

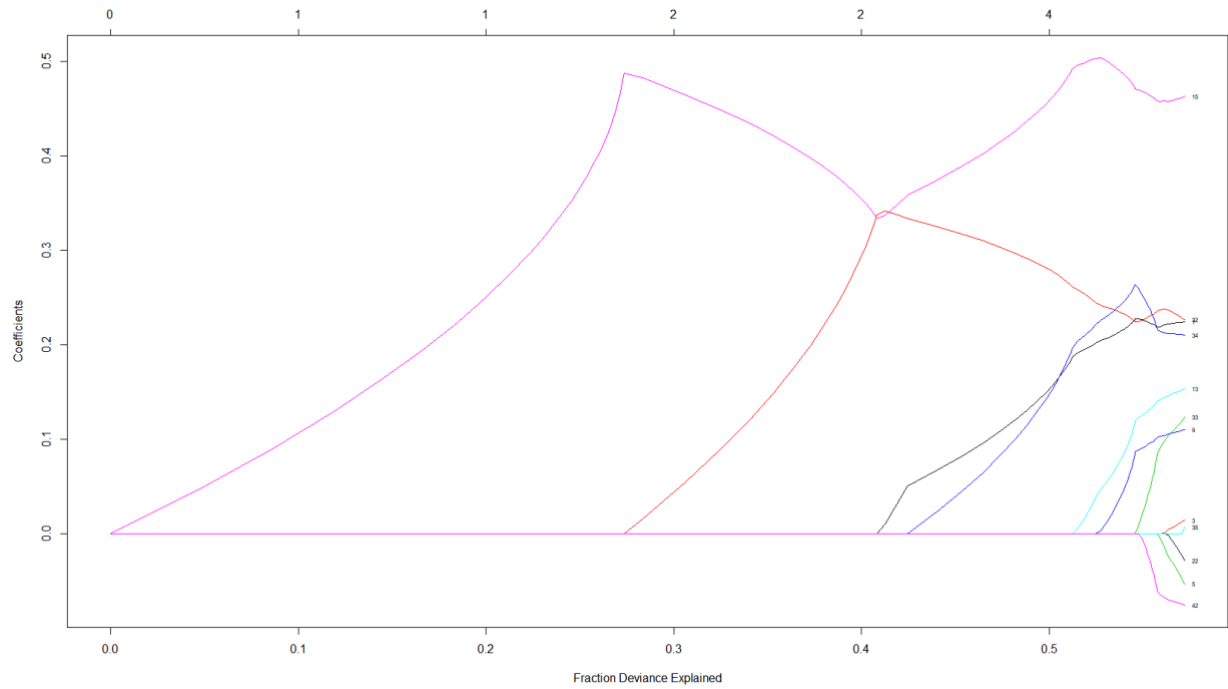
# **Internet Appendix for**

**“Disregarding the Shoulders of Giants: Inferences from Innovation Research”**

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### Figure IA1: Fraction of Deviance Explained

This figure shows the fraction of model deviance explained by the number of variables. It shows that the six variables chosen roughly explain 55% of the deviance while the whole model explains 58%.



**Table IA1 Summary Statistics**

This table shows the summary statistics of the sample with firm-year observations from 2001 to 2010. All variables are defined in Appendix C.

	Mean	Median	Std. Dev.	Lower Quartile	Upper Quartile
<b>Innovation Characteristics:</b>					
Patent	3.041	2.833	1.598	1.792	4.060
Citation	0.513	0.000	0.900	0.000	0.693
<b>CEO Characteristics:</b>					
CEO Total Pay	8.381	8.441	1.031	7.725	9.098
CEO Delta	4.390	4.370	1.513	3.435	5.397
CEO Vega	3.518	3.596	1.554	2.551	4.590
CEO Centrality	0.326	-0.042	1.305	-0.334	0.445
CEO Gender	0.019	0.000	0.137	0.000	0.000
CEO Confidence	0.450	0.000	0.498	0.000	1.000
<b>Firm Characteristics:</b>					
Size	7.644	7.561	1.491	6.594	8.788
R&D Stock	0.364	0.262	0.328	0.110	0.555
Tobin's q	1.273	0.879	1.467	0.494	1.508
Stock Liquidity	19.587	19.499	1.540	18.486	20.679
Firm Age	3.226	3.258	0.688	2.639	3.932
Distance to USPTO	7.081	7.283	1.071	6.462	7.970
Tangibility	0.193	0.161	0.134	0.095	0.259
State Tax	0.294	0.338	0.093	0.298	0.348
ROA	0.128	0.129	0.092	0.087	0.177
Manufacturing	0.637	1.000	0.481	0.000	1.000
Sales Growth	0.254	0.189	0.700	-0.013	0.417
Organization Capital	-0.023	-0.047	0.130	-0.066	-0.018
Capital Structure	0.173	0.155	0.158	0.030	0.264
<b>Governance Characteristics:</b>					
Analyst Following	1.813	1.386	1.872	0.000	3.738
Institutional Ownership	0.373	0.340	0.382	0.000	0.757
Poison Pill	0.654	1.000	0.476	0.000	1.000
Golden Parachutes	0.769	1.000	0.422	1.000	1.000
Family Firm	0.175	0.000	0.380	0.000	0.000
Blockholder	0.905	1.000	0.293	1.000	1.000
Board Size	2.496	2.398	0.566	2.079	2.708
Mergers and Charter Amendments	0.217	0.000	0.412	0.000	0.000
Staggered Board	0.552	1.000	0.497	0.000	1.000
Board Independence	0.793	0.818	0.118	0.750	0.889
Bylaw Amendments Limit	0.476	0.000	0.500	0.000	1.000
<b>Industry Characteristics:</b>					
Industry Patent Intensity	0.190	0.222	0.073	0.129	0.243
Industry Citation Intensity	0.020	0.017	0.013	0.010	0.030
Industry Competition	0.099	0.062	0.097	0.050	0.120
Industry R&D	0.091	0.097	0.058	0.042	0.114
Industry Size	14.555	14.694	0.928	14.268	15.185

**Table IA2 A Rolling Window Approach with Adaptive Lasso**

This table presents the variable selection results on multiple managerial, governance, firm, and industry factors on patents among patenting firms. We apply the adaptive Lasso process on a two-year rolling window basis. All variables are defined in Appendix C. “-” denotes variables that are not included in the selection process due to design or data availability. The boldface variables indicate ones that are chosen by adaptive Lasso.

<b>Panel A: Patents</b>				
<b>Sample:</b>	<i>2001-2010</i>	<i>1992-2010</i>	<i>2001-2010</i>	<i>1992-2010</i>
	<i>Frequency Chosen</i>			
	<i>Without R&amp;D Stock</i>		<i>With R&amp;D Stock</i>	
<i>Variables</i>	<b>Patent</b>			
<b>Managerial Characteristics:</b>				
CEO Centrality	<b>8/9</b>	-	<b>9/9</b>	-
CEO Confidence	0/9	1/18	1/9	0/18
CEO Vega	1/9	4/18	3/9	0/18
CEO Delta	1/9	1/18	1/9	0/18
CEO Total Pay	1/9	0/18	1/9	1/18
CEO Gender	0/9	0/18	0/9	0/18
<b>Firm Characteristics:</b>				
Size	<b>9/9</b>	<b>18/18</b>	<b>9/9</b>	<b>18/18</b>
R&D Stock	-	-	<b>9/9</b>	<b>15/18</b>
Tobin’s q	0/9	0/18	0/9	0/18
Stock Liquidity	<b>9/9</b>	<b>17/18</b>	<b>9/9</b>	<b>14/18</b>
Firm Age	0/9	0/18	0/9	0/18
Distance to USPTO	1/9	1/18	1/9	1/18
Tangibility	0/9	0/18	0/9	1/18
Manufacturing	1/9	1/18	4/9	4/18
State Tax	0/9	0/18	0/9	1/18
ROA	0/9	2/18	0/9	1/18
Capital Structure	0/9	0/18	0/9	0/18
Sales Growth	1/9	1/18	2/9	0/18
Organizational Capital	0/9	0/18	1/9	0/18
<b>Corporate Governance:</b>				
Analyst Following	5/9	8/18	<b>6/9</b>	9/18
Poison Pill	0/9	1/18	1/9	2/18
Blockholder	0/9	1/18	0/9	1/18
Institutional Ownership	0/9	1/18	0/9	0/18
Board Size	0/9	-	1/9	-
Golden Parachutes	0/9	0/18	0/9	0/18
Board Independence	0/9	-	0/9	-
Mergers and Charter	0/9	0/18	0/9	0/18
Staggered Board	0/9	0/18	0/9	0/18
Bylaw Amendments Limit	0/9	2/18	0/9	1/18
Family Firm	0/9	-	0/9	-
<b>Industry Characteristics:</b>				
Industry Citation	<b>8/9</b>	9/18	<b>9/9</b>	9/18
Industry Patent Intensity	<b>6/9</b>	11/18	3/9	<b>12/18</b>
Industry Size	1/9	5/18	3/9	6/18
Industry R&D	1/9	12/18	2/9	6/18
Industry Competition	0/9	0/18	0/9	0/18

**Panel B: Citations**

<i>Variables</i>	<b>Sample:</b>			
	<i>2001-2010</i>	<i>1992-2010</i>	<i>2001-2010</i>	<i>1992-2010</i>
	<i>Frequency Chosen</i>			
	<i>Without R&amp;D Stock</i>		<i>With R&amp;D Stock</i>	
	<b>Citation</b>			
<b>Managerial</b>				
CEO Centrality	3/9	-	3/9	-
CEO Confidence	0/9	1/18	0/9	0/18
CEO Vega	1/9	0/18	0/9	0/18
CEO Delta	0/9	0/18	0/9	2/18
CEO Total Pay	0/9	0/18	0/9	0/18
CEO Gender	0/9	0/18	0/9	1/18
<b>Firm Characteristics:</b>				
<b>Size</b>	<b>5/9</b>	<b>14/18</b>	<b>5/9</b>	<b>16/18</b>
R&D Stock	-	-	2/9	4/18
Tobin's q	0/9	0/18	0/9	1/18
<b>Stock Liquidity</b>	<b>9/9</b>	<b>15/18</b>	<b>9/9</b>	<b>15/18</b>
Firm Age	0/9	0/18	0/9	0/18
Distance to USPTO	0/9	0/18	0/9	0/18
Tangibility	0/9	0/18	0/9	0/18
Manufacturing	0/9	0/18	0/9	2/18
State Tax	0/9	0/18	0/9	0/18
ROA	0/9	0/18	0/9	0/18
Capital Structure	0/9	0/18	0/9	0/18
Sales Growth	0/9	0/18	0/9	0/18
Organizational Capital	0/9	0/18	0/9	0/18
<b>Corporate Governance:</b>				
Analyst Following	0/9	3/18	0/9	3/18
Poison Pill	0/9	0/18	0/9	2/18
Blockholder	2/9	1/18	2/9	1/18
Institutional	0/9	0/18	0/9	1/18
Board Size	0/9	-	0/9	-
Golden Parachutes	0/9	0/18	0/9	0/18
Board Independence	0/9	-	0/9	-
Mergers and Charter	0/9	0/18	0/9	0/18
Staggered Board	0/9	0/18	0/9	1/18
Bylaw Amendments	0/9	0/18	0/9	2/18
Family Firm	0/9	-	0/9	-
<b>Industry Characteristics:</b>				
<b>Industry Citation</b>	<b>9/9</b>	<b>12/18</b>	<b>9/9</b>	<b>14/18</b>
Industry Patent	1/9	1/18	1/9	1/18
Industry Size	0/9	1/18	0/9	1/18
Industry R&D	1/9	3/18	1/9	4/18
Industry Competition	0/9	0/18	0/9	0/18

**Table IA3 Variable Selection: A Rolling Window Approach via Stepwise Procedure**

This table presents the results of multiple managerial, governance, firm, and industry factors on innovation among patenting firms. We apply the stepwise process on a two-year rolling window basis. All the variables are defined in Appendix C. The Huber-White Sandwich estimator is clustered at the firm level. The boldface variables indicate ones that are chosen by stepwise process.

<b>Sample:</b>	2001-	1992-	2001-	1992-
	2010	2010	2010	2010
	<i>Frequency Chosen</i>			
<i>Variables:</i>	<b>Patent</b>		<b>Citation</b>	
<b>Managerial Characteristics:</b>				
CEO Centrality	4/9	-	0/9	-
CEO Vega	2/9	2/18	1/9	2/18
CEO Confidence	0/9	3/18	1/9	2/18
CEO Total Pay	0/9	0/18	0/9	0/18
CEO Delta	2/9	1/18	0/9	1/18
CEO Gender	0/9	4/18	0/9	1/18
<b>Firm Characteristics:</b>				
<b>Size</b>	<b>9/9</b>	<b>18/18</b>	<b>6/9</b>	<b>18/18</b>
<b>R&amp;D Stock</b>	<b>8/9</b>	<b>17/18</b>	3/9	9/18
Tobin's q	0/9	0/18	0/9	0/19
<b>Stock Liquidity</b>	<b>9/9</b>	<b>12/18</b>	<b>9/9</b>	<b>14/18</b>
Firm Age	0/9	0/18	0/9	0/18
Distance to USPTO	3/9	1/18	0/9	1/18
Tangibility	0/9	4/18	0/9	0/18
State Tax	0/9	2/18	0/9	1/18
ROA	0/9	3/18	0/9	2/18
Manufacturing	1/9	7/18	0/9	2/18
Sales Growth	1/9	1/18	0/9	0/18
Organizational Capital	0/9	0/18	0/9	0/18
Capital Structure	0/9	0/18	0/9	2/18
<b>Corporate Governance:</b>				
Analyst Following	4/9	6/18	0/9	2/18
Institutional Ownership	0/9	3/18	0/9	2/18
Poison Pill	2/9	3/18	2/9	5/18
Golden Parachutes	0/9	0/18	0/9	0/18
Family Firm	0/9	-	0/9	-
Blockholder	0/9	1/18	0/9	2/18
Board Size	0/9	-	0/9	-
Mergers and Charter Amendments	0/9	0/18	0/9	2/18
Staggered Board	0/9	0/18	0/9	3/18
Board Independence	0/9	-	0/9	-
Bylaw Amendments Limit	0/9	0/18	1/9	5/18
<b>Industry Characteristics:</b>				
<b>Industry Citation Intensity</b>	<b>8/9</b>	<b>10/18</b>	<b>9/9</b>	<b>13/18</b>
Industry Size	5/9	8/18	0/9	4/18
Industry R&D	4/9	10/18	0/9	4/18
Industry Patent Intensity	4/9	6/18	0/9	2/18
Industry Competition	0/9	0/18	0/9	0/18

**Table IA4 Correlation Table**

This table shows the correlation matrix between the 35 variables based on the sample of 2001-2010.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1	CEO Total Pay	1.00																		
2	CEO Delta	0.42	1.00																	
3	CEO Vega	0.46	0.78	1.00																
4	CEO Centrality	0.19	0.18	0.19	1.00															
5	Firm Age	-0.01	0.02	-0.01	-0.09	1.00														
6	CEO Gender	0.04	0.03	0.01	0.06	-0.08	1.00													
7	CEO Confidence	-0.03	0.17	0.08	-0.06	0.19	-0.08	1.00												
8	Size	0.62	0.43	0.42	0.22	0.06	0.03	-0.17	1.00											
9	R&D Stock	-0.11	-0.02	0.01	0.03	-0.13	0.00	0.08	-0.40	1.00										
10	Tobin's q	0.12	0.38	0.21	0.02	-0.06	0.02	0.22	-0.01	0.17	1.00									
11	Stock Liquidity	0.49	0.38	0.38	0.28	-0.12	0.05	-0.09	0.54	0.21	0.26	1.00								
12	Distance to USPTO	-0.06	-0.08	-0.09	-0.03	0.06	0.01	-0.04	0.07	-0.22	-0.11	-0.27	1.00							
13	Tangibility	-0.09	-0.13	-0.09	-0.08	0.12	-0.06	-0.13	0.11	-0.34	-0.27	-0.20	0.15	1.00						
14	State Tax	0.24	0.30	0.26	0.02	0.06	0.02	0.13	0.39	-0.34	0.17	-0.03	0.10	0.00	1.00					
15	ROA	0.23	0.30	0.23	0.02	0.02	-0.04	0.10	0.40	-0.29	0.30	0.06	0.10	0.17	0.55	1.00				
16	Manufacturing	-0.16	-0.13	-0.10	-0.12	0.04	-0.06	0.11	-0.16	0.04	-0.05	-0.08	-0.01	-0.17	-0.09	-0.12	1.00			
17	Sales Growth	-0.03	0.10	0.07	-0.02	-0.02	0.02	0.08	-0.19	0.19	0.22	-0.01	-0.05	-0.09	-0.08	-0.22	-0.05	1.00		
18	Organization Capital	-0.12	-0.14	-0.14	0.02	-0.01	0.06	-0.03	-0.12	0.05	-0.11	-0.12	0.00	0.05	-0.20	-0.05	-0.01	-0.07	1.00	
19	Capital Structure	-0.01	-0.07	-0.06	-0.04	0.11	-0.03	-0.07	0.08	-0.18	-0.13	-0.07	0.11	0.14	-0.15	-0.08	-0.09	0.05	0.09	1.00

		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
19	Capital Structure	1.00																	
20	Analyst Following	0.10	1.00																
21	Institutional Ownership	0.10	0.92	1.00															
22	Poison Pill	-0.02	-0.02	0.05	1.00														
23	Golden Parachutes	0.13	0.07	0.14	0.23	1.00													
24	Family Firm	-0.08	-0.14	-0.13	-0.18	-0.27	1.00												
25	Blockholder	0.02	-0.11	0.01	0.07	0.16	0.00	1.00											
26	Board Size	-0.02	0.14	0.05	-0.04	-0.01	-0.01	-0.10	1.00										
27	Mergers and Charter Amendments	0.02	0.11	0.11	0.04	0.08	0.02	0.04	-0.01	1.00									
28	Staggered Board	0.02	0.04	0.09	0.25	0.18	-0.08	0.12	0.02	0.19	1.00								
29	Board Independence	0.03	0.17	0.20	0.06	0.25	-0.25	0.05	0.03	0.06	0.03	1.00							
30	Bylaw Amendments Limit	0.00	0.04	0.05	-0.05	0.14	-0.07	0.10	0.04	0.22	0.10	0.20	1.00						
31	Industry Patent Intensity	-0.12	-0.11	-0.09	0.10	0.03	-0.03	0.00	-0.09	-0.01	0.01	-0.06	-0.10	1.00					
32	Industry Citation Intensity	-0.14	-0.12	-0.13	0.05	-0.08	-0.01	-0.04	-0.08	-0.08	-0.10	-0.10	-0.13	0.65	1.00				
33	Industry Competition	0.11	0.14	0.14	-0.07	0.01	-0.06	-0.03	0.00	-0.01	-0.06	0.03	0.03	-0.22	-0.13	1.00			
34	Industry R&D	-0.09	-0.08	-0.06	0.09	0.03	0.00	-0.03	-0.01	-0.01	0.03	0.00	0.04	0.60	0.13	-0.34	1.00		
35	Industry Size	-0.12	0.02	-0.02	0.07	-0.03	-0.07	-0.09	0.08	-0.08	-0.03	0.08	0.06	0.31	0.29	-0.18	0.53	1.00	

**Table IA5 Including Non-Patenting Firms**

This table presents adaptive Lasso variable selection results when we include firms with zero patents.

<i>Variables</i>	<i>Frequency Chosen</i>	
	<b>Patent</b>	<b>Citation</b>
<b>Managerial Characteristics:</b>		
CEO Centrality	9/9	4/9
CEO Delta	0/9	0/9
CEO Confidence	0/9	0/9
CEO Vega	1/9	0/9
CEO Total Pay	1/9	0/9
CEO Gender	0/9	0/9
<b>Firm Characteristics:</b>		
Size	9/9	6/9
R&D Stock	9/9	2/9
Tobin's q	0/9	0/9
Stock Liquidity	9/9	9/9
Firm Age	0/9	0/9
Distance to USPTO	7/9	0/9
Tangibility	0/9	0/9
State Tax	0/9	0/9
ROA	0/9	0/9
Manufacturing	0/9	0/9
Sales Growth	0/9	0/9
Organizational Capital	0/9	0/9
Capital Structure	0/9	0/9
<b>Corporate Governance:</b>		
Analyst Following	7/9	0/9
Blockholder	1/9	1/9
Bylaw Amendments Limit	2/9	0/9
Institutional Ownership	0/9	0/9
Poison Pill	1/9	0/9
Board Size	0/9	0/9
Golden Parachutes	0/9	0/9
Family Firm	0/9	0/9
Mergers and Charter Amendments	0/9	0/9
Staggered Board	0/9	0/9
Board Independence	0/9	0/9
<b>Industry Characteristics:</b>		
Industry Citation Intensity	9/9	9/9
Industry Patent Intensity	7/9	0/9
Industry Size	4/9	0/9
Industry R&D	0/9	0/9
Industry Competition	0/9	0/9



**Table IA6 Variable Selection: R&D Expenditures**

This table presents the results of variable selection in two-year rolling windows using R&D as the dependent variable. All the variables are defined in Appendix C.

<i>Variables</i>	<i>Frequency Chosen</i>	
	<b>Stepwise</b>	<b>Adaptive Lasso</b>
<b>Managerial Characteristics:</b>		
CEO Centrality	1/9	0/9
CEO Confidence	0/9	0/9
CEO Gender	0/9	0/9
CEO Vega	4/9	0/9
CEO Total Pay	0/9	0/9
CEO Delta	1/9	0/9
<b>Firm Characteristics:</b>		
Size	9/9	9/9
Tobin's q	1/9	0/9
Stock Liquidity	9/9	9/9
Firm Age	0/9	0/9
Distance to USPTO	0/9	0/9
Tangibility	9/9	1/9
Manufacturing	1/9	0/9
State Tax	4/9	3/9
ROA	0/9	0/9
Capital Structure	1/9	0/9
Sales Growth	0/9	1/9
Organizational Capital	0/9	0/9
<b>Corporate Governance:</b>		
Analyst Following	0/9	0/9
Poison Pill	0/9	0/9
Blockholder	0/9	0/9
Institutional Ownership	0/9	0/9
Board Size	0/9	0/9
Golden Parachutes	0/9	0/9
Board Independence	0/9	0/9
Mergers and Charter Amendments	0/9	0/9
Staggered Board	0/9	0/9
Bylaw Amendments Limit	0/9	0/9
Family Firm	0/9	0/9
<b>Industry Characteristics:</b>		
Industry Citation Intensity	0/9	0/9
Industry Patent Intensity	8/9	8/9
Industry Size	0/9	0/9
Industry R&D	1/9	1/9
Industry Competition	0/9	0/9