BOARD INDEPENDENCE AND FIRM PERFORMANCE IN THE IT INDUSTRY: THE MODERATING ROLE OF NEW ENTRY THREATS

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Appendix A

Controlling for Firm Innovativeness

One potential concern with regard to the effect of NET on firm performance is that NET may partly capture the effect of the innovativeness of a firm. For example, less innovative firms may face higher levels of NET, and at the same time they are likely to have lower performance. These firms also likely to benefit to a greater extent from an independent board than more innovative firms. Alternatively, highly innovative firms with higher relative performance may operate in sectors that see high NET in general. In such cases, the value of an independent board may not be as compelling. Effectively, we need to account for the innovativeness of the firm in the analysis. We therefore add a measure of the innovativeness of the incumbent firm in our regressions as a control variable. We measure the innovativeness of a firm by taking the natural log of the number of patents that the firm applied, or was granted, in the prior 3-year or 5-year period. We present the results from this model in Table A1. We observe that all our findings still hold and the coefficient estimates of the variables of interest are very similar to those in the main model in Table 4.

Table A1. Board Independence, New Entry Threats, and Firm Performance				
	ROA			
Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
Board Independence	0.711	0.717	0.775	0.766
	(1.172)	(1.172)	(1.174)	(1.175)
New Entry Threats	-4.066***	-4.090***	-4.202***	-4.209***
	(0.817)	(0.817)	(0.821)	(0.821)
New Entry Threats × Board Independence	4.917***	4.941***	5.075***	5.080***
	(1.054)	(1.054)	(1.062)	(1.062)
Firm Innovativeness Controls:				
Log(# of Applied Patents in last 3 years)	-0.373***			
	(0.091)			
Log(# of Applied Patents in last 5 years)		-0.341***		
		(0.083)		
Log(# of Granted Patents in last 3 years)			-0.233***	
			(0.087)	
Log(# of Granted Patents in last 5 years)				-0.205**
				(0.081)
Board-Related Controls	Yes	Yes	Yes	Yes
Firm-Related Controls	Yes	Yes	Yes	Yes
Year & Firm FE	Yes	Yes	Yes	Yes
No. Of Firms	582	582	582	582
Observations	4,175	4,175	4,175	4,175
R-squared	0.651	0.651	0.650	0.650

Notes: This table reports the estimates for firm operating performance as dependent variable, while controlling for firm innovativeness in each specification. Firm innovativeness is operationalized as the natural log of the number of patents the firm has applied for in the past 3 years (Column 1) or 5 years (Column 2), and the number of patent granted in the past 3 years (Column 3) or 5 years (Column 4). All the independent variables are lagged by one year. The dataset is constructed based on the sample of U.S. S&P 1500 firms in IT Industries from 1997 to 2013.
Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
New entry threats are standardized with mean of zero and standard deviation of one.

Appendix B

Alternative Instrumental Variable Regression Using Local Director Supply ▰▰▰▰

As an alternative identification strategy, we use local director supply as an instrumental variable to address the endogeneity of board independence, following prior literature on corporate governance (Knyazeva et al. 2013). Knyazeva et al. (2013) show that there is a strong impact of the pool of local director candidates on board composition, and firms located in proximity to larger pools of local director talent tend to have more independent boards. According to Güner et al. (2008), the most common outside director candidate is an executive at another nonfinancial firm, followed by an executive at a financial firm, and then one with a non-corporate background. Following Knyazeva et al., we construct the local director pool variable as the density of nonfinancial firms within the same metropolitan or micropolitan areas where the focal firm is located. We calculate the density by the number of firms (excluding financial firms and direct competitors) standardized by the population of the metropolitan or micropolitan area. The data on metropolitan or micropolitan areas and population are obtained from U.S. Census Bureau 2010 database. Natural logs are used to address the right skewness of the densities. Because executives of direct competitors are unlikely to join the board due to concerns over conflicts of interest, we exclude firms in the same four-digit NAICS industry from the calculation of the local director pools. We use a firm's headquarter location (five-digit zip code) as reported in Compustat to determine the metropolitan or micropolitan area.

The results of the 2SLS estimation are shown in Table B1. Qualitatively, the results from the second stage estimates are consistent with the FE specification we presented in Table 4. The coefficient of *NET × Board Independence* is again positive and statistically significant, providing further evidence for the finding that NET positively moderates the relationship between board independence and firm performance. However, we suggest that caution be exercised when interpreting the results from Table B1, particularly with regard to the magnitude of the point estimates, as the low value of first stage F-tests indicate local supply of board candidates may be subject to weak instrument concerns, potentially because firms in the IT industries, particularly software firms, are highly concentrated in a few geographic clusters, leading to the lack of variation in the instrument.

Table B1. 2SLS Regression with Local Director Pool as the Instrument Variable		
	SOX Implementation Year = 2002	
	2nd stage without interaction	**2nd stage with interaction**
	ROA	**ROA**
Dependent Variable	**(1)**	**(2)**
Board Independence	64.651	-6.731
	(43.411)	(80.639)
New Entry Threats	-0.710**	-120.700*
	(0.297)	(72.662)
New Entry Threats × Board Independence	–	165.070*
		(99.773)
Board-Related Controls		
CEO Duality	-1.830**	1.814
	(0.763)	(2.030)
Board Size	0.052	-0.472
	(0.148)	(0.500)
Board Tenure	0.703	0.075
	(0.492)	(0.940)
Board Age	-0.494	-0.287
	(0.338)	(0.694)
Interlocks	-0.046	0.280
	(0.071)	(0.232)
Firm-Related Controls		
Log (Assets)	-0.302	-3.954
	(0.440)	(2.539)
PPE/Assets	1.868	-8.974
	(5.785)	(11.265)
Leverage	1.192	-2.653
	(3.453)	(6.813)
Capx/Assets	47.862***	35.074*
	(9.257)	(18.989)
R&D Intensity	-0.388***	-0.576***
	(0.043)	(0.142)
Tobin's Q	1.196***	1.694***
	(0.115)	(0.436)
TNIC HHI	-1.614	-7.448*
	(1.391)	(4.228)
Firm FE	Yes	Yes
Year FE	Yes	Yes
First stage F-stat:	7.29	1.43
Stock–Yogo critical value, 10% max IV size	16.38	7.03
No. of Firms	515	515
Observations	4,322	4,322

Notes: This table reports the estimates for firm operating performance, ROA operationalized as OIBDA/Total Asset as dependent variable. The instrumental variable is *Local Director Pool*, defined as the number of firms in the same metropolitan or micropolitan area, excluding financial firms and competitors (Knyazeva et al. 2013). Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
New entry threats are standardized with mean of zero and standard deviation of one.

Appendix C

Analysis with Balanced Number of Years Before and After SOX

A lingering concern is whether the results in 2SLS regressions are mainly driven by the construction of the panel, which includes more observations long after SOX, when most public firms were already compliant. In order to address this concern, we conduct a robustness test in which we limit the observations to years before 2007, creating a sample with equal number of years prior to SOX (1997–2001) and post SOX (2002–2006). We report the results using this sample in Table C1, with both fixed effects models and 2SLS models. Here again, the results are fully consistent with those from the full sample.

Table C1. Subsample Analysis with Balanced Number of Years Before and After SOX				
	Fixed Effect Model		**Fixed Effect with IV (second stage)**	
Dependent Variable: ROA	**(1)**	**(2)**	**(3)**	**(4)**
Board Independence	3.076*	3.212*	6.195	-2.651
	(1.655)	(1.647)	(9.979)	(10.696)
New Entry Threats	-0.641*	-3.336***	-0.694**	-15.107**
	(0.363)	(1.131)	(0.347)	(7.618)
New Entry Threats ✗ Board Independence	–	4.002***	–	21.430*
		(1.489)		(11.336)
Board-Related Controls	Yes	Yes	Yes	Yes
Firm-Related Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
First stage F-stat.	–	–	31.93	9.36
Stock–Yogo critical value, 10% max. IV size	–	–	16.38	7.03
No. of Firms	486	486	345	345
Observations	2,459	2,459	2,207	2,207
R-squared	0.698	0.700	–	–

Notes: This table reports the estimates for firm operating performance as dependent variable. All independent variables are lagged one year.
Sample is constructed based on U.S. S&P 1500 firms in the IT Industries from 1997 to 2006.
Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
New entry threats are standardized with mean of zero and standard deviation of one.
Instrumental variable was constructed based on the cutoff timing of SOX in 2003.

Appendix D

Alternative Measure of NET Using 3-Year Rolling Window ▮▮▮▮▮

It is possible that the turbulent environment associated with a high level of NET is present not only due to new ventures that are recently incorporated and funded by venture capitalists, but also carried over from startups that are funded earlier in time. To address this potential concern, we construct an alternative measure of the moderating variable by calculating the average level of NET an incumbent firm faces using a 3-year moving window prior to the current period. We present the regression results using this alternative definition of NET in Table D1. In addition, the results from the 2SLS model but using this alternative measure of NET are reported in Table D2. We find that the moderating effect of NET is highly consistent, and quantitatively similar to that presented in Table 4.[1]

Table D1. NET Measured by 3-Year Moving Window						
	ROA (%) Operationalized as OIBDA/Total Asset		ROA (%) Operationalized as Net Income/Total Asset		ROE (%) Net Income/Common Shareholders' Equity	
	(1)	(2)	(3)	(4)	(5)	(6)
Board Independence	0.073	-0.215	0.720	0.218	-3.000	-3.519
	(1.281)	(1.261)	(2.349)	(2.295)	(7.146)	(7.134)
Ave (NET$_{t-2}$ + NET$_{t-1}$ + NET$_t$)	-0.377	-4.063***	-1.332**	-7.481***	-2.045*	-12.221***
	(0.285)	(0.897)	(0.541)	(2.384)	(1.195)	(4.158)
Ave (NET$_{t-2}$ + NET$_{t-1}$ +NET$_t$) × *Board Independence*	–	5.049***	–	8.430***	–	13.852**
		(1.160)		(3.029)		(5.429)
Board-Related Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Related Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of Firms	547	547	552	552	549	549
Observations	3,795	3,795	3,775	3,775	3,802	3,802
R-squared	0.662	0.666	0.585	0.587	0.513	0.514

Notes: This table reports the estimates for firm operating performance as dependent variable. All independent variables are lagged one year. The dataset constructed based on the sample of U.S. S&P 1500 firms in the IT Industries from 1997 to 2013.
Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
New entry threats are standardized with mean of zero and standard deviation of one.

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[1]In addition to using a 3-year moving window, we have also experimented with constructing the average NET using a 2-year moving window, and the findings are highly consistent.

Table D2. 2SLS Regression with NET Measured by 3-Year Moving Window					
	SOX Implementation Year = 2003				
	1st stage without interaction	2nd stage without interaction	1st stage with interaction	1st stage with interaction	2nd stage with interaction
	Board Independence	ROA	Board Independence	NET × Board Independence	ROA
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Non-compliant Firms After SOX (z1)	0.138***		0.139***	0.040**	–
	(0.014)		(0.014)	(0.020)	
z1 × Ave (NET$_{t-2}$ + NET$_{t-1}$ + NET$_t$) (z2)	–	–	-0.001	0.092***	–
			(0.011)	(0.030)	
Board Independence	–	-0.714	–	–	-13.943**
		(5.108)			(6.681)
Ave (NET$_{t-2}$ + NET$_{t-1}$ + NET$_t$)	-0.003	-0.377	-0.003	0.721***	-22.441***
	(0.004)	(0.287)	(0.004)	(0.010)	(6.736)
Ave (NET$_{t-2}$ + NET$_{t-1}$ + NET$_t$) × Board Independence	–	–	–	–	30.185***
					(9.144)
Board-Related Controls	Yes	Yes	Yes	Yes	Yes
Firm-Related Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
First stage F-stat.	–	180.60	–	–	31.72
Stock-Yogo critical value, 10% max, IV size	–	16.38	–	–	7.03
No. of Firms	353	353	353	353	353
Observations	3,245	3,245	3,245	3,245	3,245

Notes: This table reports the estimates for firm operating performance, ROA operationalized as OIBDA/Total Asset as dependent variable. All independent variables are lagged one year.

Robust standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

New entry threats are standardized with mean of zero and standard deviation of one.

The instrumental variable is constructed with SOX timing cutoff of year 2003.

References

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