

# *Knowledge Context of Entrepreneurship, New Entrants' Capabilities, and Performance Outcomes*

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# MOTIVATION

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Evolutionary economics tells us that historical antecedents in the form of pre-entry resources and capabilities shape new entrants' outcomes (Nelson & Winter, 1982; Helfat & Lieberman, 2002)

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Across different streams of entrepreneurship and strategy literature, significant scholarly attention has been paid to the role of “*knowledge context*”, where individuals identify their entrepreneurial ideas or accumulate resources as the basis for new venture formation (Agarwal & Shah, 2014)

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Although in isolate and independent from each other, only a few recent studies have examined the factors underlying the performance heterogeneity across ventures originating from universities and incumbent firms (e.g., Clarysse et al., 2011; Wennberg et al., 2011; Zahra et al., 2007)

# MOTIVATION

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Prior research has generally overlooked heterogeneity within the corporate spinoffs category as some spawns may receive support and benefit from oversight and ownership by the parent organizations (i.e., parent spinoffs), while others are independent ventures that spin out from different types of incumbent firms (i.e., employee spinouts)

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Prior works on employee spinouts have largely focused on firm formation by ex-employees of incumbents in the focal industry and overlooked spinouts from the upstream (supplier) or downstream (user) industries.

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Lack of a systematic comparison between firms originating from different knowledge contexts with respect to their capabilities and long-run performance

# RESEARCH QUESTION

How the knowledge context of entrepreneurship shapes a) formation, b) target technological fields, c) type of capabilities and resources, and d) long-run performance of new ventures originating from them?

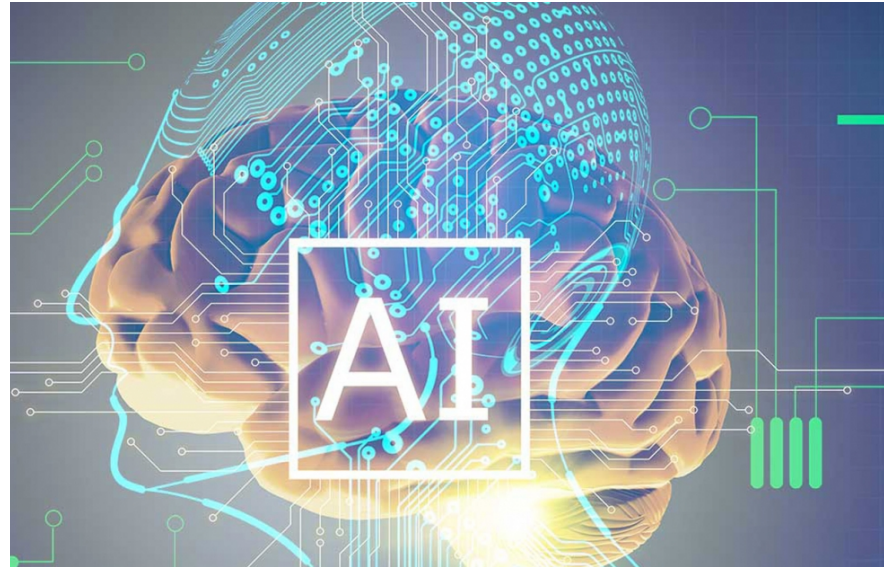
# METHODOLOGY

## Data Sources:

- i- Population of US startups listed on *Crunchbase* operating in the artificial intelligence industry
- ii- Resort to companies' website and two business directories (*Bloomberg & RelSci*) to complement and verify data related to startups' founding members
- iii- Rigorous search using *LinkedIn & Crunchbase* to collect data on the career history of all founders
- iv- Control for presence of any formal relationships between the spawning and the spawned ventures

## Final Sample:

1300 ventures entered the artificial intelligence industry in the US over the period 2000-2014



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# EMPIRICAL STRATEGY

Origin

Entry Time (Early vs Late stage)

Technological Field (Learning systems, Robotics, Symbolic)

Capabilities (Granted patents, Registered trademarks, Funding)

Performance Outcome (Survival and Failure)

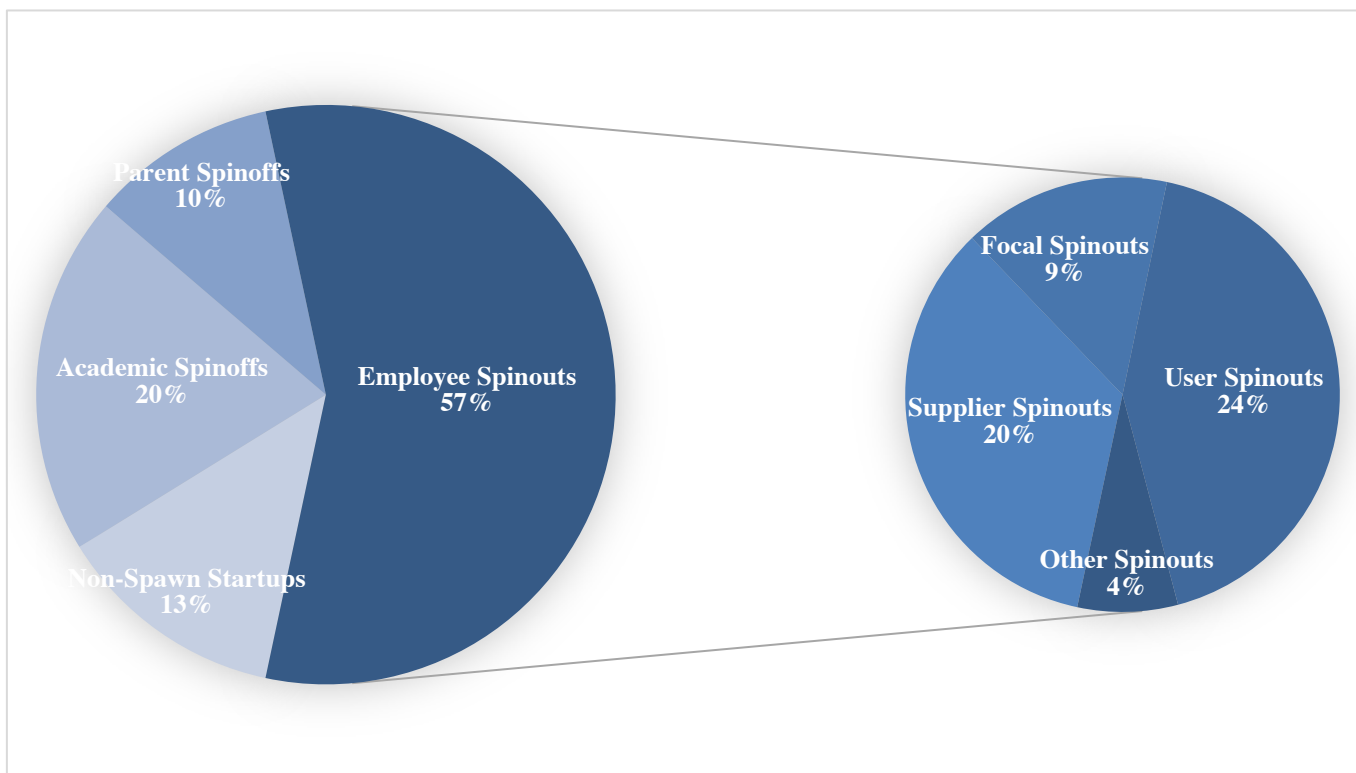
- **STAGE ONE – Spawn** (i.e., academic spinoffs, employee spinouts, and parent spinoffs) **vs Non-spawn Startups** (i.e., de-novo entrants by founders with no pre-entry employment).
- **STAGE TWO – Employee Spinouts** (i.e., spinouts from upstream supplier, focal, and downstream user industries) **vs Non-spawn Startups**



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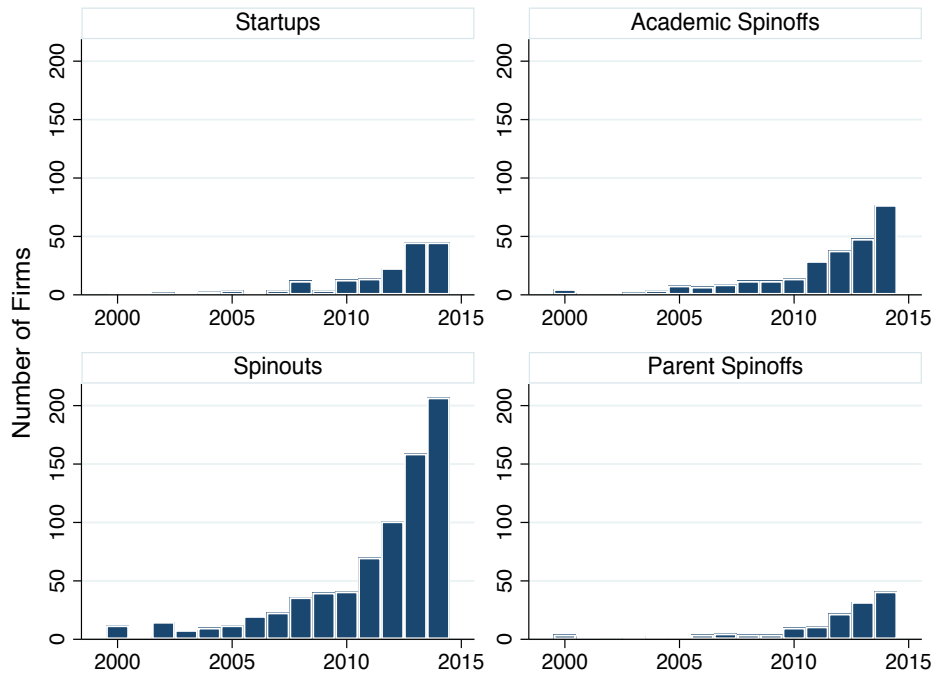
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# 1- WHO ARE THE ENTRANTS?



Non-Spawns	Academic Spinoffs	Parent Spinoffs	Supplier Spinouts	Focal Spinouts	User Spinouts	Other Spinouts
167	261	135	254	114	314	55

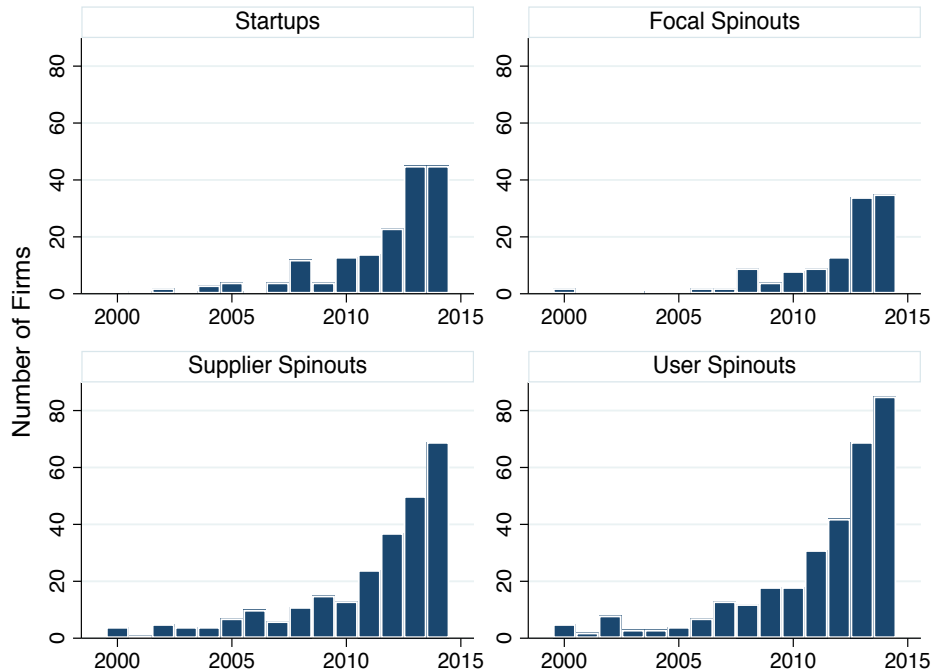
## 2- WHEN DO THEY ENTER THE INDUSTRY?



- 26.6% of non-spawn ventures entered the industry during the early stages, while 73.4% entered during the later stages of the industry growth. Also, 27.8% of academic spinoffs entered the industry during the early stages, while other 72.8% entered during the later stages.
- 29.1% of employee spinouts entered the industry during the early stages, while other 70.9% entered during the later stages of the industry growth. Finally, 27.4% of parent spinoffs entered the industry during the early stages, while other 72.6% entered during the later stages of the industry growth.



## 2- WHEN DO THEY ENTER THE INDUSTRY?



- 30.8% of supplier spinouts entered the industry during the early stages, while 69.2% entered during the later stages of the industry growth. Also, 23.5% of focal spinouts entered the industry during the early stages, while other 76.5% entered during the later stages. Finally, 29.2% of user spinouts entered the industry during the early stages, while 70.8% entered during the later stages of the AI industry growth.
- Taken together these results, employee spinouts from the focal industry have lower rates of entry during the early stages of the industry growth compared to the supplier and user spinouts.

### 3- WHICH TECHNOLOGICAL FIELDS DO THEY ENTER?

**Artificial Intelligence Application Fields  
(Keyword Allocation adopted from Cockburn et al., 2018)**

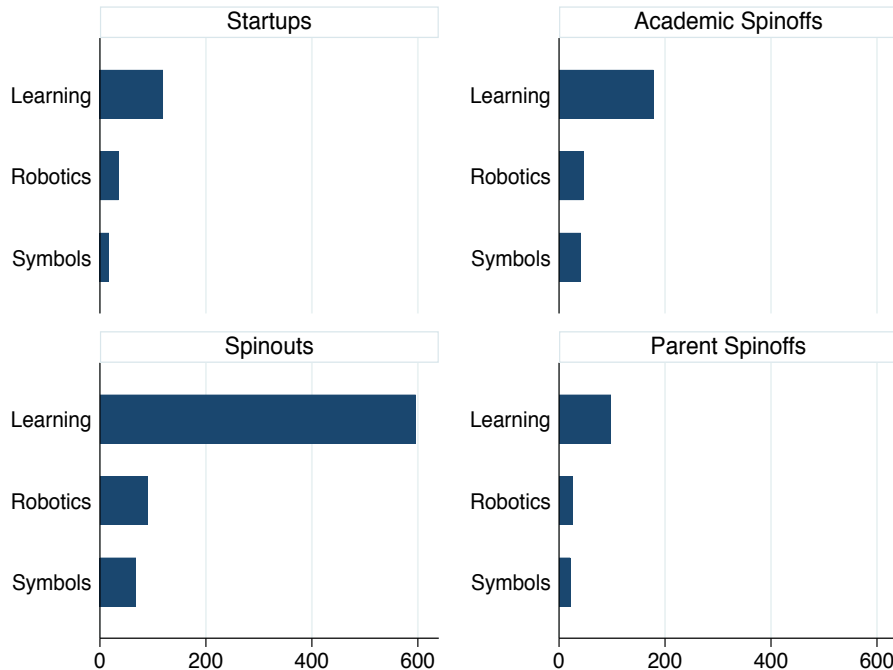
Symbols	Learning	Robotics
Natural language processing	Machine learning	Computer vision
Image grammars	Neural networks	Robot
Pattern recognition	Reinforcement learning	Robots
Image matching	Logic theorist	Robot systems
Symbolic reasoning	Bayesian belief networks	Robotics
Symbolic error analysis	Unsupervised learning	Robotic
Pattern analysis	Deep learning	Collaborative Systems
Symbol processing	Knowledge representation and reasoning	Humanoid robotics
Physical processing	Crowdsourcing and human computation	Sensor networks
Physical symbol system	Neuromorphic computing	Sensor data fusion
Natural languages	Decision making	Systems and control theory
Image alignment	Machine intelligence	layered control systems
Optimal search	Neural network	

**Symbolic systems:** firms that attempt to replicate the logical flow of human decision making through processing symbols

**Learning:** processing data through analytical programs modelled on neurologic systems. It attempts to create methods for the prediction of particular events in the presence of particular inputs.

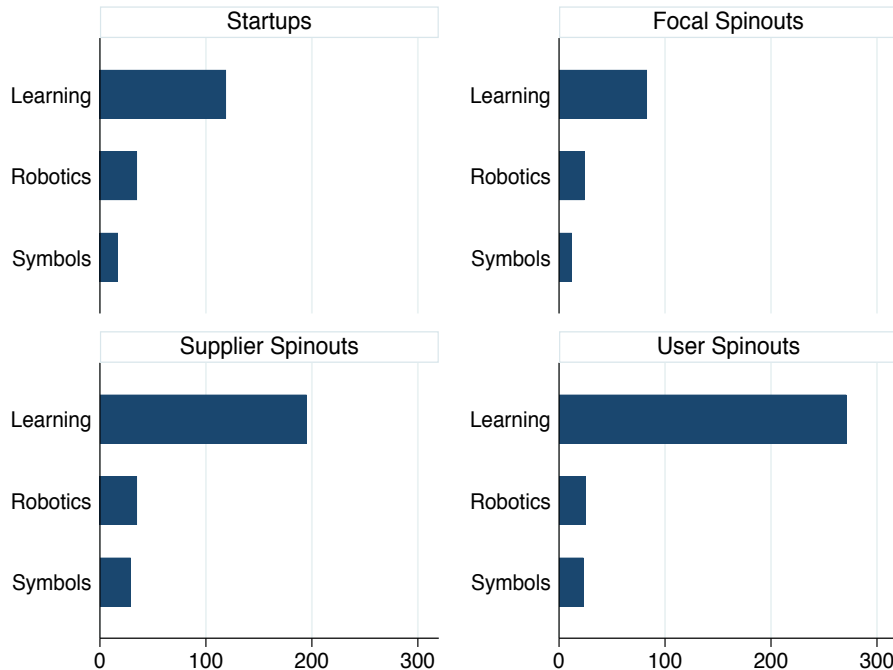
**Robotics:** the field includes deployment of “machines” and robots in manufacturing and automation applications.

### 3- WHICH TECHNOLOGICAL FIELDS DO THEY ENTER?



- 69.9% of non-spawn ventures operate in the ‘learning systems’ sector, 20.2% in ‘robotics’, and 9.8% are active in ‘symbolic systems’ field. Also, 67.3% of academic spinoffs operate in the ‘learning systems’ sector, 17.3% in ‘robotics’, and 15.4% are active in ‘symbolic systems’ field.
- 79% of employee spinouts operate in the ‘learning systems’ sector, 12% in ‘robotics’, and 9% are active in ‘symbolic systems’ field. Finally, 67.8% of parent spinoffs operate in the ‘learning systems’ sector, 17.8% in ‘robotics’, and 14.4% are active in ‘symbolic systems’ field.
- Taken together previous findings, employee spinouts account for the largest share of entrants in the ‘learning systems’ sector, while compared to the other types of entrants, academic and parent spinoffs have a higher share in the ‘symbolic systems’ and ‘robotics’ field, respectively.

### 3- WHICH TECHNOLOGICAL FIELDS DO THEY ENTER?



- 75.4% of supplier spinouts operate in the ‘learning systems’ sector, 13.5% in ‘robotics’, and 11.1% are active in ‘symbolic systems’ field. Also, 69.7% of focal spinouts operate in the ‘learning systems’ sector, 20.2% in ‘robotics’, and 10.1% are active in ‘symbolic systems’ field. Finally, 84.5% of user spinouts operate in the ‘learning systems’ sector, 8.4% in ‘robotics’, and 7.1% are active in ‘symbolic systems’ field.
- Taken together, the share of spinouts from the downstream user industries is larger in the ‘learning systems’ sector. In contrast, spinouts from the upstream supplier industries account for a larger share of entrants in the ‘symbolic systems’ and ‘robotics’ fields.

# 4- HOW DO THEY DIFFER WITH RESPECT TO CAPABILITIES?

STAGE ONE – Negative Binomial Regressions for the Entrants' Capabilities

VARIABLES	(1)			(2)			(3)			(4)		
	Patent	Trademark	Funding	Patent	Trademark	Funding	Patent	Trademark	Funding	Patent	Trademark	Funding
Startups	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Academic Spinoffs	0.405 (0.467)	-0.0639 (0.274)	0.420 (0.466)	0.405 (0.467)	-0.0640 (0.274)	0.430 (0.466)	0.264 (0.508)	-0.0987 (0.275)	0.480 (0.493)	0.264 (0.507)	-0.0985 (0.275)	0.483 (0.493)
Spin-outs	1.147*** (0.341)	0.0798 (0.212)	0.945*** (0.354)	1.147*** (0.341)	0.0798 (0.212)	0.954*** (0.354)	1.010*** (0.353)	0.106 (0.211)	0.953*** (0.365)	1.010*** (0.353)	0.106 (0.211)	0.956*** (0.365)
Parent Spinoff	1.291*** (0.448)	0.712*** (0.279)	0.903* (0.488)	1.288*** (0.448)	0.712** (0.279)	0.919* (0.487)	0.970* (0.511)	0.655** (0.289)	0.913* (0.501)	0.969* (0.511)	0.655** (0.289)	0.917* (0.501)
Test of coefficient equality: Academic Spinoff = Spin-out	3.46*	0.37	2.05	3.46*	0.37	2.04	2.88*	0.73	1.42	2.88*	0.73	1.42
Test of coefficient equality: Parent Spinoff = Spin-out	0.15	8.31***	0.01	0.15	8.30***	0.01	0.01	5.55**	0.01	0.01	5.55**	0.01
N. Founders	0.275** (0.127)	0.245*** (0.0783)	0.406*** (0.140)	0.275** (0.127)	0.245*** (0.0783)	0.406*** (0.140)	0.267* (0.138)	0.219*** (0.0793)	0.410*** (0.144)	0.267* (0.138)	0.219*** (0.0794)	0.410*** (0.144)
N. Founders Same Parent	1.842*** (0.193)	0.617*** (0.120)	0.484** (0.235)	1.845*** (0.193)	0.617*** (0.121)	0.485** (0.235)	1.791*** (0.210)	0.635*** (0.123)	0.486** (0.240)	1.794*** (0.210)	0.635*** (0.123)	0.485** (0.240)
Founder Tenure	0.0207 (0.0259)	0.0225 (0.0146)	-0.0121 (0.0252)	0.0207 (0.0259)	0.0225 (0.0146)	-0.0116 (0.0252)	0.0298 (0.0272)	0.0231 (0.0149)	-0.00971 (0.0254)	0.0297 (0.0272)	0.0231 (0.0149)	-0.00955 (0.0254)
Founder Position Parent (Executive=1; Other=0)	-0.277 (0.251)	0.219 (0.165)	0.0318 (0.278)	-0.276 (0.251)	0.219 (0.165)	0.0281 (0.278)	-0.218 (0.281)	0.184 (0.169)	0.0434 (0.296)	-0.217 (0.281)	0.184 (0.169)	0.0413 (0.296)
Serial Entrepreneur	0.670*** (0.258)	0.106 (0.150)	0.0574 (0.254)	0.670*** (0.258)	0.107 (0.150)	0.0551 (0.254)	0.689** (0.268)	0.107 (0.152)	0.0160 (0.263)	0.689** (0.268)	0.107 (0.152)	0.0139 (0.263)
Founder Position Firm (Executive=1; Other=0)	1.212*** (0.368)	0.755*** (0.220)	0.526 (0.377)	1.213*** (0.368)	0.755*** (0.220)	0.536 (0.377)	1.254*** (0.386)	0.746*** (0.221)	0.609 (0.394)	1.254*** (0.386)	0.746*** (0.221)	0.611 (0.394)
Founder Gender (Female=1; Male=0)	0.901** (0.390)	0.564** (0.248)	0.629 (0.412)	0.902** (0.391)	0.564** (0.248)	0.626 (0.412)	0.630 (0.413)	0.519** (0.250)	0.626 (0.421)	0.630 (0.413)	0.520** (0.250)	0.626 (0.421)
Founder Education (PhD=1; Other=0)	0.685*** (0.259)	0.0235 (0.160)	0.530* (0.278)	0.683*** (0.259)	0.0233 (0.160)	0.526* (0.278)	0.712** (0.279)	0.00409 (0.165)	0.461 (0.287)	0.711** (0.279)	0.00402 (0.165)	0.460 (0.287)
Collaboration	0.122 (0.399)	0.252 (0.241)	0.472 (0.372)	0.122 (0.399)	0.252 (0.241)	0.473 (0.372)	0.148 (0.459)	0.342 (0.246)	0.393 (0.409)	0.147 (0.459)	0.342 (0.246)	0.394 (0.409)
Firm Age	0.103*** (0.0362)	0.0365* (0.0203)	0.128*** (0.0351)				0.138 (0.107)	0.00194 (0.0540)	0.105 (0.0696)			
IMR				-5.311*** (1.874)	-4.755* (2.639)	3.526*** (0.989)				-7.128 (5.496)	-0.339 (6.982)	2.877 (2.027)
Founding Year Fixed Effect							YES	YES	YES	YES	YES	YES
Inalpha	2.559*** (0.0651)	1.549*** (0.0615)	2.793*** (0.0651)	2.559*** (0.0651)	1.549*** (0.0615)	2.793*** (0.0651)	2.518*** (0.0656)	1.520*** (0.0620)	2.789*** (0.0656)	2.518*** (0.0656)	1.520*** (0.0620)	2.789*** (0.0656)
Constant	-5.852*** (0.765)	-2.752*** (0.444)	12.01*** (2.409)	1.923 (2.409)	2.544 (2.746)	10.51*** (0.970)	-6.120** (2.379)	-1.856 (1.255)	12.30*** (1.735)	4.339 (6.043)	-1.492 (6.725)	11.02*** (2.563)
Observations	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
Log likelihood	-1765.7595	-1949.5488	-15101.049	-1765.771	-1949.546	-15101.182	-1756.125	-1941.208	-15098.1	-1756.111	-1941.208	-15098.201
LR chi2	250.50***	109.59***	61.25***	250.48***	109.60***	60.99***	269.89***	126.77***	67.15***	269.80***	126.27***	66.95***

Note: Inverse Mill's Ratio was created using the residuals from the first stage selection model, where we estimated the likelihood of receiving patent, trademark and financing by means of a probit regression using firm' age. Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

- Both employee spinouts and parent spinoffs create more knowledge (in term of granted patents) and raise a higher amount of capital compared to the academic spinoffs and non-spawn startups.
- Parent spinoffs also possess better market capabilities (in term of registered trademarks) than other types of entrants.

# 4- HOW DO THEY DIFFER WITH RESPECT TO CAPABILITIES?

STAGE TWO – Negative Binomial Regressions for the Spin-outs' Capabilities

VARIABLES	(1)			(2)			(3)			(4)		
	Patent	Trademark	Funding	Patent	Trademark	Funding	Patent	Trademark	Funding	Patent	Trademark	Funding
Startups	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Supplier Spin-outs	0.817** (0.359)	-0.255 (0.231)	0.889** (0.426)	0.817** (0.359)	-0.255 (0.231)	0.899** (0.426)	0.670* (0.373)	-0.261 (0.236)	0.783* (0.466)	0.671* (0.373)	-0.261 (0.236)	0.785* (0.467)
Focal Spin-outs	1.195*** (0.451)	0.480* (0.285)	1.229** (0.545)	1.195*** (0.451)	0.479* (0.285)	1.238** (0.545)	1.126** (0.438)	0.499* (0.280)	1.258** (0.557)	1.125** (0.438)	0.499* (0.280)	1.261** (0.557)
User Spin-outs	1.340*** (0.358)	0.198 (0.228)	1.054** (0.410)	1.340*** (0.358)	0.198 (0.228)	1.060*** (0.410)	1.451*** (0.362)	0.259 (0.229)	1.083** (0.423)	1.451*** (0.362)	0.259 (0.229)	1.084** (0.423)
Test of coefficient equality: Supplier Spin-out = Focal Spin-out	0.70	7.46***	0.46	0.70	7.46***	0.46	1.07	7.82***	0.82	1.06	7.81***	0.82
Test of coefficient equality: User Spin-out = Focal Spin-out	0.12	1.23	0.14	0.12	1.23	0.13	0.62	0.90	0.13	0.62	0.90	0.13
N. Founders	0.244** (0.124)	0.182** (0.0812)	0.376** (0.165)	0.244** (0.124)	0.182** (0.0812)	0.376** (0.165)	0.314** (0.135)	0.167** (0.0832)	0.385** (0.174)	0.315** (0.135)	0.167** (0.0832)	0.385** (0.174)
N. Founders Same Parent	0.0942 (0.249)	0.146 (0.157)	0.450 (0.321)	0.0940 (0.249)	0.146 (0.157)	0.450 (0.321)	0.0713 (0.277)	0.142 (0.164)	0.460 (0.346)	0.0716 (0.277)	0.142 (0.164)	0.459 (0.346)
Founder Tenure	0.0333 (0.0338)	0.0528*** (0.0192)	-0.000698 (0.0387)	0.0333 (0.0338)	0.0528*** (0.0192)	-0.000676 (0.0387)	0.0506 (0.0355)	0.0546*** (0.0196)	-6.45e-05 (0.0386)	0.0505 (0.0355)	0.0546*** (0.0196)	6.90e-05 (0.0386)
Founder Position Parent (Executive=1; Other=0)	-0.519* (0.302)	0.0863 (0.186)	-0.0381 (0.358)	-0.520* (0.302)	0.0864 (0.186)	-0.0386 (0.358)	-0.332 (0.304)	0.104 (0.191)	0.0308 (0.362)	-0.331 (0.304)	0.105 (0.191)	0.0300 (0.363)
Serial Entrepreneur	0.107 (0.267)	-0.0414 (0.169)	-0.00329 (0.316)	0.108 (0.267)	-0.0414 (0.169)	-0.00433 (0.315)	0.111 (0.270)	-0.0662 (0.171)	-0.0543 (0.329)	0.112 (0.270)	-0.0661 (0.171)	-0.0576 (0.329)
Founder Position Firm (Executive=1; Other=0)	1.350*** (0.458)	0.759*** (0.277)	0.814 (0.520)	1.350*** (0.458)	0.759*** (0.277)	0.817 (0.520)	1.352*** (0.470)	0.811*** (0.280)	0.830 (0.532)	1.351*** (0.470)	0.811*** (0.280)	0.830 (0.532)
Founder Gender (Female=1; Male=0)	0.918* (0.470)	0.388 (0.310)	0.554 (0.572)	0.918* (0.470)	0.388 (0.310)	0.557 (0.572)	0.900* (0.503)	0.366 (0.322)	0.607 (0.588)	0.900* (0.503)	0.366 (0.322)	0.610 (0.588)
Founder Education (PhD=1; Other=0)	1.145*** (0.308)	0.264 (0.199)	0.372 (0.381)	1.144*** (0.308)	0.264 (0.199)	0.373 (0.381)	1.076*** (0.318)	0.251 (0.209)	0.383 (0.395)	1.075*** (0.318)	0.251 (0.209)	0.382 (0.395)
Collaboration	-0.321 (0.507)	-0.332 (0.328)	0.607 (0.615)	-0.321 (0.507)	-0.332 (0.328)	0.606 (0.616)	-0.502 (0.507)	-0.350 (0.330)	0.202 (0.673)	-0.503 (0.507)	-0.350 (0.330)	0.204 (0.673)
Firm Age	0.0415 (0.0360)	0.0425* (0.0239)	0.116** (0.0460)				0.158 (0.105)	0.0863 (0.0596)	0.0814 (0.102)			
IMR				-2.156 (1.872)	-5.444* (3.061)	3.168** (1.277)				-8.223 (5.397)	-11.08 (7.573)	2.163 (2.946)
Founding Year Fixed Effect	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Inalpha	2.364*** (0.0859)	1.437*** (0.0818)	2.864*** (0.0478)	2.364*** (0.0859)	1.437*** (0.0818)	2.864*** (0.0478)	2.308*** (0.0867)	1.398*** (0.0825)	2.858*** (0.0478)	2.308*** (0.0867)	1.398*** (0.0825)	2.858*** (0.0478)
Constant	-3.384*** (0.836)	-2.070*** (0.521)	12.02*** (0.952)	-0.227 (2.474)	3.999 (3.204)	10.67*** (2.62)	-5.401** (2.416)	-2.701* (1.460)	12.72*** (2.546)	6.644 (6.055)	9.656 (7.274)	11.81*** (3.762)
Observations	847	847	847	847	847	847	847	847	847	847	847	847
LR chi2	43.63***	33.58***	37.04***	43.63***	33.59***	36.96***	59.84***	48.62***	42.36***	59.92***	48.66***	42.27***
Pseudo R2	0.02	0.0014	0.0019	0.02	0.0138	0.0019	0.0275	0.0199	0.0022	0.0275	0.02	0.0022

Note: Inverse Mill's Ratio was created using the residuals from the first stage selection model, where we estimated the likelihood of receiving patent, trademark and financing by means of a probit regression using firm' age. Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

- All three types of spinouts (i.e., spinouts from the supplier, focal, and user industries) create more knowledge and attract more funding than non-spawn startups.
- Focal spinouts have a higher number of registered trademarks compared to supplier spinouts and non-spawn startups.

# 5- HOW DO THEY DIFFER WITH RESPECT TO SUCCESS?

STAGE ONE – Competing Hazard Regressions of Entrants’ Failure (Dissolution) or Success (Cash-Out)

VARIABLES	(1)		(2)	
	Failure	Success	Failure	Success
Startups	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Academic Spinoffs	-0.253 (0.542)	0.555 (0.382)	-0.229 (0.545)	0.627 (0.383)
Spin-outs	-0.447 (0.397)	0.740** (0.321)	-0.418 (0.401)	0.746** (0.323)
Parent Spinoff	-1.032 (0.690)	0.436 (0.414)	-0.992 (0.700)	0.418 (0.418)
Test of coefficient equality: Academic Spinoff = Spin-out	0.17	0.53	0.16	0.21
Test of coefficient equality: Parent Spinoff = Spin-out	0.87	1.08	0.83	1.23
N. Founders	-0.0529 (0.185)	0.130 (0.0809)	-0.131 (0.192)	0.0955 (0.0834)
N. Founders Same Parent	0.129 (0.293)	0.121 (0.128)	0.168 (0.292)	0.0948 (0.129)
Founder Tenure	0.0101 (0.0323)	-0.0417** (0.0195)	0.00800 (0.0325)	-0.0426** (0.0197)
Founder Position Parent (Executive=1; Other=0)	-0.362 (0.352)	0.0212 (0.197)	-0.339 (0.361)	0.0598 (0.199)
Serial Entrepreneur	0.304 (0.317)	0.196 (0.169)	0.316 (0.324)	0.219 (0.174)
Founder Position Firm (Executive=1; Other=0)	-0.174 (0.445)	0.0303 (0.261)	-0.233 (0.452)	-0.0202 (0.265)
Founder Gender (Female=1; Male=0)	0.413 (0.604)	0.278 (0.319)	0.477 (0.611)	0.307 (0.322)
Founder Education (PhD=1; Other=0)	0.181 (0.363)	0.519*** (0.179)	0.132 (0.364)	0.589*** (0.181)
Collaboration	-1.045 (0.660)	-0.139 (0.252)	-1.021 (0.662)	-0.206 (0.258)
N. Trademark	0.0406*** (0.0103)	-0.0246 (0.0199)	0.0470*** (0.0118)	-0.0147 (0.0195)
N. Patent	-0.168* (0.0881)	0.000912 (0.000621)	-0.162* (0.0907)	0.000600 (0.000608)
Total Funding (log)	0.0125 (0.0206)	0.0575*** (0.0119)	0.00725 (0.0209)	0.0570*** (0.0121)
Time (log)	0.339 (0.209)	0.468*** (0.116)	0.584** (0.257)	0.697*** (0.143)
Constant	-5.730*** (0.930)	-6.769*** (0.568)	-7.016*** (1.437)	-8.161*** (0.847)
Entry Year Fixed Effect		NO		YES
Observations (N. Firms)		10,703		10,703
Log likelihood		-1120.9287		-1103.9721
LR chi2		108.95***		142.86***

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

- Employee spinouts have a higher likelihood of cash-out through acquisition or IPO than non-spawn startups.

# 5- HOW DO THEY DIFFER WITH RESPECT TO SUCCESS?

STAGE TWO – Competing Hazard Regressions of Spin-outs' Failure (Dissolution) or Success (Cash-Out)

VARIABLES	(1)		(2)	
	Failure	Success	Failure	Success
Startups	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Supplier Spin-outs	-0.989* (0.569)	<b>0.832**</b> <b>(0.350)</b>	-0.930 (0.580)	<b>0.833**</b> <b>(0.355)</b>
Focal Spin-outs	-0.287 (0.608)	<b>0.988**</b> <b>(0.388)</b>	-0.272 (0.611)	<b>0.948**</b> <b>(0.392)</b>
User Spin-outs	-0.279 (0.454)	<b>0.682**</b> <b>(0.345)</b>	-0.227 (0.463)	<b>0.679*</b> <b>(0.350)</b>
Test of coefficient equality: Supplier Spin-out = Focal Spin-out	1.07	0.29	0.91	0.15
Test of coefficient equality: User Spin-out = Focal Spin-out	0.00	1.12	0.01	0.85
N. Founders	0.0598 (0.202)	0.0550 (0.0977)	-0.00734 (0.209)	0.0308 (0.100)
N. Founders Same Parent	-0.350 (0.458)	0.119 (0.162)	-0.341 (0.463)	0.0694 (0.166)
Founder Tenure	-0.0191 (0.0471)	<b>-0.0798***</b> <b>(0.0300)</b>	-0.0156 (0.0474)	<b>-0.0801***</b> <b>(0.0303)</b>
Founder Position Parent (Executive=1; Other=0)	-0.151 (0.422)	0.108 (0.241)	-0.197 (0.433)	0.190 (0.245)
Serial Entrepreneur	0.207 (0.394)	0.341* (0.205)	0.206 (0.401)	0.347* (0.208)
Founder Position Firm (Executive=1; Other=0)	0.00357 (0.549)	0.373 (0.377)	-0.0611 (0.557)	0.319 (0.382)
Founder Gender (Female=1; Male=0)	0.315 (0.743)	-0.00862 (0.381)	0.389 (0.765)	-0.123 (0.389)
Founder Education (PhD=1; Other=0)	0.0399 (0.499)	0.436* (0.225)	-0.0556 (0.511)	0.556** (0.234)
Collaboration	-13.44 (587.2)	0.0532 (0.358)	-15.31 (1,542)	-0.0195 (0.366)
N. Trademark	-0.0913 (0.119)	0.00415 (0.0241)	-0.101 (0.125)	0.00845 (0.0232)
N. Patent	-0.150 (0.132)	-0.0104 (0.0119)	-0.137 (0.134)	-0.00870 (0.0111)
Total Funding (log)	0.0124 (0.0260)	<b>0.0659***</b> <b>(0.0150)</b>	0.00927 (0.0267)	<b>0.0676***</b> <b>(0.0153)</b>
Time (log)	0.203 (0.254)	<b>0.667***</b> <b>(0.150)</b>	0.469 (0.309)	<b>0.939***</b> <b>(0.190)</b>
Constant	-5.028*** (1.150)	<b>-7.082***</b> <b>(0.691)</b>	-21.09 (2,293)	<b>-8.251***</b> <b>(1.051)</b>
Entry Year Fixed Effect		NO		YES
Observations		6,948		6,948
Log likelihood		-726.02952		-707.90316
Chi-square		91.14***		127.39***

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

- All three types of spinouts are more likely to cash-out.
- supplier spinouts are less likely to fail compared to non-spawn startups.



# CONCLUSION

We examine all the various types of start-ups in a consistent way

Consistent with the evolutionary and the resource-based theories of the firm, we show that heterogeneity in pre-entry knowledge and resources leads to heterogeneity in new ventures' capabilities and long-run performance.

We confirm that founders' pre-entry experiences in the vertically related upstream supplier or downstream user industries also matter significantly (Adams et al., 2019).

Type of Entrants	Entry Time	Trajectory	Resources & Capabilities	Performance
Academic Spinoffs	28% Early-Stages	Symbolic systems	—	—
Parent Spinoffs	27% Early-Stages	Robotics	Technological capabilities, Market capabilities & Financial resources	—
Supplier Spinouts	31% Early-Stages	Symbolic systems	Technological capabilities & Financial resources	More likely to Cash-out & less likely to Fail
Focal Spinouts	24% Early-Stages	Robotics	Technological capabilities, Market capabilities & Financial resources	More likely to Cash-out
User Spinouts	29% Early-Stages	Learning systems	Technological capabilities & Financial resources	More likely to Cash-out

# Thank You for Your Attention

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# DESCRIPTIVES

Summary Statistics and Correlation Matrix

Variable	Mean	Std. Dev.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1- Failure	0.04	0.19	0	1	1.00													
2- Success	0.13	0.34	0	1	<b>-0.08</b>	1.00												
3- N. Patents	15.63	465.68	0	16787	-0.01	<b>0.07</b>	1.00											
4- N. Trademarks	2.04	15.44	0	521	0.02	<b>0.08</b>	<b>0.94</b>	1.00										
5- Total Funding (mill)	20.50	73.95	0	1241	-0.03	0.02	0.01	<b>0.10</b>	1.00									
6- N. Founders	1.99	1.05	1	9	-0.02	<b>0.10</b>	0.03	<b>0.05</b>	<b>0.19</b>	1.00								
7- N. Founders Same Parent	1.29	0.61	1	5	-0.01	<b>0.09</b>	<b>0.08</b>	<b>0.09</b>	<b>0.17</b>	<b>0.48</b>	1.00							
8- Founder Tenure	5.54	4.91	0.25	39	0.00	<b>-0.05</b>	0.00	0.02	-0.02	<b>-0.08</b>	0.00	1.00						
9- Founder Position Parent (Executive=1; Other=0)	0.60	0.49	0	1	-0.02	0.00	0.02	0.03	-0.03	<b>-0.06</b>	-0.02	<b>0.19</b>	1.00					
10- Serial Entrepreneur	0.43	0.50	0	1	0.01	0.03	0.03	0.03	-0.03	0.03	-0.01	<b>0.10</b>	<b>0.33</b>	1.00				
11- Founder Position New Firm (Executive=1; Other=0)	0.89	0.31	0	1	-0.01	0.01	0.01	0.02	0.04	<b>-0.10</b>	-0.02	0.00	<b>0.05</b>	0.01	1.00			
12- Founder Gender (Female=1; Male=0)	0.91	0.28	0	1	0.02	0.03	0.01	0.02	<b>0.05</b>	<b>0.06</b>	0.01	0.00	0.05	<b>0.06</b>	0.02	1.00		
13- Founder Education (PhD=1; Other=0)	0.27	0.44	0	1	-0.01	<b>0.09</b>	-0.01	-0.01	<b>0.08</b>	<b>0.08</b>	<b>0.05</b>	<b>0.08</b>	<b>-0.21</b>	<b>-0.10</b>	-0.01	<b>-0.10</b>	1.00	
14- Collaboration between Industry & Academia	0.14	0.35	0	1	-0.05	0.02	-0.01	0.00	<b>0.08</b>	<b>0.24</b>	0.03	0.03	<b>-0.23</b>	<b>-0.09</b>	-0.02	<b>-0.06</b>	<b>0.31</b>	1.00

Observation=1300. Bolded pairwise correlations are significant at the 0.05 level (two-tailed tests of significance).

# FURTHER ANALYSIS I

Entrants' Capabilities and Moderating effect of the Entry Time (*Threshold: 2012*)

VARIABLES	(1)			(2)		
	Patent	Trademark	Funding	Patent	Trademark	Funding
Startups	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Academic Spinoffs	-0.157 (0.567)	-0.373 (0.361)	0.0538 (0.651)	-0.103 (0.565)	-0.327 (0.363)	-0.0265 (0.642)
Spin-outs	1.742*** (0.455)	0.292 (0.281)	0.723 (0.496)	1.767*** (0.459)	0.310 (0.284)	0.717 (0.495)
Parent Spinoff	0.403 (0.631)	-0.202 (0.389)	0.446 (0.675)	0.455 (0.614)	-0.197 (0.391)	0.463 (0.676)
Entry Time (Early Entrants=1; Late Entrants=0)	0.720 (1.710)	0.321 (0.923)	-0.102 (1.428)	-0.461 (0.617)	-0.166 (0.393)	-0.375 (0.689)
Academic Spinoffs × Early Entrants	0.909 (0.776)	0.472 (0.474)	0.931 (0.840)	1.277* (0.744)	0.427 (0.470)	0.822 (0.830)
Spin-outs × Early Entrants	-1.590** (0.676)	-0.410 (0.411)	0.598 (0.737)	-1.387** (0.657)	-0.469 (0.411)	0.504 (0.722)
Parent Spinoff × Early Entrants	0.891 (0.917)	1.407** (0.560)	1.069 (0.981)	1.376 (0.870)	1.449*** (0.552)	0.934 (0.966)
N. Founders	0.293** (0.139)	0.224*** (0.0788)	0.407*** (0.143)	0.308** (0.125)	0.253*** (0.0780)	0.403*** (0.138)
N. Founders Same Parent	1.544*** (0.218)	0.641*** (0.123)	0.513** (0.241)	1.580*** (0.209)	0.614*** (0.121)	0.498** (0.236)
Founder Tenure	0.0279 (0.0248)	0.0176 (0.0145)	-0.0152 (0.0258)	0.0270 (0.0234)	0.0177 (0.0142)	-0.0162 (0.0256)
Founder Position Parent (Executive=1; Other=0)	0.0686 (0.276)	0.237 (0.168)	0.0323 (0.301)	0.136 (0.253)	0.269 (0.164)	-0.00914 (0.286)
Serial Entrepreneur	0.554** (0.261)	0.109 (0.152)	0.0498 (0.268)	0.458* (0.247)	0.0960 (0.149)	0.0664 (0.260)
Founder Position Firm (Executive=1; Other=0)	1.418*** (0.376)	0.691*** (0.218)	0.655* (0.397)	1.378*** (0.356)	0.711*** (0.218)	0.571 (0.384)
Founder Gender (Female=1; Male=0)	0.840** (0.403)	0.573** (0.250)	0.671 (0.427)	0.972** (0.387)	0.592** (0.248)	0.384 (0.415)
Founder Education (PhD=1; Other=0)	0.543** (0.268)	0.00880 (0.164)	0.480* (0.289)	0.569** (0.250)	0.0455 (0.159)	0.549** (0.280)
Collaboration	0.0110 (0.434)	0.406* (0.245)	0.412 (0.413)	-0.0957 (0.399)	0.315 (0.240)	0.508 (0.376)
Firm Age	0.0955 (0.104)	0.0236 (0.0525)	0.103 (0.0702)			
IMR				-8.585*** (2.268)	-8.037** (3.461)	3.169*** (1.203)
Founding Year Fixed Effect	YES	YES	YES	NO	NO	NO
Inalpha	2.466*** (0.0662)	1.488*** (0.0625)	2.787*** (0.0380)	2.480*** (0.0659)	1.511*** (0.0620)	2.792*** (0.0380)
Constant	-5.835*** (1.063)	-2.593*** (0.590)	12.07*** (0.868)	6.211** (3.036)	6.054* (3.660)	10.88*** (1.075)
Observations	1,300	1,300	1,300	1,300	1,300	1,300
Log likelihood	-1743.70	-1931.62	-15097.31	-1746.74	-1938.02	-15100.32
LR chi2	294.61***	145.45***	68.72***	288.54***	132.65***	62.71***

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Spinouts' Capabilities and Moderating effect of the Application Field (*ref. Non-Spawn Startup*)

VARIABLES	(1)			(2)		
	Patent	Trademark	Funding	Patent	Trademark	Funding
Startups	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Supplier Spinouts	0.554 (0.823)	-0.907 (0.556)	1.084 (1.124)	0.859 (0.833)	-0.00105 (0.539)	1.400 (1.086)
Focal Spinouts	1.286 (0.992)	0.342 (0.635)	2.092 (1.273)	1.661* (1.007)	0.481 (0.639)	2.138* (1.235)
User Spinouts	-0.241 (0.892)	-0.409 (0.602)	0.733 (1.155)	-0.195 (0.908)	-0.348 (0.602)	0.721 (1.141)
Robotics	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Learning Systems	-1.260* (0.685)	-0.356 (0.441)	-0.342 (0.824)	-1.175* (0.675)	-0.255 (0.437)	-0.281 (0.813)
Symbolic Systems	-0.961 (1.124)	-0.594 (0.706)	-0.797 (1.338)	-1.148 (1.113)	-0.429 (0.701)	-0.642 (1.309)
Supplier Spinouts × Learning Systems	0.380 (0.938)	-0.133 (0.637)	-0.312 (1.221)	0.0636 (0.932)	-0.218 (0.614)	-0.570 (1.205)
Supplier Spinouts × Symbolic Systems	0.420 (1.517)	-0.809 (0.987)	0.342 (1.869)	0.454 (1.461)	-1.215 (0.954)	-0.171 (1.762)
Focal Spinouts × Learning Systems	0.122 (1.157)	0.304 (0.712)	-1.090 (1.425)	-0.364 (1.355)	0.0918 (0.713)	-1.237 (1.382)
Focal Spinouts × Symbolic Systems	-1.485 (1.784)	-0.879 (1.154)	-1.054 (2.175)	-2.048 (1.743)	-0.952 (1.313)	-1.310 (2.091)
User Spinouts × Learning Systems	2.291** (1.024)	0.781 (0.667)	0.425 (1.260)	2.106** (1.034)	0.637 (0.661)	0.419 (1.225)
User Spinouts × Symbolic Systems	1.318 (1.530)	0.524 (0.975)	0.0488 (1.847)	1.340 (1.540)	0.292 (0.977)	-0.217 (1.802)
N. Founders	0.384** (0.138)	0.186** (0.0854)	0.453** (0.185)	0.252* (0.129)	0.210** (0.0831)	0.443** (0.177)
N. Founders Same Parent	0.0651 (0.273)	0.162 (0.166)	0.435 (0.348)	0.0688 (0.244)	0.153 (0.159)	0.453 (0.324)
Founder Tenure	0.0392 (0.0347)	0.0515*** (0.0198)	0.00215 (0.0393)	0.0273 (0.0340)	0.0518*** (0.0195)	-0.00179 (0.0385)
Founder Position Parent (Executive=1; Other=0)	-0.366 (0.327)	0.0793 (0.199)	0.153 (0.381)	-0.542* (0.317)	0.0986 (0.195)	0.152 (0.379)
Serial Entrepreneur	0.0234 (0.287)	-0.0702 (0.173)	-0.136 (0.340)	-0.08661 (0.278)	-0.0483 (0.171)	-0.0680 (0.322)
Founder Position Firm (Executives=1; Other=0)	1.678*** (0.514)	0.820*** (0.288)	1.073* (0.570)	1.735*** (0.482)	0.797*** (0.285)	1.091* (0.562)
Founder Gender (Female=1; Male=0)	0.816 (0.514)	0.387 (0.325)	0.616 (0.597)	1.002** (0.488)	0.397 (0.312)	0.578 (0.583)
Founder Education (PhD=1; Other=0)	1.900*** (0.322)	0.259 (0.209)	0.398 (0.409)	1.259*** (0.309)	0.259 (0.199)	0.407 (0.393)
Collaboration	-0.265 (0.511)	-0.410 (0.330)	0.188 (0.668)	-0.122 (0.510)	-0.399 (0.328)	0.348 (0.643)
Firm Age	0.148 (0.105)	0.0604 (0.0604)	0.0449 (0.108)			
IMR				-3.306* (1.963)	-6.284** (3.109)	2.997** (1.291)
Founding Year Fixed Effect	YES	YES	YES	NO	NO	NO
Inalpha	2.273*** (0.0872)	1.376*** (0.0829)	2.858*** (0.0479)	2.320*** (0.0863)	1.413*** (0.0822)	2.863*** (0.0478)
Constant	-4.270* (2.460)	-1.849 (1.543)	13.36*** (2.752)	1.668 (2.679)	4.991 (3.301)	10.53*** (1.406)
Observations	849	849	849	849	849	849
Log likelihood	-1052.96	-1190.6	-9548.81	-1059.38	-1197.5	-9550.78
LR chi2	71.34***	58.10***	45.84	58.49***	44.22***	41.72***

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

While employee spinouts have a better technological capability than non-spawn startups, those that entered the industry during the early stages have a lower number of granted patents than other spinouts. Instead, parent spinoffs that entered the industry during the early stages of growth have a higher number of registered trademarks.

User spinouts active in the learning systems field create more knowledge compared to non-spawn startups.

# FURTHER ANALYSIS II

Negative Binomial Regressions for Spinouts' Capabilities (*ref. Academic Spinoffs*)

VARIABLES	(1)			(2)			(3)			(4)		
	Patent	Trademark	Funding	Patent	Trademark	Funding	Patent	Trademark	Funding	Patent	Trademark	Funding
Academic Spinoffs	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Supplier Spinouts	0.469 (0.394)	-0.273 (0.255)	0.488 (0.436)	0.471 (0.394)	-0.273 (0.255)	0.490 (0.437)	0.239 (0.419)	-0.396 (0.261)	0.286 (0.487)	0.240 (0.419)	-0.397 (0.261)	0.288 (0.488)
Focal Spinouts	0.793 (0.497)	0.449 (0.302)	0.836 (0.533)	0.795 (0.497)	0.449 (0.302)	0.835 (0.533)	0.743 (0.504)	0.374 (0.305)	0.742 (0.570)	0.741 (0.504)	0.373 (0.305)	0.747 (0.570)
User Spinouts	0.874** (0.446)	0.183 (0.272)	0.649 (0.444)	0.876** (0.446)	0.184 (0.272)	0.644 (0.444)	0.941** (0.453)	0.167 (0.276)	0.596 (0.474)	0.940** (0.453)	0.167 (0.276)	0.596 (0.474)
N. Founders	0.339*** (0.131)	0.217*** (0.0821)	0.407** (0.167)	0.340*** (0.131)	0.218*** (0.0821)	0.405** (0.167)	0.441*** (0.135)	0.230*** (0.0835)	0.428** (0.177)	0.442*** (0.135)	0.230*** (0.0835)	0.428** (0.177)
N. Founders Same Parent	0.0470 (0.225)	0.148 (0.137)	0.500* (0.267)	0.0472 (0.225)	0.148 (0.137)	0.502* (0.267)	0.0629 (0.240)	0.159 (0.141)	0.471* (0.274)	0.0633 (0.240)	0.159 (0.141)	0.470* (0.275)
Founder Tenure	0.0608** (0.0300)	0.0439** (0.0189)	-0.000707 (0.0330)	0.0608** (0.0301)	0.0439** (0.0189)	-0.000441 (0.0330)	0.0794** (0.0314)	0.0461** (0.0196)	0.00169 (0.0333)	0.0793** (0.0314)	0.0461** (0.0196)	0.00192 (0.0333)
Founder Position Parent (Executive=1; Other=0)	-0.392 (0.286)	0.146 (0.186)	-0.0871 (0.345)	-0.392 (0.286)	0.146 (0.186)	-0.0846 (0.345)	-0.271 (0.300)	0.191 (0.189)	-0.0698 (0.369)	-0.270 (0.299)	0.192 (0.189)	-0.0723 (0.369)
Serial Entrepreneur	0.308 (0.258)	-0.0782 (0.163)	0.0144 (0.307)	0.308 (0.258)	-0.0780 (0.163)	0.0138 (0.308)	0.382 (0.258)	-0.0235 (0.166)	-0.0459 (0.322)	0.382 (0.258)	-0.0232 (0.166)	-0.0485 (0.323)
Founder Position Firm (Executive=1; Other=0)	0.716* (0.381)	0.705*** (0.242)	0.803* (0.454)	0.717* (0.381)	0.705*** (0.242)	0.806* (0.455)	1.053** (0.417)	0.715*** (0.245)	0.769* (0.457)	1.050** (0.417)	0.715*** (0.245)	0.767* (0.457)
Founder Gender (Female=1; Male=0)	0.365 (0.413)	0.580** (0.274)	0.605 (0.489)	0.366 (0.413)	0.580** (0.274)	0.602 (0.489)	0.251 (0.428)	0.535* (0.278)	0.705 (0.504)	0.251 (0.428)	0.535* (0.278)	0.701 (0.504)
Founder Education (PhD=1; Other=0)	0.936*** (0.265)	0.0920 (0.171)	0.452 (0.328)	0.934*** (0.265)	0.0917 (0.171)	0.454 (0.329)	0.846*** (0.279)	0.0768 (0.177)	0.457 (0.335)	0.846*** (0.279)	0.0767 (0.177)	0.460 (0.335)
Collaboration	0.0420 (0.373)	0.149 (0.245)	0.493 (0.407)	0.0415 (0.373)	0.149 (0.245)	0.496 (0.407)	-0.0247 (0.399)	0.0976 (0.249)	0.335 (0.442)	-0.0264 (0.399)	0.0966 (0.249)	0.337 (0.442)
Firm Age	0.124*** (0.0388)	0.0629*** (0.0232)	0.138*** (0.0454)				0.204** (0.0962)	0.104* (0.0550)	0.136 (0.0898)			
IMR				-6.463*** (2.008)	-8.220*** (3.023)	3.743*** (1.269)				-10.64** (4.902)	-13.73* (7.113)	3.660 (2.605)
Founding Year Fixed Effect							YES	YES	YES	YES	YES	YES
Inalpha	2.337*** (0.0776)	1.382*** (0.0767)	2.805*** (0.0447)	2.336*** (0.0776)	1.382*** (0.0767)	2.806*** (0.0447)	2.274*** (0.0783)	1.354*** (0.0771)	2.801*** (0.0447)	2.273*** (0.0783)	1.354*** (0.0771)	2.801*** (0.0447)
Constant	-2.948*** (0.851)	-2.391*** (0.493)	12.09*** (0.910)	6.511*** (2.525)	6.763** (3.166)	10.53*** (1.244)	-4.340** (1.978)	-3.021** (1.229)	11.68*** (2.134)	11.23*** (5.621)	12.26* (6.940)	10.14*** (3.211)
Observations	943	943	943	943	943	943	943	943	943	943	943	943
LR chi2	41.16***	43.96***	38.59***	41.24***	44.03***	38.15***	66.46***	56.86***	42.88***	66.45***	56.97***	42.62***
Pseudo R2	0.0156	0.0158	0.0017	0.0156	0.0158	0.0017	0.0244	0.0205	0.0019	0.0244	0.0205	0.0019

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

- Spinouts originating from the downstream (i.e., user) industries have a higher number of granted patents compared to academic spinoffs.

# FURTHER ANALYSIS III

VARIABLES	Spinouts' Capabilities and Moderating effect of the Application File ( <i>ref. Academic Spinoff</i> )					
	(1)			(2)		
	Patent	Trademark	Funding	Patent	Trademark	Funding
Academic Spinoffs	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Supplier Spinouts	1.800*** (0.815)	-0.0917 (0.523)	1.042 (1.073)	1.830** (0.813)	0.00122 (0.503)	1.164 (0.958)
Focal Spinouts	2.131** (0.957)	0.354 (0.593)	1.864 (1.167)	2.036** (0.981)	0.426 (0.594)	1.927* (1.137)
User Spinouts	0.976 (0.889)	-0.496 (0.588)	0.402 (1.094)	0.800 (0.898)	-0.406 (0.578)	0.459 (1.068)
Robotics	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Learning Systems	0.747 (0.587)	-0.262 (0.380)	0.118 (0.722)	0.490 (0.591)	-0.336 (0.365)	0.127 (0.702)
Symbolic Systems	0.531 (0.763)	0.181 (0.490)	0.449 (0.935)	0.176 (0.748)	0.239 (0.475)	0.417 (0.909)
Supplier Spinouts × Learning Systems	-1.937** (0.838)	-0.220 (0.568)	-0.923 (1.171)	-1.737** (0.838)	-0.176 (0.548)	-0.945 (1.107)
Supplier Spinouts × Symbolic Systems	-1.608 (1.225)	-1.685** (0.814)	-0.973 (1.600)	-1.469 (1.158)	-1.938** (0.788)	-1.254 (1.473)
Focal Spinouts × Learning Systems	-1.605 (1.051)	0.176 (0.660)	-1.512 (1.308)	-1.504 (1.124)	0.189 (0.663)	-1.640 (1.300)
Focal Spinouts × Symbolic Systems	-2.705* (1.558)	-1.337 (1.014)	-2.369 (1.856)	-3.122** (1.542)	-1.680* (0.986)	-2.403 (1.800)
User Spinouts × Learning Systems	-0.0314 (0.906)	0.814 (0.608)	0.154 (1.141)	0.0590 (0.916)	0.749 (0.599)	0.0640 (1.108)
User Spinouts × Symbolic Systems	-0.710 (1.265)	-0.207 (0.832)	-1.096 (1.628)	-0.275 (1.234)	-0.339 (0.806)	-1.235 (1.500)
N. Founders	0.428*** (0.136)	0.252*** (0.0850)	0.490*** (0.186)	0.326** (0.133)	0.252*** (0.0834)	0.468*** (0.177)
N. Founders Same Parent	0.0784 (0.238)	0.158 (0.142)	0.453 (0.278)	0.0522 (0.224)	0.136 (0.137)	0.502* (0.270)
Founder Tenure	0.0765** (0.0303)	0.0483** (0.0193)	0.00309 (0.0336)	0.0574** (0.0293)	0.0469** (0.0187)	-0.000165 (0.0332)
Founder Position Parent (Executive=1; Other=0)	-0.231 (0.321)	0.200 (0.196)	0.129 (0.385)	-0.346 (0.316)	0.179 (0.193)	0.168 (0.372)
Serial Entrepreneur	0.268 (0.268)	0.167 (0.167)	0.334 (0.334)	0.267 (0.267)	0.164 (0.164)	0.316 (0.316)
Founder Position Firm (Executive=1; Other=0)	1.320** (0.445)	0.710*** (0.250)	0.953* (0.493)	1.024** (0.414)	0.701*** (0.248)	0.997** (0.487)
Founder Gender (Female=1; Male=0)	0.136 (0.444)	0.573** (0.279)	0.710 (0.511)	0.333 (0.434)	0.619** (0.273)	0.641 (0.495)
Founder Education (PhD=1; Other=0)	0.850*** (0.284)	0.0409 (0.176)	0.436 (0.339)	0.969*** (0.273)	0.0553 (0.170)	0.446 (0.335)
Collaboration	0.0607 (0.393)	0.0652 (0.253)	0.275 (0.443)	0.113 (0.371)	0.0783 (0.250)	0.325 (0.430)
Firm Age	0.187** (0.0954)	0.0931* (0.0555)	0.113 (0.0940)			
IMR				-7.511** (2.014)	-8.995*** (2.993)	3.589*** (1.301)
Founding Year Fixed Effect	YES	YES	YES	NO	NO	NO
Inalpha	2.245*** (0.0786)	1.329*** (0.0776)	2.797*** (0.0447)	2.306*** (0.0780)	1.350*** (0.0772)	2.801*** (0.0447)
Constant	-4.694** (2.020)	-2.608** (1.272)	11.85*** (2.240)	7.685*** (2.562)	7.685*** (3.137)	10.21*** (1.337)
Observations	943	943	943	943	943	943
Log likelihood	-1284.69	-1355.49	-11017.89	-1296.01	-1360.34	-11019.79
LR chi2	75.09***	67.89***	46.95*	52.44***	58.21***	43.15***

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

VARIABLES	Spinouts' Capabilities and Moderating effect of the Entry Time ( <i>ref. Academic Spinoff, Threshold: 2012</i> )					
	(1)			(2)		
	Patent	Trademark	Funding	Patent	Trademark	Funding
Academic Spinoffs	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>	<i>ref.</i>
Supplier Spinouts	1.142** (0.482)	-0.289 (0.343)	0.162 (0.607)	1.386*** (0.465)	-0.157 (0.339)	0.318 (0.593)
Focal Spinouts	1.674*** (0.579)	0.667** (0.393)	1.244* (0.716)	1.783*** (0.582)	0.782** (0.395)	1.420** (0.707)
User Spinouts	1.376*** (0.507)	0.599* (0.347)	0.874 (0.604)	1.358*** (0.505)	0.602* (0.347)	0.923 (0.595)
Entry Time (Early Entrants=1; Late Entrants=0)	1.200 (1.472)	0.0692 (0.913)	0.0347 (1.661)	0.742 (0.488)	0.185 (0.305)	0.452 (0.573)
A Supplier Spinouts × Early Entrants	-2.030*** (0.643)	-0.152 (0.408)	0.310 (0.793)	-2.267*** (0.618)	-0.142 (0.401)	0.326 (0.771)
Focal Spinouts × Early Entrants	-2.178*** (0.803)	-0.540 (0.506)	-1.270 (0.982)	-2.705*** (0.793)	-0.630 (0.504)	-1.244 (0.964)
User Spinouts × Early Entrants	-1.209** (0.595)	-0.769** (0.384)	-0.506 (0.732)	-1.357** (0.589)	-0.725* (0.373)	-0.397 (0.715)
N. Founders	0.451*** (0.134)	0.228*** (0.0842)	0.438** (0.181)	0.368*** (0.128)	0.226*** (0.0825)	0.429** (0.171)
N. Founders Same Parent	0.0930 (0.235)	0.185 (0.141)	0.507* (0.285)	0.206 (0.229)	0.200 (0.140)	0.516* (0.281)
Founder Tenure	0.0733** (0.0300)	0.0454** (0.0192)	0.00326 (0.0344)	0.0581** (0.0280)	0.0415** (0.0186)	0.00589 (0.0345)
Founder Position Parent (Executive=1; Other=0)	-0.143 (0.294)	0.194 (0.190)	-0.0663 (0.376)	-0.156 (0.283)	0.170 (0.187)	-0.142 (0.366)
Serial Entrepreneur	0.362 (0.258)	-0.0816 (0.168)	0.158 (0.328)	0.359 (0.245)	-0.120 (0.166)	-0.116 (0.317)
Founder Position Firm (Executive=1; Other=0)	1.263*** (0.410)	0.710*** (0.246)	0.792* (0.459)	1.139*** (0.381)	0.724*** (0.243)	0.816* (0.460)
Founder Gender (Female=1; Male=0)	0.494 (0.427)	0.512* (0.280)	0.686 (0.516)	0.545 (0.422)	0.559** (0.275)	0.610 (0.497)
Founder Education (PhD=1; Other=0)	0.632** (0.274)	0.0710 (0.177)	0.453 (0.332)	0.682*** (0.258)	0.0839 (0.171)	0.495 (0.327)
Collaboration	-0.111 (0.388)	0.146 (0.252)	0.316 (0.447)	-0.0694 (0.372)	0.203 (0.248)	0.430 (0.419)
Firm Age	0.179* (0.0934)	0.102* (0.0544)	0.131 (0.0903)			
IMR				-8.908*** (2.278)	-10.19*** (3.878)	3.077** (1.537)
Founding Year Fixed Effect	YES	YES	YES	NO	NO	NO
Inalpha	2.239*** (0.0789)	1.343*** (0.0773)	2.798*** (0.0447)	2.274*** (0.0785)	1.369*** (0.0769)	2.802*** (0.0447)
Constant	-4.972*** (0.922)	-2.979*** (0.596)	11.71*** (1.057)	8.525*** (3.066)	8.614** (4.110)	10.68*** (1.359)
Observations	943	943	943	943	943	943
Log likelihood	-1284.2	-1358.7	-11018.5	-1290.6	-1364.5	-11020.6
LR chi2	76.09***	61.51***	45.76**	63.33***	49.78***	41.52***

Standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

- All three types of spinouts that entered the industry during the early stages have a lower number of patents and trademarks compared to the late entrants, such that there is no significant difference in their capabilities and those of the academic spinoffs.
- Controlling for the fields of application, supplier and focal spinouts create more knowledge compared to the academic spinoffs. However, supplier spinouts operating in the learning systems sector and focal spinouts active in the symbolic systems have a lower number of granted patents, such that there is no difference between their technological capability and that of academic spinoffs.
- Supplier spinouts active in the symbolic systems sector have a lower number of trademarks compared to other entrants.