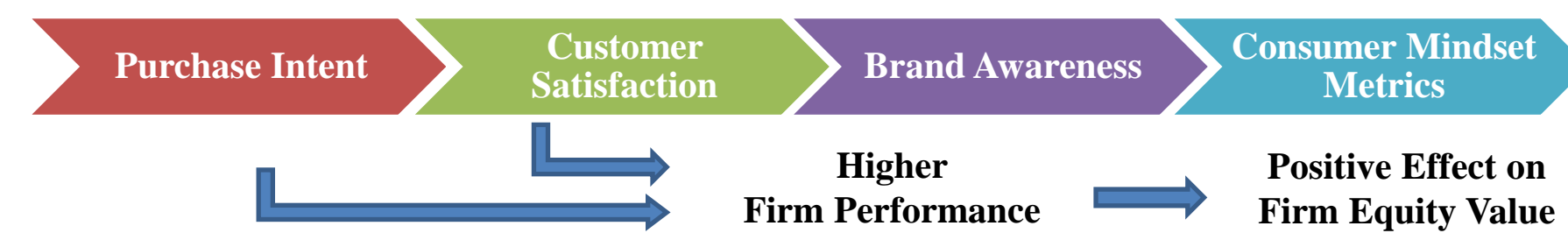
Abstract

We examine how information acquisition through social media affects venture capital (VC) investments into VC-backed startups. We collect a unique data set from Twitter API to measure the impact of portfolio companies owned social media (OSM) and earned social media (ESM) on the structure of VC investments. We find evidence consistent with the hypothesis that startup firms' social media engagement affects the staging of VC financing, the VC syndicate structure, and the probability of a successful exit. If a portfolio company's social media accounts are more active and the company has a higher engagement volume with its followers, VC firms reduce the extent of stage financing and are less likely to syndicate with each other in financing such a portfolio company. In particular, our results demonstrate that entrepreneurial firms with higher OSM and ESM engagement volume have fewer VC financing rounds, a smaller number of VCs in their VC syndicates, a lower probability of VC syndication, a higher probability of an IPO exit and a higher amount total funding across all rounds. Our findings are robust to a variety of alternative model specifications, subsamples, controlling for endogeneity in VC staging and syndication, selection biases and machine learning approaches.

Motivation

Social media affects

- Monetary policy expectations of market participants (Bianchi et al., 2019)
- Brand awareness, consumer satisfaction and purchase intent (Colicev et al., 2018)



- To the best our knowledge, no empirical study on the impact of social media and
 - VC investment structures
 - Probability of successful exit
 - Total funding of portfolio firms

Research Questions

1. Do VC investors **acquire information** through social media accounts of startups?
2. Can startups attract venture capital **investors' attention** through social media?
3. How do Earned Social Media (ESM) and Owned Social Media (OSM) affect VC financing?
4. Are VCs less likely to **stage financing** and **syndicate** with each other when social media accounts of startups are more informative?

Our expectations:

- Less Asymmetric Information → Less Stage Finance
- Less Asymmetric Information → Fewer Members in VC syndicate

Contribution of Our Study:

- 1- No study testing social media impact on VCs' investment structures
 - VC stage financing and VC syndication
 - No study testing social media impact on VCs for the post-financial crisis
- 2- It is the first paper uses Twitter data in VC investment structure literature

Data & Hypotheses

Scope: Only VC-backed firms in U.S.

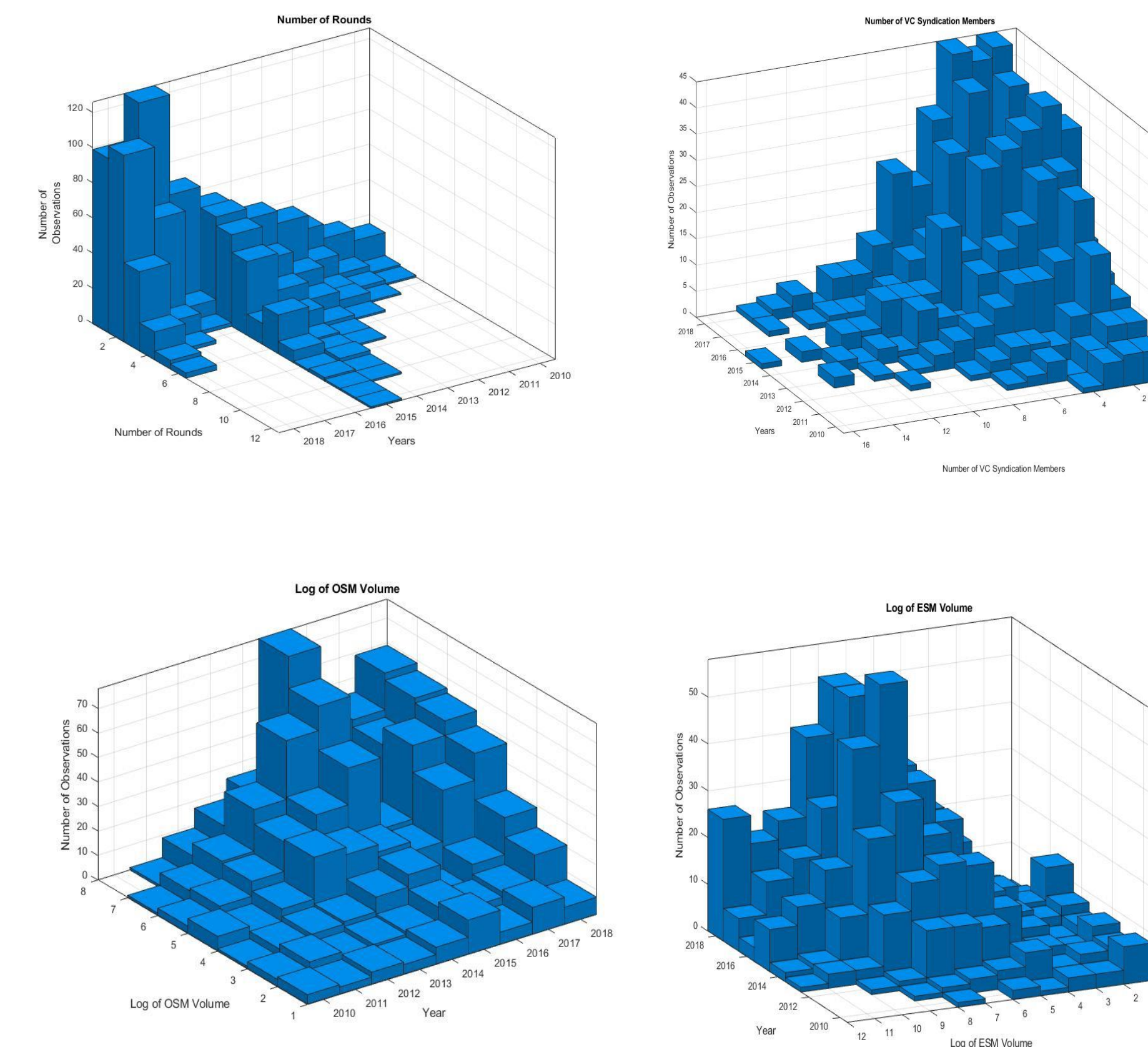
Period: 2010 - 2018

Data sources:

- Twitter API
- Thomson Reuters SDC Platinum - VenturExpert
- Capital IQ, Bloomberg, Compustat, PrivCO, Crunchbase

Our Sample:

- Portfolio firms-social media count level
- Round-level VC investments
- 4572 startups
- 1536 startups with Twitter accounts
- 1196 startups have an active Twitter account before first capital infusion



Hypotheses:

- ? H1: The higher ESM (OSM), the fewer the number of financing rounds it receives.
- ? H2: The higher ESM (OSM) volume, the fewer the number of VC firms in the VC syndicate.
- ? H3: The higher ESM (OSM) volume, the lower the probability of VC syndication.
- ? H4: The higher ESM (OSM) volume, the higher total funding across all rounds.
- ? H5: The higher an entrepreneurial firm's ESM (OSM) volume with power sentiment before the first capital infusion from VCs, the fewer the number of financing rounds it receives and the fewer the number of VC firms in the VC syndicate.

Methodology & Results

Dependent variables:

- Number of funding rounds
- Syndication dummy
- Number of members in VC syndicate
- Total funding amount all rounds

Independent variables:

- OSM and ESM

Control variables: Firm age, stage, Tobin's Q, R&D Ratio, Tangibility Ratio, VC age, VC reputation measures, year, industry, state fixed effects.

- Baseline estimation model with only Twitter dummy:

$$Y_i = \alpha + \beta_1 \text{Twitter Dummy} + \delta \text{Controls} + \varepsilon_i$$

- Baseline estimation model with OSM and ESM:

$$Y_i = \alpha + \beta_1 \text{OSM}_i + \beta_2 \text{ESM}_i + \delta \text{Controls} + \varepsilon_i$$

$$Y_i = \alpha + \beta_1 \text{OSM}_i + \beta_2 (\text{OSM}_i \times \text{Power Sentiment}_i) + \delta \text{Controls} + \varepsilon_i$$

- Estimation model with ESM and power sentiment interaction:

$$Y_i = \alpha + \beta_1 \text{ESM}_i + \beta_2 (\text{ESM}_i \times \text{Power Sentiment}_i) + \delta \text{Controls} + \varepsilon_i$$

Robustness Tests

1. Addressing endogeneity concerns
 - a) 2SLS approach
 - i. Advertising expense-to-sales ratio → OSM
 - ii. Intangible assets-to-total assets ratio → ESM
 - b) Using OSM and ESM volume before first capital infusion
2. Addressing selection bias
 - a) Heckman two-step approach
 - b) Propensity score matching
3. Using only subsample successful exits

Variables	Number of Rounds (1)	Number of Rounds (2)	Number of Rounds (3)	Number of Rounds (4)	Number of Syndicate Members (5)	Number of Syndicate Members (6)	Number of Syndicate Members (7)	Number of Syndicate Members (8)
Twitter Dummy	-0.834*** (0.000)	-0.406*** (0.000)	-0.971*** (0.000)	-0.0162 (0.934)	-0.738*** (0.000)	-0.532*** (0.000)	-0.723*** (0.000)	-0.154 (0.591)
Twitter Dummy x Startup Age		-0.0996*** (0.000)		-0.130*** (0.000)		-0.0480* (0.056)		-0.0772** (0.015)
Twitter Dummy x Early Stage Dummy			0.194 (0.136)	-0.366** (0.023)			-0.0218 (0.908)	-0.355 (0.137)
Early Stage Dummy	1.145*** (0.000)	1.112*** (0.000)	1.093*** (0.000)	1.200*** (0.000)	1.458*** (0.000)	1.442*** (0.000)	1.464*** (0.000)	1.528*** (0.000)
Startup Age	0.233*** (0.000)	0.255*** (0.000)	0.234*** (0.000)	0.260*** (0.000)	0.116*** (0.000)	0.126*** (0.000)	0.116*** (0.000)	0.132*** (0.000)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Acquisition Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Write-off Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,572	4,572	4,572	4,572	4,572	4,572	4,572	4,572
Adjusted R ²	31.50%	31.90%	31.50%	31.90%	25.80%	25.80%	25.80%	25.80%

Results cont.

Variables	Number of Rounds (AME) (1)	Number of Rounds (AME) (2)	Number of Rounds (AME) (3)
Power Sentiment	8.616 (0.185)	9.777 (0.169)	13.09* (0.058)
Log OSM	0.224*** (0.001)	0.257*** (0.001)	0.247*** (0.002)
Log ESM	-0.0934** (0.046)	-0.0937** (0.048)	-0.0680 (0.105)
Power Sentiment x Log OSM	-5.879* (0.054)	-5.903* (0.057)	-5.659** (0.041)
Power Sentiment x Log ESM	3.547 (0.122)	3.287 (0.128)	2.521 (0.159)
Control Variables	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes
Industry Dummy	No	Yes	Yes
State Dummy	No	No	Yes
Pseudo R ²	0.086	0.091	0.104
Observations	1,196	1,196	1,196

Conclusion

- ✓ H1: The higher ESM (OSM), the fewer the number of financing rounds it receives.
- ✓ H2: The higher ESM (OSM) volume, the fewer the number of VC firms in the VC syndicate.
- ✓ H3: The higher ESM (OSM) volume, the lower the probability of VC syndication.
- ✓ H4: The higher ESM (OSM) volume, the higher total funding across all rounds.
- ✓ H5: The higher an entrepreneurial firm's ESM (OSM) volume with power sentiment before the first capital infusion from VCs, the fewer the number of financing rounds it receives and the fewer the number of VC firms in the VC syndicate.
- ✓ **Active** Twitter account → **Less** financing rounds and **fewer** VC members
- ✓ **High** OSM → **More** total funding across all rounds.
- ✓ **High** OSM → **Lower** probability of VC syndication.
- ✓ **High** OSM with "power sentiment" → **Less** financing rounds and **fewer** VC members

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