Regulation and the funding of new ventures

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Motivation

- Does regulation promote or stifle the development of markets and innovation?
  (Aghion et al., 2023; Lerner and Nanda, 2023; Minniti and Palubinskas, 2023)

- If yes, through which economic channels?
  $\rightarrow$ Diff jurisdictions introducing same regulation can experience different outcomes

- How do the companies that **fund** the innovation respond to regulation?

We focus on the effects of regulation on the funding and financing of new ventures

Using crypto as a laboratory

- Nascent industry that relies heavily on VC funding
    - Blockchain technology has multiple uses, mostly explored by startups
    - No clear prior on a 'preferred' jurisdiction/location

- Little or no previous regulation

- The regulatory fragmentation of crypto markets
    - Crypto-markets are of a global nature but there is little regulatory homogeneity
    - The EU recently approved the Markets in Crypto Assets (MiCA) regulation
    - In the United States, regulation of crypto-related firms varies across states

Do states' regulatory attitudes towards crypto impact VC funding?

1. Study the relationship between regulation and VC funding at the state-level
   - Build a comprehensive index of regulatory stringency for all U.S. states

2. Understand the mechanisms exploiting the introduction of the BitLicense (deal-level)
   - Increase in disclosure requirements
   - Look for control deals using matching

Do states' regulatory attitudes towards crypto impact VC funding?

1. Study the relationship between regulation and VC funding at the state-level
   - Build a comprehensive index of regulatory stringency for all U.S. states
   - → More stringent crypto regulation associated with more VC in 'financial hubs'

2. Understand the mechanisms exploiting the introduction of the BitLicense (deal-level)
   - Increase in disclosure requirements
   - Look for control deals using matching
   - → Firms with pervasive info asymm raise more: young, low collateral
   - → Investors suffering from info asymm invest more: smaller, less specialized

Contribution

- Public policies aimed at promoting innovation:
  - ✓ Grants and R&D (Howell, 2017)
  - ✓ Business accelerator and incubators
    (González-Uribe and Reyes, 2021; Yu, 2020)
  - ✓ Regulatory sandboxes and start-up outcomes (G. Cornelli et al., 2024)
  - **?** Regulation (Lerner and Nanda, 2020; Minniti and Palubinskas, 2023)

- VC can ameliorate some information asymmetries (F. Cornelli and Yosha, 2003)
  - → Regulation can assist in removing remaining information asymmetries

Data and correlations

The economic channel

Conclusion

Data and correlations

Pitchbook

- Over 3,700 US-based crypto firms, 8,302 deals

- Information:
    - Deal: amount raised, type and purpose of the deal
    - Company: industry, headquarter state, education and gender of the CEO
    - Investors: employees and headquarters

- Cryptocurrency/Blockchain and either Financial Services or Information Technology

- Time span: January 2010 to December 2022

Monthly capital raised per state, in USD mn

Observations	Mean	Std. dev.	Min	99pctl	Max
7,956	9.36	119.21	0	186.71	7,196.81

Crypto Stringency-Index

- Hand-collected dataset of crypto related state laws

- Search for legislation using Google, academic websites, law firms, research papers, newspapers, and industry participants

- We then verify in official sources if legislation was **approved**

- Worked independently and cross-checked results

1. Money Transmission
2. Licensing general
3. Licensing specific
4. Audit
5. ATM
6. Sandbox
7-8. Income taxable/ exempt
9-10. Sales taxable/ exempt
11. AML KYC
12. Banks
13. Liquidity
14. Public
15. Blockchain

Crypto Stringency-Index
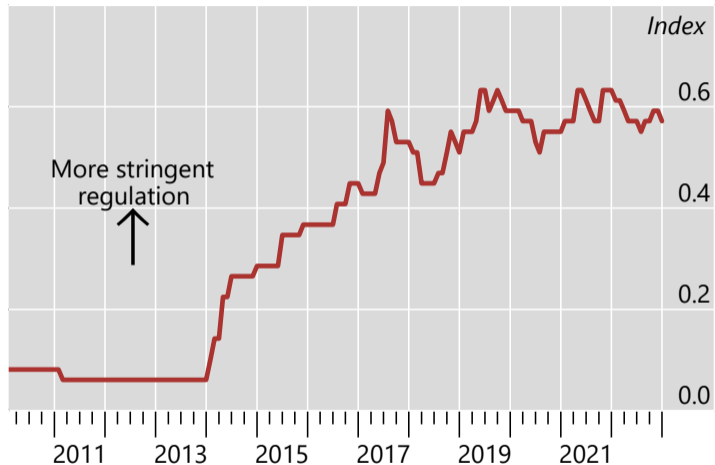
CryStIn: ▬ Average

- Observations: 7,956
- Average value: 0.32
- Standard deviation: 1.21
- Min: -4
- Max: 5

- Average state: 1.6 laws/year
- Each year: 6.3 laws

Crypto regulation and deal-making activity go hand in hand

$$\ln(y_{s,t}) = \beta \text{Index}_{s,t} + \alpha_s + \tau_t + \varepsilon_{s,t}$$
$$\ln(y_{s,t}) = \beta \text{Index}_{s,t} + \gamma \text{Index}_{s,t} \times \text{Fin hub}_s + \alpha_s + \tau_t + \varepsilon_{s,t}$$

| | Dependent Variable | | | | | | | |
| | $\ln(\text{capital raised})_{s,t}$ | | | | $\ln(\text{number of deals})_{s,t}$ | | | |
Explanatory Variables	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
$\text{CryStIn}_{s,t}$	0.102	-0.100^{**}	0.198^{**}	-0.058	0.052	-0.072^{**}	0.101^{*}	-0.041
	(0.07)	(0.05)	(0.09)	(0.04)	(0.04)	(0.03)	(0.06)	(0.03)
$\mathbb{1}[\text{Fin Hub}_s] \times \text{CryStIn}_{s,t}$		0.358^{***}				0.219^{***}		
		(0.10)				(0.06)		
Observations	7,644	7,644	3,900	3,744	7,644	7,644	3,900	3,744
Sample	Pooled	Pooled	Fin hub	Non fin hub	Pooled	Pooled	Fin hub	Non fin hub
Adjusted R^2	0.409	0.430	0.474	0.167	0.559	0.581	0.622	0.258

The economic channel

# Regulation can help decrease asymmetric information

- From previous analysis: focus on a change in regulation in a financial hub

- VCs may refrain from investing in new firms due to regulatory uncertainty

- A more stringent regulatory framework could help more opaque firms raise capital:
    - Young ($\leq$ 2yo) or start-up firms ($<$ 1yo) (Morellec and Schürhoff, 2011)
    - Firms with low-collateral (Aboody and Lev, 2000; Goyal and Wang, 2013)

- Some investors suffer more from info asymmetries:
  smaller companies, less spezialized, further away (Ivković and Weisbenner, 2005)

New York BitLicense
Institutional settings

- Approved in June 2015 in the state of New York

- Requires a specific business license to conduct cryptocurrency related activities

- The objective is to increase transparency, impacting both customers and investors

- First ever BitLicense was granted by NYDFS in September 2015

Firms' fundraising activity
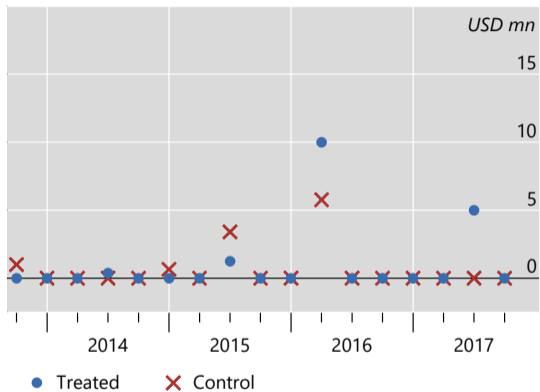
(a) Capital raised
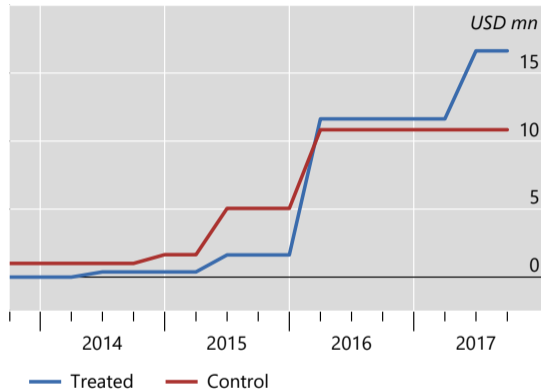
(b) Cumulative capital raised

Empirical strategy

- We use data at the firm (i) - quarter-year (t) level :

$$y_{i,t} = \exp\left(\beta\, \mathsf{NY}_i \times \mathsf{Post}_t \times \mathsf{IA}_i + X_{i,t}'\gamma + \alpha_i + \theta_t + \varepsilon_{i,t}\right)$$

- Build control group using coarsed-exact matching (Iacus et al., 2012)

- Matching: index, industry, firm age, CEO characteristics

Explanatory variables	Dependent Variable: Cumulative capital raised$_{i,t}$			
	(I)	(II)	(III)	(IV)
$\mathbb{1}\left[\text{Post}_t\right] \times \mathbb{1}\left[\text{NY}_i\right]$	0.228***	0.582	0.180**	0.544
	(0.07)	(0.64)	(0.07)	(0.58)
$\mathbb{1}\left[\text{Young}_{i,t}\right]$			-0.537	-0.276
			(0.35)	(0.35)
$\mathbb{1}\left[\text{Post}_t\right] \times \mathbb{1}\left[\text{Young}_{i,t}\right]$			0.296	0.231
			(0.25)	(0.26)
$\mathbb{1}\left[\text{NY}_i\right] \times \mathbb{1}\left[\text{Young}_{i,t}\right]$			-1.229***	-1.383***
			(0.32)	(0.35)
$\mathbb{1}\left[\text{Post}_t\right] \times \mathbb{1}\left[\text{NY}_i\right] \times \mathbb{1}\left[\text{Young}_{i,t}\right]$			0.542**	0.881***
			(0.27)	(0.30)
Controls		✓		✓
Observations	2,584	2,584	2,584	2,584
Pseudo R^2	0.881	0.897	0.885	0.899

Extensions and robustness

- Extensions:
    - Stronger results for even younger firms, low collateral
    - Considering the investors angle
    - Ex-post survival

- Robustness:
    - Firm and industry$\times$time fixed effects: control for time-varying agg demand
    - Falsification test: California as treatment group instead of New York
    - Within state control: New York fintech firms that are not active in crypto
    - Use different splits of investor participation

Conclusion

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- Exploiting the introduction of the BitLicense in NY
  $\rightarrow$ Younger firms receive more VC funding
  $\rightarrow$ Less specialized investors increase their investment

Conclusion **... and thank you!**

- We introduce a new framework to asses the stringency of crypto-regulation

- More stringent regulation correlates with more VC funding
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  $\rightarrow$ Less specialized investors increase their investment

Appendix

Investment in crypto firms increased remarkably from 2012 to 2022
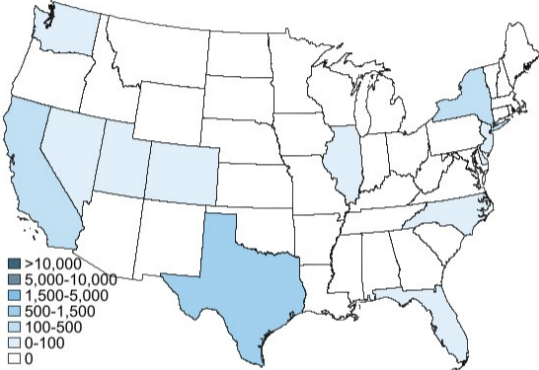
(a) Investment by 2012

(b) Investment by 2022

Legend:
- >10,000
- 5,000-10,000
- 1,500-5,000
- 500-1,500
- 100-500
- 0-100
- 0
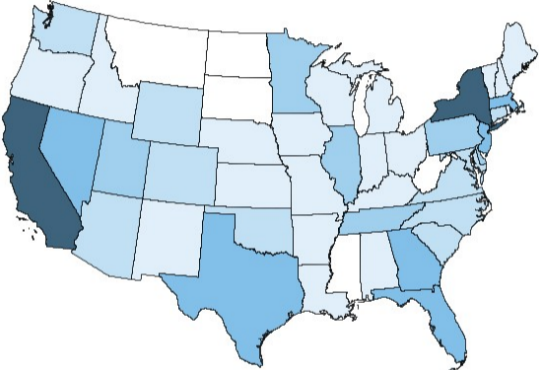
Summary statistics

Table: Descriptive statistics

Panel A: state-level analysis

	No obs	Mean	St dev	Min	Max
Deals					
Capital raised, in USD mn	7,644	4.17	23.31	0	196.76
Number	7,644	0.73	3.31	0	74
CryStIn	7,644	0.35	1.21	−4	5

NOTE: The sample includes 49 states for the period 2010–22. *Capital raised* is winsorised at the 1st and 99th percentiles. *CryStIn* refers to the Cryptocurrecy Stringency Index.

Panel B: firm-level analysis

	No obs	Mean	St dev	Min	Max
Cumulative capital raised, in USD mn	2,584	4.18	18.15	0	262
Firm age	2,584	0.85	1.91	0	7
CEO male, (0/1)	2,584	0.97	0.16	...	...
CryStIn	2,584	0.59	1.34	0	4
Deal number	2,584	1.21	1.26	0	5
Young, (0/1)	2,584	0.62	0.48	...	...
Startup, (0/1)	2,584	0.18	0.39	...	...
Low-collateral, (0/1)	2,584	0.80	0.40	...	...
Survival, (0/1)	2,584	0.73	0.44	...	...

NOTE: The sample includes quarterly data for 152 firms around the approval of the New York DFS BitLicense ie Sep 2013 to Jun 2017. *Cumulative capital raised* is winsorised at the 2nd and 98th percentiles.

Panel C: investor-firm-level analysis

	No obs	Mean	St dev	Min	Max
Cumulative capital invested, in USD mn	21,968	0.56	1.98	0	48.37
Foreign investor, (0/1)	21,935	0.21	0.45	...	...
Non-specialist investor, (0/1)	21,935	0.68	0.47	...	...
Small investment firm, (0/1)	21,968	0.41	0.49	...	...

NOTE: The sample includes quarterly data for 942 investors and 142 firms around the approval of the New York DFS BitLicense ie Sep 2013 to Jun 2017. Foreign investor refers to investors headquartered outside of the U.S. Non-specialist investor refers to investors whose main sector is not the crypto sector, and Small investment firm refers to VC firms with less than five investment professionals.
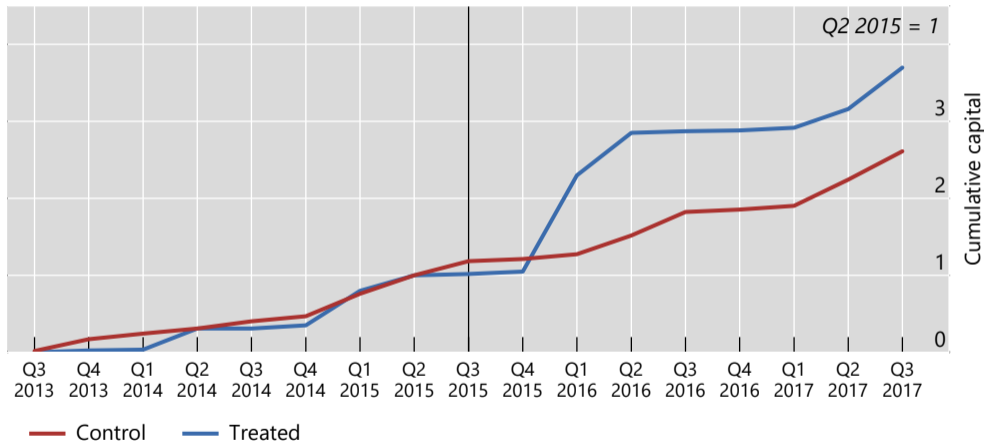
State level robustness test

- Financial hub definition: top-bottom tercile of finance GDP distribution

- Instrument the index:
    - One-period lag of the the out-of-state average
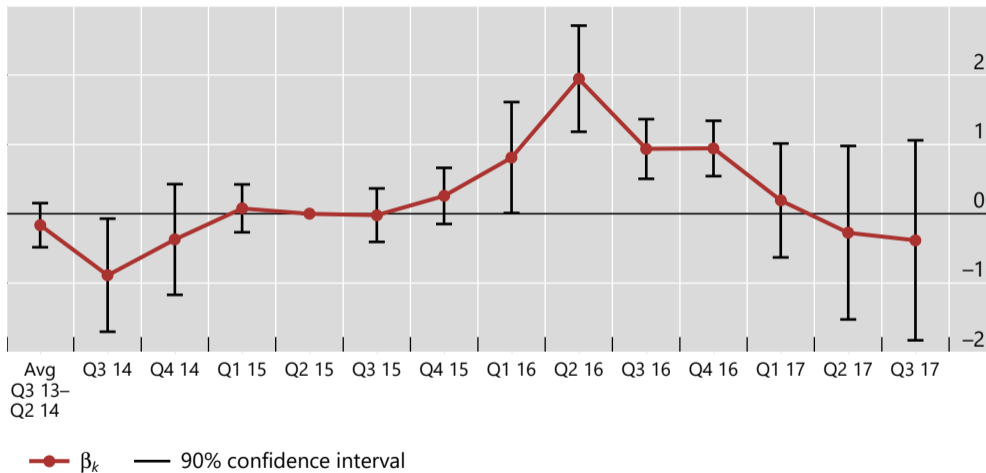   - Window around the ranking of all VC funding

$$\ln(y_{s,t}) = \beta \widehat{\text{Index}}_{s,t} + \gamma \widehat{\text{Index}_{s,t}\text{Fin hub}_s} + \alpha_s + \tau_t + \varepsilon_{s,t}$$

$$\widetilde{\text{Index}}_{s,t-1} = \text{Index}_{s,t-1} - \frac{\sum_{j \neq s}^{S} \text{Index}_{j,t-1}}{S-1}$$

Parallel trends

Dynamic effects for young firms ▸ Back

Explanatory variables	Dependent Variable: Cumulative capital raised$_{i,t}$			
	(I)	(II)	(III)	(IV)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i]$	0.210*** (0.05)	0.901 (0.58)	-0.250 (0.29)	0.203 (0.73)
$\mathbb{1}\left[\text{Start-up}_{i,t}\right]$	-0.669** (0.30)	-0.436 (0.32)		
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\left[\text{Start-up}_{i,t}\right]$	-0.063 (0.40)	-0.174 (0.38)		
$\mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\left[\text{Start-up}_{i,t}\right]$	-0.989*** (0.35)	-1.299^{***} (0.33)		
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\left[\text{Start-up}_{i,t}\right]$	1.740*** (0.41)	2.109*** (0.38)		
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{Low-collateral}_i]$			-0.315 (0.34)	-0.375 (0.44)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\,[\text{Low-collateral}_i]$			0.996*** (0.34)	1.249** (0.49)
Controls		✓		✓
Observations	2,584	2,584	2,584	2,584
Pseudo R^2	0.883	0.898	0.882	0.898

Compared to the median pre-BitLicense it's 5.6–7.2 USD million more in total capital raised.

Considering investors' angle

| | Dependent Variable: Cumulative capital raised$_{j,i,t}$ | | | |
Explanatory variables	(I)	(II)	(III)	(IV)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i]$	0.515***	0.383***	0.288**	0.331*
	(0.14)	(0.14)	(0.13)	(0.17)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\left[\text{Foreign investor}_j\right]$		0.462*		
		(0.27)		
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\left[\text{Foreign investor}_j\right]$		0.550**		
		(0.27)		
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\left[\text{Non-specialist investor}_j\right]$			-0.078	
			(0.13)	
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\left[\text{Non-specialist investor}_j\right]$			0.327**	
			(0.13)	
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\left[\text{Small investment firm}_j\right]$				-0.328***
				(0.09)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\left[\text{Small investment firm}_j\right]$				0.543***
				(0.13)
Observations	21,968	21,935	21,935	21,968
Pseudo R^2	0.646	0.648	0.646	0.647

Foreign investors invest nearly twice more capital. Non-specialists, increase their investment by about 50%.

Considering firms' ex-post survival • Back

Explanatory variables	Dependent Variable: Cumulative capital raised$_{i,t}$		
	(I)	(II)	(III)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i]$	−0.152	4.404	0.685
	(0.67)	(3.43)	(0.57)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{Survived}_i]$	−0.542		
	(0.46)		
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\,[\text{Survived}_i]$	1.162***		
	(0.44)		
$\mathbb{1}\left[\text{Young}_{i,t}\right]$		-0.546**	0.044
		(0.28)	(0.43)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\left[\text{Young}_{i,t}\right]$		0.686***	0.066
		(0.26)	(0.27)
$\mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\left[\text{Young}_{i,t}\right]$		0.566*	−2.178***
		(0.34)	(0.41)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\left[\text{Young}_{i,t}\right]$		-0.333*	1.241***
		(0.19)	(0.31)
Sample of firms	Young	Eventually bankrupt	No bankruptcy
Observations	1,370	697	1,887
Pseudo R^2	0.792	0.792	0.914

Table: Controlling for time-varying industry characteristics

Explanatory Variables	Dependent Variable: Cumulative capital raised$_{i,t}$			
	(I)	(II)	(III)	(IV)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i]$	0.469	0.357	0.879**	-0.432
	(0.52)	(0.47)	(0.44)	(0.73)
$\mathbb{1}\,[\text{Young}_{i,t}]$		-0.295		
		(0.33)		
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{Young}_{i,t}]$		0.255		
		(0.27)		
$\mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\,[\text{Young}_{i,t}]$		-1.617***		
		(0.47)		
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\,[\text{Young}_{i,t}]$		1.065**		
		(0.46)		
$\mathbb{1}\,[\text{Start-up}_{i,t}]$			-0.440	
			(0.28)	
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{Start-up}_{i,t}]$			-0.144	
			(0.37)	
$\mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\,[\text{Start-up}_{i,t}]$			-1.341***	
			(0.40)	
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\,[\text{Start-up}_{i,t}]$			2.110***	
			(0.57)	
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{Low-collateral}_i]$				0.387
				(0.25)
$\mathbb{1}\,[\text{Post}_t] \times \mathbb{1}\,[\text{NY}_i] \times \mathbb{1}\,[\text{Low-collateral}_i]$				1.466**
				(0.67)
Observations	2,455	2,455	2,455	2,455
Pseudo R^2	0.897	0.899	0.898	0.899

NOTE: Firm-level data for the 8 quarters before to the 8 quarters around the introduction of the New York DFS BitLicense ie Sep 2013 to Sep 2017. The table reports the coefficients of Poisson pseudo-maximum-

CA as a placebo • Back

Table: Falsification test using California

Explanatory Variables	(I)	(II)	(III)	(IV)	(V)	(VI)
			Dependent Variable: Cumulative capital raised$_{i,t}$			
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{CA}_i]$	0.208	0.340**	0.227	0.130	-0.102	0.453**
	(0.17)	(0.16)	(0.15)	(0.44)	(0.14)	(0.20)
$\mathbb{1}[\text{Young}_{i,t}]$		-0.695*			-0.570**	-0.585
		(0.38)			(0.29)	(0.48)
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{Young}_{i,t}]$		0.594***			0.687***	0.516**
		(0.22)			(0.25)	(0.21)
$\mathbb{1}[\text{CA}_i] \times \mathbb{1}[\text{Young}_{i,t}]$		-0.223			0.542*	-0.457
		(0.44)			(0.32)	(0.54)
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{CA}_i] \times \mathbb{1}[\text{Young}_{i,t}]$		0.162			-0.232	0.358
		(0.23)			(0.18)	(0.22)
$\mathbb{1}[\text{Start-up}_{i,t}]$			-0.604**			
			(0.27)			
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{Start-up}_{i,t}]$			0.619			
			(0.40)			
$\mathbb{1}[\text{CA}_i] \times \mathbb{1}[\text{Start-up}_{i,t}]$			-0.523			
			(0.34)			
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{CA}_i] \times \mathbb{1}[\text{Start-up}_{i,t}]$			-0.645			
			(0.39)			
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{Low-collateral}_i]$				0.137		
				(0.47)		
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{CA}_i] \times \mathbb{1}[\text{Low-collateral}_i]$				0.087		
				(0.47)		
Sample of firms	All	All	All	All	Eventually bankrupt	No bankruptcy
Observations	2,839	2,839	2,839	2,839	714	2,125
Pseudo R^2	0.894	0.896	0.895	0.894	0.763	0.909

NOTE: Firm-level data for the 8 quarters before to the 8 quarters after the introduction of the New York DFS BitLicense ie Sep 2013 to Jun 2017. The table reports the coefficients of Poisson pseudo-maximum-likelihood regressions for a falsification test where the treated

Proportional capital split ▸ Back

Table: Investors' characteristics and informational asymmetries: cumulative capital

Explanatory variables	Dependent Variable: Cumulative capital invested$_{j,i,t}$			
	(I)	(II)	(III)	(IV)
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{NY}_i]$	0.425***	0.252	0.156	0.308**
	(0.15)	(0.16)	(0.15)	(0.15)
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}\left[\text{Foreign investor}_j\right]$		0.282		
		(0.30)		
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{NY}_i] \times \mathbb{1}\left[\text{Foreign investor}_j\right]$		0.576*		
		(0.33)		
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}\left[\text{Non-specialist investor}_j\right]$			0.104	
			(0.12)	
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{NY}_i] \times \mathbb{1}\left[\text{Non-specialist investor}_j\right]$			0.404***	
			(0.13)	
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{Small investment firm}_j]$				-0.393***
				(0.15)
$\mathbb{1}[\text{Post}_t] \times \mathbb{1}[\text{NY}_i] \times \mathbb{1}[\text{Small investment firm}_j]$				1.095***
				(0.21)
Observations	16,499	16,499	16,499	16,499
Pseudo R^2	0.767	0.768	0.767	0.768

NOTE: Investor-firm level data for the 8 quarters before to the 8 quarters after the introduction of the New York DFS BitLicense ie Sep 2013 to Jun 2017. The table reports the coefficients of Pois-

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