Do Venture Capitalists Value Climate Risk?: Evidence from State Climate Adaptation Plans

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Background & Main Findings

- This paper finds its motivation from the link between two lines of studies.
  1. Both institutional and retail investors address climate risk in their investment strategies.
     - Dyck, Lins, Roth, and Wagner (2019), Hartzmark and Sussman (2019), Krueger, Sautner, and Starks (2020), Andriosopoulos, Czarnowski, and Marshall (2021), Bauer, Ruof, and Smeets (2021), Burt, Harford, Stanfield, and Zein (2022), Cheng, Chu, Deng, Huang (2022)
  2. How venture capital (VC) investors monitor their portfolio companies through their investment strategy and this alters startups' performance.
     - Megginson and Weiss (1991), Amit, Brander, and Zott (1998), Gompers and Lerner (2001), Hellmann and Puri (2002), Hsu (2004), Kaplan and Schoar (2005), Tian (2011), Decker, Haltiwanger, Jarmin, and Miranda (2014), Bernstein (2015)

- What happens if there is an exogenous shock that can alter the level of environmental regulation and associated compliance costs? And how would this affect venture capital investment and their portfolio companies?
  1. Increase VC investment on green startups.
  2. Green startups increase green innovation while receiving more VC funding.
  3. Brown startups penalized by VCs by receiving less amount of investment.
  4. Startups funded by experienced VCs focus on increasing total innovation outcome.
  5. Startups in energy industry increase green innovation but does not receive larger funding.
  6. Only green startups funded by experienced VCs make successful exit.

Research Question

- *Greenbacks for Greenery*
  - According to Cleantech Group, investors funded $36 billion into climate-related technology in 2019, up from $17 billion in 2015.
  - Ideally, this should spur innovation and lower the relative price of climate-friendly technology.
  - However, VC-backed startups are one of the largest innovation drivers but the returns of clean-tech VCs are controversial (Gompers and Lerner, 2004; Kaplan and Lerner, 2010).
    1. It is uncertain whether clean-tech is related to shareholder wealth increase.
    2. Many VC funds took a financing model designed for software firms and applied it to companies producing physical products, solar panels, and biofuels.

  $\Rightarrow$ *What if a legislative amendment fosters a regulatory framework that significantly incentivizes the adoption of sustainable technology?*

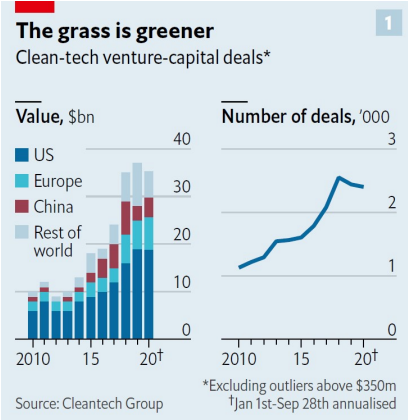

Figure: *Rise of Clean-tech VC (The Economist)*

State Climate Adaptation Plans

- *State Climate Adaptation Plans (SCAP)* is a plan led by 15 states to take preemptive measures to address existing and anticipated climate risk.
  1. *Planning and capacity building*: Raising awareness of climate risk for local businesses and investors.
  2. *Law and policy*: Directly influence stakeholders by creating or revising legislation or regulations.
  3. *Post-implementation monitoring*: Affect the cost of capital and quality of local businesses.

- This law change can lead to three different consequences.
  1. *Successful*: Reduce the level of perceived corporate climate risk, promote clean-tech innovation, and send positive signal of 'public safety net' to VC investors.
  2. *Challenge*: Pose significant compliance cost, lead financial constraint of local businesses, reduce startups' willingness to take riskier projects.
  3. *Irrelevant*: If the VC investors do not address climate risk, the adoption may not impose any changes.

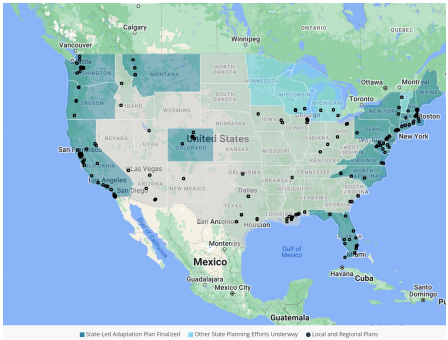

Figure: *SCAP Adoption from Georgetown Climate Center*

Hypothesis Development

- Successful implementation of the SCAP would provide favorable conditions for local startups to adopt environmentally friendly policies, leading to an increase in their level of innovation output.
- As VC investors screen and monitor private companies, startups are likely to increase their green innovation to demonstrate their alignment with SCAP. (Kaplan and Stromberg, 2001; Brander, Amit, and Antweiler, 2002; Chemmanur, Krishnan, and Nandi, 2011)

$\Rightarrow$ ***H1****: The SCAP adoption will increase the level of green innovation output made by startups.*

- The purpose of the SCAP is to reduce future corporate climate risk and can provide green startups a comparative advantage.
- Investors who recognize the importance of the climate risk would prefer startups with more sustainable outlook.

$\Rightarrow$ ***H2****: After the SCAP, green startups will be rewarded by VC investors with a larger amount of investment whereas brown startups will be penalized.*

Hypothesis Development

- Prior research suggest that there exists an ESG innovation disconnect, particularly in energy industries (Cohen, Gurun, and Nguyen, 2020; Unsal and Yildrim, 2021, Li, Neupane-Joshi, and Tan, 2022).
- Despite being major contributors to toxic emissions, energy firms are among the largest drivers of green innovation.

$\Rightarrow$ ***H3***: *Energy startups will increase green innovation after the SCAP but will not be able to obtain larger amounts of investment from VC investors.*

- The relationship between green innovation and shareholder wealth is controversial.
  1. Prior studies highlight ESG policies may not necessarily result in enhanced firm value.
  2. It remains unclear whether private companies that prioritize eco-friendly practices will be well-received by the public market.
- VC's experience becomes important for green startups to make successful exit.
  1. Certification effect from VC investors.
  2. Financing model designed for software companies and green startups differ.

$\Rightarrow$ ***H4***: *Green startups will have a successful exit compared to brown startups after the adoption of SCAP only if funded by experienced VCs.*

Data

1. Data for VC investment
   - Downloaded using VentureXpert from Refinitiv's Securities Data Company (SDC) Platinum.
   - Panel of VC and startup pair per each round between 1953-2019.
   - Yields 36,991 unique startups and 119,738 round year observations.

2. Data for innovation
   - Downloaded from United States Patent and Trademark Office (USPTO) and PatentsView.
   - Number of patents applied and citation received between 1953-2019.
   - Yields 16,639,585 patents granted and 34,124,236 citation records.
   - Green innovation outcomes sorted following Haščič and Migotto (2015) and guidelines Organization for Economic Co-operation and Development (OECD).

3. Data for corporate violation records
   - Downloaded from Violation Tracker dataset, provided from Corporate Research Project of Good Jobs First.
   - Classify different types of violations such as environment, employment, financial, and safety-related offenses.
   - Yields more than 520,000 violation records from 376,796 unique companies.

Empirical Method

$$y_{ijst} = \beta_1 SCAP_{st} + \gamma' \mathbb{X}_{ijst} + \eta_i + \omega_s + \delta_{jt} + \varepsilon_{ijst}$$

- Difference-in-differences employed by referring Bernstein, Giroud, and Townsend (2016) and Gu, Huang, Mao, and Tian (2020) for model specification.

- y proxies for VC monitoring and innovation for startup i, operating in industry j, headquartered in state s, in year t.
  1. η_i represent lead VC fixed effects.
  2. ω_s represent state fixed effects.
  3. δ_{jt} represent industry-by-year fixed effects.

- As lead VC investors are main agents who engage in VC monitoring (Gompers, 1996; Bernstein et al., 2016), lead VCs are sorted out by
  1. VC firms that involved in the investment the longest.
  2. VC firms that made the most amount of investment.

Table 3: Green Innovation

- To study impact of SCAP adoption on innovation, I employ three measures including
  1. *Green patents*
  2. *Ratio of green patents*
  3. *Patent application*

- Compared to sample average, SCAP adoption leads
  1. Increase in green patents by 60%.
  2. Increase in ratio of green patents by 50%.
  3. No impact on overall patents.

Table 3

The Effect of SCAP Adoptions on Green Innovation

	Green Patent		*Green Patent/Patent*		*Patent*	
	(1)	(2)	(3)	(4)	(5)	(6)
SCAP	0.007***	0.006**	0.002***	0.001**	0.004	-0.012
	(2.88)	(2.51)	(2.73)	(2.26)	(0.25)	(-0.70)
Unemployment		0.000		-0.000		0.009**
		(0.13)		(-0.49)		(2.26)
GDP Growth		-0.000		-0.000		-0.001
		(-0.07)		(-0.28)		(-0.97)
Political Rep		-0.005		-0.001		-0.046*
		(-1.06)		(-0.59)		(-1.96)
Distance		0.000		0.000		-0.000*
		(1.08)		(1.27)		(-1.92)
Age		-0.002***		-0.001***		-0.008**
		(-2.70)		(-3.10)		(-2.19)
Early Dummy		-0.002		-0.000		-0.028***
		(-1.43)		(-0.96)		(-4.58)
Patent Before VC		0.010***		0.002***		0.165***
		(22.42)		(15.59)		(25.46)
Lead VC FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,735	75,735	75,735	75,735	75,735	75,735
Adjusted R^2	0.222	0.241	0.256	0.267	0.206	0.407

Table 4: Likelihood

- Does SCAP adoption shift VC investment towards green startups?
- An hypothetical VC investment dataset constructed by matching counterpart if
  1. Deals made within 30 days prior to actual deal.
  2. Same industry.
- SCAP raise likelihood of *Investment* in green startups by 1.0%, which is 50% increase compare to the unconditional probability of VC investment.

Table 4

Likelihood of VC Investment on Green Startups

	Investment			
	(1)	(2)	(3)	(4)
SCAP	0.010***	0.011***	0.008**	0.010***
	(3.28)	(3.54)	(2.55)	(3.07)
Unemployment		-0.001		-0.002
		(-1.05)		(-1.65)
GDP Growth		0.000		0.000
		(0.46)		(0.83)
Political Rep		-0.009		-0.013
		(-1.19)		(-1.65)
Distance			-0.000	-0.000
			(-0.09)	(-0.06)
Age			-0.000	-0.000
			(-0.10)	(-0.16)
Early Dummy			0.004***	0.004***
			(3.01)	(3.03)
Patent Before VC			0.020***	0.020***
			(13.89)	(13.77)
Lead VC FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	175,696	175,696	175,696	175,696
Adjusted R^2	0.287	0.287	0.316	0.316

Table 5: Green Startups

- What happens to the innovation performance and VC investment for green startups?
- *Green startups* are defined as those with green patent applications at least three years before receiving first VC round of investment.
- Compared to sample average, green startups tend to
  1. Increase green innovation by 630%.
  2. Increase ratio of green innovation by 850%.
  3. Decrease innovation by 118%.
  4. Receive more VC investment by 1.6%.
- Green innovation requires substantial input, leading to difficulty in balancing overall innovation output.

Table 5

The Effect of SCAP Adoptions on Green Startups

Panel A: Innovation

	Green Patent		*Green Patent/Patent*		*Patent*	
	(1)	(2)	(3)	(4)	(5)	(6)
SCAP	-0.001	-0.000	-0.000	-0.000	0.005	-0.005
	(-0.32)	(-0.16)	(-0.52)	(-0.38)	(0.39)	(-0.35)
Green Startups	0.172***	0.169***	0.038***	0.038***	0.613***	0.299***
	(16.04)	(16.19)	(10.74)	(10.98)	(10.97)	(7.02)
SCAP × Green Startups	0.063***	0.063***	0.017***	0.017***	-0.183**	-0.164**
	(4.27)	(4.27)	(4.85)	(4.84)	(-2.07)	(-2.19)
Controls	No	Yes	No	Yes	No	Yes
Lead VC FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,735	75,735	75,735	75,735	75,735	75,735
Adjusted R^2	0.390	0.391	0.391	0.391	0.254	0.416

Panel B: VC Investment

	Round Amount		*Syndicate Size*	
	(1)	(2)	(3)	(4)
SCAP	0.015	-0.032	0.011	0.005
	(0.26)	(-0.61)	(0.57)	(0.28)
Green Startups	0.219***	-0.058	0.036***	-0.018
	(4.44)	(-1.03)	(3.43)	(-1.62)
SCAP × Green Startups	0.110*	0.133**	0.011	0.017
	(1.90)	(2.38)	(0.48)	(0.68)
Controls	No	Yes	No	Yes
Lead VC FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	54,974	54,974	75,735	75,735
Adjusted R^2	0.372	0.382	0.185	0.189

Table 6: Brown Startups

- *Brown startups* are defined as those with an environmental violation record during the VC investment horizon.
- Compared to sample average, brown startups tend to
  1. Decrease green patent by 280%.
  2. Receive less VC funding by 10.8%.
- The compliance costs and enhanced regulation due to SCAP adoption can be a significant burdensome for brown startups.

Table 6

The Effect of SCAP Adoptions on Brown Startups

Panel A: Innovation

	Green Patent		*Green Patent/Patent*		*Patent*	
	(1)	(2)	(3)	(4)	(5)	(6)
SCAP	0.007***	0.006**	0.002***	0.001**	0.004	-0.011
	(2.92)	(2.53)	(2.76)	(2.28)	(0.31)	(-0.69)
Brown Startups	-0.010***	-0.014***	-0.002**	-0.003***	0.087**	0.004
	(-2.93)	(-5.01)	(-2.66)	(-3.92)	(2.18)	(0.21)
SCAP × Brown Startups	-0.032*	-0.028*	-0.008	-0.007	-0.120	-0.060
	(-1.79)	(-1.75)	(-1.59)	(-1.52)	(-1.32)	(-1.21)
Controls	No	Yes	No	Yes	No	Yes
Lead VC FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,735	75,735	75,735	75,735	75,735	75,735
Adjusted R^2	0.223	0.241	0.256	0.267	0.206	0.407

Panel B: VC Investment

	Round Amount		*Syndicate Size*	
	(1)	(2)	(3)	(4)
SCAP	0.033	-0.019	0.013	0.007
	(0.58)	(-0.37)	(0.69)	(0.36)
Brown Startups	0.785***	0.740***	0.057**	0.047*
	(4.79)	(4.69)	(2.40)	(1.98)
SCAP × Brown Startups	-1.012***	-0.880***	-0.111*	-0.100*
	(-4.21)	(-3.22)	(-1.81)	(-1.86)
Controls	No	Yes	No	Yes
Lead VC FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	54,974	54,974	75,735	75,735
Adjusted R^2	0.372	0.383	0.185	0.189

Table 7: Experienced VCs

- By following Sørensen (2007) and Kwon (2022), *experienced VCs* are defined as VCs led their portfolio companies to successful exit via IPO above the market average.
- If experienced VCs deviate from the established patterns of general VC investment in green startups, this will cast doubt on the true value of green innovation.
- Green startups funded by experienced VCs show distinct pattern;
  1. No significant rise in green innovation.
  2. Significant increase in innovation output by 118% than sample average.
- Findings from brown startups remain consistent.

Table 7

Experienced VCs

	Green Startups				Brown Startups			
	Green Patent	*Patent*	*Round Amount*	*Syndicate Size*	*Green Patent*	*Patent*	*Round Amount*	*Syndicate Size*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SCAP	-0.000	0.005	-0.096*	-0.014	0.006*	-0.009	-0.079	-0.010
	(-0.15)	(0.32)	(-1.89)	(-0.75)	(1.90)	(-0.55)	(-1.55)	(-0.56)
Exp_VC	-0.001	-0.004	-0.016	0.002	-0.001	-0.001	-0.023	0.003
	(-0.72)	(-0.62)	(-0.41)	(0.34)	(-0.85)	(-0.17)	(-0.61)	(0.47)
SCAP × Exp_VC	0.000	-0.019***	0.116**	0.038***	0.001	-0.006	0.110**	0.033***
	(0.08)	(-3.36)	(2.24)	(4.94)	(0.16)	(-1.30)	(2.36)	(5.14)
Green Startups	0.159***	0.268***	-0.029	-0.028				
	(11.14)	(6.34)	(-0.37)	(-1.48)				
SCAP × Green Startups	0.071***	-0.252***	0.207	0.059**				
	(4.13)	(-3.94)	(1.57)	(2.08)				
Exp_VC × Green Startups	0.023*	0.067*	-0.066	0.022				
	(1.70)	(1.85)	(-0.71)	(0.80)				
SCAP × Exp_VC	-0.018	0.164***	-0.131	-0.086				
× Green Startups	(-0.59)	(3.60)	(-0.53)	(-1.23)				
Brown Startups					-0.017***	0.032	0.669***	0.048
					(-3.23)	(0.96)	(4.50)	(1.48)
SCAP × Brown Startups					0.012	-0.109*	-0.209	-0.087
					(1.28)	(-1.73)	(-0.77)	(-0.60)
Exp_VC × Brown Startups					0.007	-0.060	0.170	-0.001
					(0.81)	(-1.07)	(0.41)	(-0.02)
SCAP × Exp_VC					-0.057**	0.090	-0.965*	-0.028
× Brown Startups					(-2.41)	(0.88)	(-1.73)	(-0.16)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lead VC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,735	75,735	54,974	75,735	75,735	75,735	54,974	75,735
Adjusted R^2	0.391	0.417	0.382	0.190	0.241	0.407	0.383	0.190

Table 8: Debt Accessibility

- *Debt* is defined as a dummy variable that equal to one if a startup has utilized its patents as collateral to secure debt (Hochberg, Serrano, and Ziedonis, 2018).

- I focus on secured debt channel for two reasons.
  1. Due to financial frictions and information asymmetries, startups successful in pledging their patents may possess advantage in using external debt.
     - Leland and Pyle (1977), Stiglitz and Weiss (1981)
  2. VCs' commitment as intermediaries can influence the level of debt accessibility.
     - Holmstrom and Tirole (1997), Nanda and Rhodes-Kropf (2017)

- Likelihood of debt usage increases by 3.5% only from the green startups funded by experienced VCs.

Table 8

The Effect of SCAP on Green Startups' Debt Accessibility

	Debt		
	(1)	(2)	(3)
SCAP	-0.004	-0.004	-0.003
	(-0.92)	(-0.89)	(-0.58)
Green Startups		0.030*	0.024
		(1.75)	(1.13)
SCAP × Green Startups		0.003	-0.016
		(0.08)	(-0.52)
Exp_VC			0.001
			(0.58)
SCAP × Exp_VC			-0.003
			(-1.04)
Exp_VC × Green Startups			0.014
			(0.75)
SCAP × Exp_VC × Green Startups			0.035*
			(1.74)
Controls	Yes	Yes	Yes
Lead VC FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Observations	75,735	75,735	75,735
Adjusted R^2	0.165	0.166	0.166

Table 9: Violation Records

- When companies face financial pressure, it increases the likelihood of managers engaging in manipulation of real activities, such as violation on workplace safety and wage.
  - Caskey and Ozel (2017), Raghunandan (2021), Farzamfar, Foroughi, and Ng (2022)
- Despite the increased VC funding, SCAP adoption may still pose a significant financial burden in the form of compliance cost for startups.
- The findings turns opposite when experienced VCs get involve in.
  1. Green startups are more likely to engage in consumer & employment-related offenses.
  2. Green startups with experienced VCs are less likely to engage in consumer-related offenses.

Table 9

The Effect of SCAP Adoptions on Violation Records

Panel A: Green Startups

	Consumer Protection		*Employment*		*Environment*	
	(1)	(2)	(3)	(4)	(5)	(6)
SCAP	-0.000	-0.000	-0.002**	-0.002**	-0.001	-0.000
	(-0.83)	(-0.97)	(-2.38)	(-2.30)	(-0.66)	(-0.50)
SCAP × Green Startups	0.004**	0.004**	0.003***	0.003***	0.000	0.000
	(2.14)	(2.13)	(2.83)	(2.90)	(0.19)	(0.26)
Controls	No	Yes	No	Yes	No	Yes
Lead VC FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,735	75,735	75,735	75,735	75,735	75,735
Adjusted R^2	0.016	0.016	0.171	0.171	0.501	0.501

Panel B: Green Startups Funded by Experienced VCs

	Consumer Protection		*Employment*		*Environment*	
	(1)	(2)	(3)	(4)	(5)	(6)
SCAP	0.000	0.000	-0.002**	-0.002*	-0.000	-0.000
	(0.61)	(0.54)	(-2.02)	(-1.92)	(-0.25)	(-0.05)
SCAP × Exp_VC	-0.007**	-0.007**	-0.005	-0.005	0.004	0.004
× Green Startups	(-2.26)	(-2.26)	(-1.44)	(-1.44)	(1.37)	(1.35)
Controls	No	Yes	No	Yes	No	Yes
Lead VC FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	75,735	75,735	75,735	75,735	75,735	75,735
Adjusted R^2	0.018	0.018	0.171	0.171	0.501	0.501

Table 11: Energy Startups

- Startups in energy industries tend to
  1. Increase green innovation by 750% compared to sample mean.
  2. Increase ratio of green innovation by 2.4% relative to sample average.
- However, even with green innovation output, there is no significant change in the amount of VC funding that energy startups receive.
- Confirms the ESG innovation disconnect holds in private market.

Table 11

The Effect of SCAP Adoptions on Energy Industries

Panel A: Innovation

	Green Patent		*Green Patent/Patent*		*Patent*	
	(1)	(2)	(3)	(4)	(5)	(6)
SCAP	0.002	0.002	0.001	0.001	-0.014	-0.020
	(1.02)	(0.86)	(0.91)	(0.61)	(-0.91)	(-1.20)
Energy Industry	0.032**	0.033**	0.012**	0.012**	0.022	0.029
	(2.08)	(2.42)	(2.36)	(2.64)	(0.41)	(1.38)
SCAP × Energy Industry	0.084**	0.075**	0.026**	0.024**	0.165	0.002
	(2.62)	(2.47)	(2.51)	(2.37)	(1.55)	(0.03)
Controls	No	Yes	No	Yes	No	Yes
Lead VC FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	78,166	78,166	78,166	78,166	78,166	78,166
Adjusted R^2	0.088	0.121	0.101	0.123	0.127	0.377

Panel B: VC Investment

	Round Amount		*Syndicate Size*	
	(1)	(2)	(3)	(4)
SCAP	0.040	-0.011	-0.004	-0.008
	(0.92)	(-0.25)	(-0.25)	(-0.45)
Energy Industry	0.047	0.039	-0.020	-0.016
	(0.50)	(0.36)	(-1.42)	(-0.98)
SCAP × Energy Industry	0.177*	0.084	0.025	0.007
	(1.84)	(0.85)	(1.41)	(0.35)
Controls	No	Yes	No	Yes
Lead VC FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes
Observations	57,018	57,018	78,166	78,166
Adjusted R^2	0.353	0.364	0.177	0.183

Table 12: Exits

- Based on the true value of green innovation
  1. Startups with larger investment after SCAP are likely to have successful exits.
  2. Or only the startups funded by experienced VCs will outperform.
- Which side dominates the other? Green innovation VS Monitoring.
- It turns out that
  1. Green startups are less likely to exit via IPO by 1.1%
  2. If funded by experienced VCs, green startups are likely to have 3.2% higher successful exit (1.7% higher IPOs).
- Brown startups have 15.4% lower liklihood of successful exits (10.2% lower likelihood of IPO).

Table 12

The Effect of SCAP on Exit Performance of Startups

Panel B: Green Startups

	Success	*IPO*	*M&A*	*M&A Public*	*M&A Private*
	(1)	(2)	(3)	(4)	(5)
SCAP	-0.003	0.000	-0.004	-0.025**	-0.015
	(-0.42)	(0.03)	(-0.61)	(-2.20)	(-1.53)
SCAP × Green Startups	-0.004	-0.011*	0.005	0.028	0.022
	(-0.57)	(-2.00)	(0.75)	(1.53)	(1.33)
Controls	Yes	Yes	Yes	Yes	Yes
Lead VC FE	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Observations	72,371	72,371	72,371	72,371	72,371
Adjusted R^2	0.039	0.083	0.028	0.150	0.162

Panel C: Green Startups funded by experienced VC

	Success	*IPO*	*M&A*	*M&A Public*	*M&A Private*
	(1)	(2)	(3)	(4)	(5)
SCAP	-0.010	-0.003	-0.007	-0.029**	-0.009
	(-1.24)	(-0.69)	(-0.98)	(-2.27)	(-0.79)
SCAP × Green Startups × Exp_VC	0.032**	0.017**	0.020	-0.108***	0.036
	(2.27)	(2.46)	(1.46)	(-2.69)	(1.65)
Controls	Yes	Yes	Yes	Yes	Yes
Lead VC FE	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Observations	72,371	72,371	72,371	72,371	72,371
Adjusted R^2	0.039	0.083	0.028	0.150	0.162

Table 13: Parallel Trend

Table 13

Timing of SCAP Adoptions on Main Dependent Variables

	Green Patent	*Green Patent /Patent*	*Round Amount*
	(1)	(2)	(3)
$Year\ Before3 \times Green\ Startup$	0.013	-0.002	-0.074
	(0.22)	(-0.16)	(-0.58)
$Year\ Before2 \times Green\ Startup$	0.002	-0.001	-0.187
	(0.11)	(-0.12)	(-0.90)
$Year\ Before1 \times Green\ Startup$	-0.003	0.000	-0.005
	(-0.08)	(0.05)	(-0.03)
$Year0 \times Green\ Startup$	0.053**	0.011*	0.083
	(2.60)	(1.87)	(0.97)
$Year1 \times Green\ Startup$	0.040*	0.006	-0.126
	(2.00)	(0.97)	(-0.65)
$Year2 \times Green\ Startup$	0.018	0.004	0.230**
	(1.10)	(0.60)	(2.18)
$Year3\ and\ After \times Green\ Startup$	0.075**	0.021***	0.202***
	(2.47)	(3.13)	(2.98)
Controls	Yes	Yes	Yes
Lead VC FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Observations	78,226	78,226	56,943
Adjusted R^2	0.391	0.391	0.375

Table 14: Robustness Checks

Table 14

Robustness Checks

Panel A: Stacked Approach

	Green Patent	*Green Patent /Patent*	*Round Amount*
	(1)	(2)	(3)
SCAP × Green Startup	0.047**	0.013***	0.132*
	(2.44)	(2.98)	(1.84)
Controls	Yes	Yes	Yes
Lead VC FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Observations	175,908	175,908	132,479
Adjusted R^2	0.418	0.417	0.411

Panel B: Fixed Controls with Staggered Setting

	Green Patent	*Green Patent /Patent*	*Round Amount*
	(1)	(2)	(3)
SCAP × Green Startup	0.063***	0.017***	0.131**
	(4.31)	(4.89)	(2.34)
Controls	Yes	Yes	Yes
Lead VC FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
State FE	Yes	Yes	Yes
Observations	75,731	75,731	54,969
Adjusted R^2	0.391	0.391	0.382

Conclusion

- Green startups receive significant increases in VC investment after the SCAP adoption whereas brown startups get penalized.
- Sudden increase in demand for green innovation result in a lack of balance in startups' innovation portfolios.
- Early-stage startups face financial constraints while ESG innovation disconnect holds from energy startups.
- Green startups outperformed in terms of exit performance only when funded by experienced VCs.

The End

I appreciate your attention and comments.