

## **Internet Appendix for**

### **“Managerial Risk-Taking Incentive and Firm Innovation: Evidence from FAS 123R”**

**(Not to Be Published)**

This internet appendix provides various robustness tests to the main results presented in “Managerial Risk-Taking Incentive and Firm Innovation: Evidence from FAS 123R”. Section A presents the robustness checks for the difference-in-differences (DiD) results reported in Section 3.4 of the paper. Section B presents a summary of the changes in severance contract terms before versus after FAS 123R. Section C reports the effect of FAS 123R on R&D investments in a subsample of firms that do not have performance-vesting (p-v) equity grants. Section D presents the robustness checks for innovation search strategy results reported in Section 3.8 of the paper.

#### **A. Robustness Checks for DiD Results**

We conduct various robustness tests for our DiD specifications reported in Section 3.4 of the paper. First, we examine our findings using an alternative definition of treatment group in the DiD framework. Bakke et al. (2016) point out that FAS 123R would not affect the firms that did not grant options in employee compensations before the implementation of FAS 123R. Therefore, we define a dummy variable, *Withoption*, that equals one for firms with option expenses in 2003 or 2004, and zero for those without option expenses in 2003 and 2004. The firms without option expenses in both years are classified as the control group. The DiD results are reported in the Internet Appendix Table IA1. In Panel A, where we examine the effect on innovation output quantity and quality, we find that the coefficient estimates on the interaction terms *Post-123R\*Withoption* are negative and statistically significant at the 1% level in five out of the six models. In Panel B, we find no significant difference in the effect of the FAS 123R

implementation on R&D investments between the treatment and control firms. The evidence suggests that our DiD results are robust to alternative definition of treatment group.

Second, patent and citation data are non-negative integer values, and a large proportion of the observations are zero. We use alternative estimation methods to deal with such data, including the Poisson model and the Negative Binomial model (NB2 model). As shown in the Internet Appendix Table IA2, we estimate the following model using a Poisson regression:

$$\begin{aligned} \# Patent \text{ or } \# Citation = & \alpha + \beta_1 * Post-123R * HighAccImpact + \beta_2 * Post-123R \\ & + \beta_3 * HighAccImpact + Controls + Industry Fixed Effects + \epsilon. \end{aligned} \quad (1)$$

The dependent variable *# Patent* is the total number of patents filed (and eventually granted). The dependent variable *# Citation* is the total number of citations received per patent. In Table IA2, the coefficient estimates on interaction terms are negative and significant at the 1% level in five out of the six models. We also estimate the DiD tests using Negative Binomial regression and the results are reported in the Internet Appendix Table IA3. The coefficient estimates on interaction terms are all negative and statistically significant for all models, except column (6). The evidence suggests that our DiD results are robust to alternative econometric models.

Third, we investigate whether our results are driven by the 2007–08 financial crisis, during which firms experienced significant reductions in corporate investments. It is likely that, because of the financial crisis, which began in 2007, firms curtailed executive option grants and innovation activities because of declining corporate profitability and shrinking investment opportunities. As such, the positive correlation between the risk-taking incentive and innovation activities could be driven by the financial crisis. To address this concern, we limit our sample to the pre-crisis period – from 2003 to 2007 (excluding 2005) and re-run our difference-in-differences regressions. The results are reported in the Internet Appendix Table IA4. Though the

sample becomes smaller after restricting it to the pre-crisis period, our results remain robust. As with our findings in Table 5, treatment firms experience a significantly larger drop in both patent counts and citations per patent than control firms after the FAS 123R implementation. Thus, our finding is unlikely driven by the financial crisis.

## **B. Severance Payments of CEOs**

One concern is that there are unobservables in executive compensation that are not captured in our analyses. For example, severance payments might have changed as a response to FAS 123R. To address the concern, we randomly selected 100 firms in our sample, and hand collect severance contract terms for CEOs in the year 2004 and 2006. We compare detailed severance contract terms before (2004) and after (2006) FAS 123R and the results are reported in the Appendix Table IA5. Overall we find that most of severance contracts remain the same or similar after the adoption of FAS 123R, so our results are unlikely driven by the changes in severance payments associated with FAS 123R.

## **C. The Effect of Performance-Vesting (p-v) Equity Grants on Innovation**

One concern of our study is that we might mis-measure the true risk-taking incentive without taking into account the p-v equity awards in executive compensation. To address the concern, we investigate the robustness of our results by focusing on a subsample of firms that do not have any p-v provisions in a given year. For such firms, vega derived from option grants is an accurate measure of CEOs' risk-taking incentive. We use the Incentive Lab database to

determine whether a firm in our sample has any p-v provisions in a sample year.<sup>1</sup> We end up with a final sample of 943 firm-year observations without p-v equity grants.

We estimate the same difference-in-differences tests on innovation output and input variables using this subsample. Results on patent counts and citation per patent are reported in Panel A of the Internet Appendix Table IA6. Results on R&D investments are reported in Panel B. The coefficient estimates on the interaction terms in Panel A are negative and highly significant in all six models, confirming our earlier findings on innovation output quantity and quality. In Panel B, the coefficient estimates on the interaction terms are all positive and statistically significant at the 5% level, suggesting that treatment firms with greater impact by the accounting regulation experience greater increase in R&D investments. Overall, the evidence confirms the robustness of our main DiD results.

#### **D. Risk-taking Incentive and Innovation Search Strategies in Years t+2 and t+3**

To examine the long term effect of managerial risk incentive on firms' innovation search strategies, we conduct DiD regressions with dependent variables being the innovation search variables in leading years t+2 and t+3, results are reported in Panel A and B, respectively of the Internet Appendix Table IA7. We find that FAS 123R causes a significantly larger increase in technological proximity in treatment firms compared to control firms in both years t+2 and t+3. There is a significant reduction in the number of patents in the two highly cited groups, top 1% and top 2%-10% in the citation distribution in treatment firms than in control firms in leading two and three years post-FAS 123R, however there is no significant change in the number of patents that are less cited. The evidence confirms our results in Table 10.

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<sup>1</sup> Incentive Lab collects detailed information on all short-term and long-term equity-based awards and cash awards from proxy statements for the largest 750 firms, measured by stock market capitalization every year starting in 1998.

**Appendix Table IA1: Difference-in-Differences Tests Using Alternative Treatment Group**

This table presents the difference-in-differences tests results using an alternative definition of treatment firm, those with option expenses in 2003 or 2004. In Panel A, the dependent variables  $Ln(1+Pat)$  are a natural logarithm of one plus total number of patents filed (and eventually granted) in years  $t+1$ ,  $t+2$ , and  $t+3$ , and the results are reported in columns (1)–(3) respectively; the dependent variables  $Ln(1+Cite)$  are a natural logarithm of one plus total number of citations received per patent in years  $t+1$ ,  $t+2$ , and  $t+3$ , and the results are reported in columns (4)–(6) respectively. In Panel B, the dependent variables are  $RD/Assets$  in years  $t+1$ ,  $t+2$ , and  $t+3$ , in columns (1)–(3) respectively, where  $RD/Assets$  is R&D expenses divided by total assets.  $Post-123R$  is a dummy variable that equals one for observations in the post-FAS 123R period (2006–2008), and equals zero for observations in the pre-FAS 123R period (2002–2004).  $Withoption$  that is a dummy variable that equals one if the firm has option expenses in 2003 or 2004, and zero otherwise. In Panel B, all control variables (except  $HHI$  and  $HHI^2$ ) are scaled by dividing by 100. We include industry fixed effects based on two-digit SIC codes. P-values based on robust standard errors are reported in parentheses under the corresponding estimated coefficients. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level, respectively.

**Panel A: Patents and Citations**

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	$Ln(1+Pat)$	$Ln(1+Pat)$	$Ln(1+Pat)$	$Ln(1+Cite)$	$Ln(1+Cite)$	$Ln(1+Cite)$
	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$
<i>Post-123R*Withoption</i> ( $\beta_1$ )	-0.181** (0.021)	-0.255*** (0.001)	-0.278*** (0.000)	-0.185*** (0.000)	-0.152*** (0.001)	-0.132*** (0.001)
<i>Post-123R</i> ( $\beta_2$ )	-0.413*** (0.000)	-0.602*** (0.000)	-0.725*** (0.000)	-0.490*** (0.000)	-0.468*** (0.000)	-0.370*** (0.000)
<i>Withoption</i>	0.118** (0.045)	0.173*** (0.005)	0.196*** (0.002)	0.141*** (0.001)	0.096** (0.024)	0.094** (0.015)
<i>Ln(Sales)</i>	0.390*** (0.000)	0.312*** (0.000)	0.236*** (0.000)	0.091*** (0.000)	0.069*** (0.000)	0.055*** (0.000)
<i>Ln(PPE/EMP)</i>	0.121*** (0.000)	0.107*** (0.000)	0.100*** (0.000)	0.054*** (0.000)	0.038*** (0.000)	0.032*** (0.000)
<i>Tobin's Q</i>	0.174*** (0.000)	0.168*** (0.000)	0.121*** (0.000)	0.067*** (0.000)	0.050*** (0.000)	0.032*** (0.000)
<i>Ln(1+Tenure)</i>	-0.035** (0.012)	-0.036*** (0.010)	-0.034** (0.011)	-0.024*** (0.010)	-0.020** (0.020)	-0.020*** (0.005)
<i>Inst. Ownership</i>	-0.475*** (0.000)	-0.361*** (0.000)	-0.274*** (0.000)	-0.090** (0.044)	-0.038 (0.341)	-0.062* (0.067)
<i>HHI</i>	-6.723*** (0.000)	-5.352*** (0.000)	-4.235*** (0.001)	-1.625* (0.058)	-1.520* (0.054)	-1.753*** (0.010)
<i>HHI^2</i>	24.860*** (0.000)	19.990*** (0.001)	16.470*** (0.004)	3.301 (0.391)	3.313 (0.349)	5.526* (0.065)
Industry Fixed Effects	YES	YES	YES	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.000	0.000	0.000	0.000
Observations	6,552	6,263	5,961	6,552	6,263	5,961
Adjusted R <sup>2</sup>	0.440	0.396	0.369	0.318	0.298	0.265

**Panel B: R&D Investments**

Dependent Variables	(1) <i>RD/Assets<sub>t+1</sub></i>	(2) <i>RD/Assets<sub>t+2</sub></i>	(3) <i>RD/Assets<sub>t+3</sub></i>
<i>Post-123R*Withoption</i> ( $\beta_1$ )	-0.002 (0.572)	0.001 (0.875)	0.001 (0.596)
<i>Post-123R</i> ( $\beta_2$ )	0.007** (0.011)	0.003 (0.171)	-0.000 (0.934)
<i>Withoption</i>	0.004*** (0.009)	0.004** (0.037)	0.004* (0.082)
<i>Ln(Sales)</i>	-0.741*** (0.000)	-0.690*** (0.000)	-0.673*** (0.000)
<i>Ln(PPE/EMP)</i>	0.165** (0.011)	0.197*** (0.003)	0.270*** (0.000)
<i>Tobin's Q</i>	0.739*** (0.000)	0.745*** (0.000)	0.744*** (0.000)
<i>Ln(1+Tenure)</i>	-0.083 (0.135)	-0.038 (0.497)	0.022 (0.697)
<i>Inst.Ownership</i>	-0.504 (0.109)	-0.363 (0.234)	-0.074 (0.804)
<i>HHI</i>	-0.545*** (0.000)	-0.534*** (0.000)	-0.509*** (0.000)
<i>HHI^2</i>	1.851*** (0.000)	1.820*** (0.000)	1.722*** (0.000)
Industry Fixed Effects	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.254
Observations	6,552	6,263	5,961
Adjusted R <sup>2</sup>	0.423	0.429	0.426

**Appendix Table IA2: Difference-in-Differences Tests of the Effect of FAS 123R on  
Innovation: Poisson Regression**

This table presents the difference-in-differences tests results using Poisson regression models. The dependent variables # *Patent* are total number of patents filed (and eventually granted) in years t+1, t+2, and t+3, and the results are reported in columns (1)–(3) respectively. The dependent variables # *Citation* are total number of citations received per patent in years t+1, t+2, and t+3, and the results are reported in columns (4)–(6) respectively. *Post-123R* is a dummy variable that equals one for observations in the post-FAS 123R period (2006–2008), and equals zero for observations in the pre-FAS 123R period (2002–2004). *HighAccImpact* is a dummy variable that equals one for treatment firms (high accounting impact group) and zero for control firms (low accounting impact group). P-values based on robust standard errors are reported in parentheses under the corresponding estimated coefficients. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	# <i>Patent</i> <i>t+1</i>	# <i>Patent</i> <i>t+2</i>	# <i>Patent</i> <i>t+3</i>	# <i>Citation</i> <i>t+1</i>	# <i>Citation</i> <i>t+2</i>	# <i>Citation</i> <i>t+3</i>
<i>Post-123R*HighAccImpact</i> ( $\beta_1$ )	-0.286*** (0.000)	-0.294*** (0.000)	-0.186*** (0.000)	-0.440*** (0.000)	-0.314*** (0.001)	0.124 (0.589)
<i>Post-123R</i> ( $\beta_2$ )	-0.884*** (0.000)	-1.525*** (0.000)	-2.458*** (0.000)	-1.542*** (0.000)	-2.298*** (0.000)	-3.778*** (0.000)
<i>HighAccImpact</i>	0.523*** (0.000)	0.572*** (0.000)	0.584*** (0.000)	0.329*** (0.000)	0.281*** (0.000)	0.240*** (0.000)
<i>Ln(Sales)</i>	0.787*** (0.000)	0.756*** (0.000)	0.719*** (0.000)	0.119*** (0.000)	0.143*** (0.000)	0.175*** (0.000)
<i>Ln(PPE/EMP)</i>	0.088*** (0.000)	0.101*** (0.000)	0.104*** (0.000)	0.119*** (0.000)	0.082*** (0.000)	0.083*** (0.000)
<i>Tobin's Q</i>	0.203*** (0.000)	0.215*** (0.000)	0.195*** (0.000)	0.103*** (0.000)	0.099*** (0.000)	0.107*** (0.000)
<i>Ln(1+Tenure)</i>	-0.012*** (0.002)	-0.020*** (0.000)	-0.031*** (0.000)	-0.054*** (0.000)	-0.054*** (0.000)	-0.077*** (0.000)
<i>Inst. Ownership</i>	-0.694*** (0.000)	-0.695*** (0.000)	-0.703*** (0.000)	-0.179*** (0.000)	-0.001 (0.993)	-0.203** (0.016)
<i>HHI</i>	-10.49*** (0.000)	-8.684*** (0.000)	-6.687*** (0.000)	-0.050 (0.953)	-1.615 (0.133)	-4.537*** (0.001)
<i>HHI^2</i>	29.960*** (0.000)	20.370*** (0.000)	10.971*** (0.000)	-11.191** (0.012)	-7.730 (0.169)	4.062 (0.584)
Industry Fixed Effects	YES	YES	YES	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.000	0.000	0.000	0.000
Observations	6,552	6,263	5,961	6,552	6,263	5,961

**Appendix Table IA3: Difference-in-Differences Tests of the Effect of FAS 123R on  
Innovation: Negative Binomial Regression**

This table presents the difference-in-differences tests results using Negative Binomial regression models. The dependent variables *# Patent* are total number of patents filed (and eventually granted) in years t+1, t+2, and t+3, and the results are reported in columns (1)–(3) respectively. The dependent variables *# Citation* are total number of citations received per patent in years t+1, t+2, and t+3, and the results are reported in columns (4)–(6) respectively. *Post-123R* is a dummy variable that equals one for observations in the post-FAS 123R period (2006–2008), and equals zero for observations in the pre-FAS 123R period (2002–2004). *HighAccImpact* is a dummy variable that equals one for treatment firms (high accounting impact group) and zero for control firms (low accounting impact group). P-values based on robust standard errors are reported in parentheses under the corresponding estimated coefficients. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	<i># Patent</i> <i>t+1</i>	<i># Patent</i> <i>t+2</i>	<i># Patent</i> <i>t+3</i>	<i># Citation</i> <i>t+1</i>	<i># Citation</i> <i>t+2</i>	<i># Citation</i> <i>t+3</i>
<i>Post-123R*HighAccImpact</i> ( $\beta_1$ )	-0.306** (0.047)	-0.439** (0.020)	-0.447* (0.085)	-0.682*** (0.001)	-0.550* (0.055)	-0.116 (0.842)
<i>Post-123R</i> ( $\beta_2$ )	-1.022*** (0.000)	-1.666*** (0.000)	-2.496*** (0.000)	-1.572*** (0.000)	-2.498*** (0.000)	-3.819*** (0.000)
<i>HighAccImpact</i>	0.641*** (0.000)	0.790*** (0.000)	0.798*** (0.000)	0.386*** (0.000)	0.490*** (0.000)	0.410*** (0.002)
<i>Ln(Sales)</i>	0.800*** (0.000)	0.804*** (0.000)	0.786*** (0.000)	0.232*** (0.000)	0.300*** (0.000)	0.334*** (0.000)
<i>Ln(PPE/EMP)</i>	0.083* (0.087)	0.077 (0.173)	0.160** (0.018)	0.061 (0.210)	-0.018 (0.755)	0.122* (0.095)
<i>Tobin's Q</i>	0.309*** (0.000)	0.372*** (0.000)	0.373*** (0.000)	0.249*** (0.000)	0.281*** (0.000)	0.129*** (0.004)
<i>Ln(1+Tenure)</i>	-0.099*** (0.004)	-0.103** (0.011)	-0.075 (0.159)	-0.103*** (0.007)	-0.138*** (0.007)	-0.104** (0.032)
<i>Inst.Ownership</i>	-0.850*** (0.000)	-0.750** (0.014)	-1.030** (0.013)	-0.581** (0.014)	0.153 (0.572)	-0.827** (0.011)
<i>HHI</i>	-15.432*** (0.000)	-17.301*** (0.000)	-14.313*** (0.003)	0.661 (0.839)	0.317 (0.939)	-6.295 (0.232)
<i>HHI^2</i>	51.780*** (0.001)	62.094*** (0.000)	50.873** (0.032)	-19.22 (0.241)	-29.59 (0.132)	6.464 (0.791)
Industry Fixed Effects	YES	YES	YES	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.000	0.000	0.000	0.000
Observations	6,552	6,263	5,961	6,552	6,263	5,961

**Appendix Table IA4: Difference-in-Differences Tests of the Effect of FAS 123R on Innovation: Excluding Financial Crisis (Sample Period is 2003-2007)**

This table presents the difference-in-differences tests results by restricting the sample to the pre-crisis period of 2003-2007 (excluding 2005). The dependent variables  $Ln(I+Pat)$  are a natural logarithm of one plus total number of patents filed (and eventually granted) in years  $t+1$ ,  $t+2$ , and  $t+3$ , and the results are reported in columns (1)–(3) respectively; the dependent variables  $Ln(I+Cite)$  are a natural logarithm of one plus total number of citations received per patent in years  $t+1$ ,  $t+2$ , and  $t+3$ , and the results are reported in columns (4)–(6) respectively. *Post-123R* is a dummy variable that equals one for observations in the post-FAS 123R period (2006–2008), and equals zero for observations in the pre-FAS 123R period (2002–2004). *HighAccImpact* is a dummy variable that equals one for treatment firms (high accounting impact group) and zero for control firms (low accounting impact group). P-values based on robust standard errors are reported in parentheses under the corresponding estimated coefficients. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level, respectively.

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	$Ln(I+Pat)$ <i>t+1</i>	$Ln(I+Pat)$ <i>t+2</i>	$Ln(I+Pat)$ <i>t+3</i>	$Ln(I+Cite)$ <i>t+1</i>	$Ln(I+Cite)$ <i>t+2</i>	$Ln(I+Cite)$ <i>t+3</i>
<i>Post-123R*HighAccImpact</i> ( $\beta_1$ )	-0.226*** (0.001)	-0.286*** (0.000)	-0.403*** (0.000)	-0.279*** (0.000)	-0.246*** (0.000)	-0.189*** (0.000)
<i>Post-123R</i> ( $\beta_2$ )	-0.274*** (0.000)	-0.410*** (0.000)	-0.579*** (0.000)	-0.323*** (0.000)	-0.326*** (0.000)	-0.275*** (0.000)
<i>HighAccImpact</i>	0.411*** (0.000)	0.416*** (0.000)	0.423*** (0.000)	0.258*** (0.000)	0.212*** (0.000)	0.160*** (0.000)
$Ln(Sales)$	0.423*** (0.000)	0.378*** (0.000)	0.266*** (0.000)	0.106*** (0.000)	0.0798*** (0.000)	0.0618*** (0.000)
$Ln(PPE/EMP)$	0.118*** (0.000)	0.115*** (0.000)	0.103*** (0.000)	0.047*** (0.000)	0.032*** (0.006)	0.023** (0.025)
<i>Tobin's Q</i>	0.151*** (0.000)	0.151*** (0.000)	0.111*** (0.000)	0.067*** (0.000)	0.047*** (0.000)	0.037*** (0.000)
$Ln(I+Tenure)$	-0.049*** (0.004)	-0.045*** (0.008)	-0.040** (0.015)	-0.025** (0.023)	-0.015 (0.136)	-0.014* (0.072)
<i>Inst. Ownership</i>	-0.555*** (0.000)	-0.486*** (0.000)	-0.390*** (0.000)	-0.074 (0.182)	-0.015 (0.764)	-0.084** (0.037)
<i>HHI</i>	-5.719*** (0.000)	-6.284*** (0.000)	-4.125** (0.010)	-1.538 (0.140)	-2.120** (0.028)	-2.062*** (0.009)
<i>HHI</i> <sup>2</sup>	20.040*** (0.006)	23.070*** (0.002)	15.213** (0.040)	2.526 (0.594)	4.758 (0.274)	6.211* (0.072)
Industry Fixed Effects	YES	YES	YES	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.000	0.000	0.000	0.000
Observations	4,343	4,133	3,941	4,343	4,133	3,941
Adjusted R <sup>2</sup>	0.466	0.436	0.372	0.310	0.277	0.242

**Appendix Table IA5: Comparison of Severance Contracts Before and After FAS 123R**

This table reports a summary of the changes in CEOs' severance contracts before vs. after FAS 123R. We randomly selected 100 sample firms, and hand collected severance contract terms for CEOs from proxy statements in the year 2004 and 2006. We compare detailed severance contract terms before (2004) and after (2006) FAS 123R. "No change" refers to the firms in which there is not a single change in the severance contract terms before vs. after FAS 123R. "Start severance contract in 2006" refers to the firms that have no severance contract before FAS 123R, however start using severance contracts after FAS 123R. The categories of "Small change", "Some change" and "Substantial change" refer to the firms where various degrees of changes occur in the severance contracts post-FAS 123R.

Changes before vs. after FAS 123R	Percentage of firms
No change	66%
Small change	14%
Some change	9%
Substantial change	4%
Start severance contract in 2006	7%
Total (100 firms)	100%

**Appendix Table IA6: The Effect of FAS 123R on Innovation in a Subsample of Firms That Do Not Have P-V Equity Grants: Difference-in-Differences Tests**

This table presents the difference-in-differences tests results using subsample of firms that do not have any p-v provisions in a sample year during 2002-2008. For such firms, vega derived from option grants is an accurate measure of CEOs' risk-taking incentive. We use the Incentive Lab database to determine whether a firm has any p-v provisions in a sample year. Our final sample contains 943 firm-year observations that do not have any p-v equity grants. In Panel A, the dependent variables  $Ln(1+Pat)$  are a natural logarithm of one plus total number of patents filed (and eventually granted) in years  $t+1$ ,  $t+2$ , and  $t+3$ , and the results are reported in columns (1)–(3) respectively; the dependent variables  $Ln(1+Cite)$  are a natural logarithm of one plus total number of citations received per patent in years  $t+1$ ,  $t+2$ , and  $t+3$ , and the results are reported in columns (4)–(6) respectively. In Panel B, the dependent variables are  $RD/Assets$  in years  $t+1$ ,  $t+2$ , and  $t+3$ , reported in columns (1)–(3) respectively.  $Post-123R$  is a dummy variable that equals one for observations in the post-FAS 123R period (2006–2008), and equals zero for observations in the pre-FAS 123R period (2002–2004). P-values based on robust standard errors are reported in parentheses under the corresponding estimated coefficients. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level, respectively.

**Panel A. Innovation Output**

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
	$Ln(1+Pat)$	$Ln(1+Pat)$	$Ln(1+Pat)$	$Ln(1+Cite)$	$Ln(1+Cite)$	$Ln(1+Cite)$
	$t+1$	$t+2$	$t+3$	$t+1$	$t+2$	$t+3$
<i>Post-123R*HighAccImpact</i> ( $\beta_1$ )	-0.477** (0.041)	-0.753*** (0.005)	-1.049*** (0.000)	-0.401** (0.021)	-0.497*** (0.002)	-0.408*** (0.001)
<i>Post-123R</i> ( $\beta_2$ )	-0.0767 (0.679)	-0.166 (0.463)	-0.276 (0.266)	-0.360** (0.017)	-0.313** (0.030)	-0.286** (0.010)
<i>HighAccImpact</i>	0.407*** (0.000)	0.492*** (0.000)	0.501*** (0.000)	0.309*** (0.000)	0.256*** (0.002)	0.233*** (0.003)
$Ln(Sales)$	0.440*** (0.000)	0.405*** (0.000)	0.381*** (0.000)	0.059** (0.025)	0.028 (0.247)	0.055** (0.014)
$Ln(PPE/EMP)$	0.191*** (0.006)	0.185*** (0.008)	0.213*** (0.002)	0.131*** (0.002)	0.109*** (0.005)	0.087** (0.012)
<i>Tobin's Q</i>	0.161*** (0.000)	0.149*** (0.000)	0.115*** (0.000)	0.084*** (0.001)	0.064** (0.010)	0.035 (0.117)
$Ln(1+Tenure)$	0.057 (0.249)	0.038 (0.478)	0.036 (0.471)	-0.047 (0.148)	-0.047 (0.157)	-0.006 (0.842)
<i>Inst.Ownership</i>	-1.455*** (0.000)	-1.475*** (0.000)	-1.514*** (0.000)	-0.717*** (0.001)	-0.680*** (0.001)	-0.568*** (0.002)
<i>HHI</i>	-3.195 (0.429)	-3.310 (0.421)	-2.467 (0.573)	2.089 (0.446)	0.500 (0.852)	0.285 (0.912)
<i>HHI^2</i>	21.06 (0.233)	20.47 (0.268)	16.40 (0.417)	-9.345 (0.431)	-4.455 (0.705)	-1.725 (0.882)
Industry Fixed Effects	YES	YES	YES	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.000	0.000	0.000	0.000
Observations	943	926	900	943	926	900
Adjusted R <sup>2</sup>	0.564	0.546	0.533	0.440	0.398	0.340

**Panel B. Innovation Input**

Dependent Variables	(1) <i>RD/Assets<sub>t+1</sub></i>	(2) <i>RD/Assets<sub>t+2</sub></i>	(3) <i>RD/Assets<sub>t+3</sub></i>
<i>Post-123R*HighAccImpact</i> ( $\beta_1$ )	0.031*** (0.000)	0.027*** (0.000)	0.019** (0.011)
<i>Post-123R</i> ( $\beta_2$ )	-0.005 (0.281)	-0.002 (0.665)	-0.003 (0.574)
<i>HighAccImpact</i>	0.014*** (0.000)	0.013*** (0.000)	0.013*** (0.000)
<i>Ln(Sales)</i>	-1.100*** (0.000)	-1.100*** (0.000)	-1.100*** (0.000)
<i>Ln(PPE/EMP)</i>	0.052 (0.792)	0.113 (0.564)	0.333* (0.090)
<i>Tobin's Q</i>	0.556*** (0.000)	0.529*** (0.000)	0.604*** (0.000)
<i>Ln(1+Tenure)</i>	0.166 (0.288)	0.187 (0.230)	0.301* (0.055)
<i>Inst.Ownership</i>	-1.900* (0.067)	-2.401** (0.013)	-2.000* (0.053)
<i>HHI</i>	-0.678*** (0.000)	-0.646*** (0.000)	-0.555*** (0.000)
<i>HHI^2</i>	2.565*** (0.000)	2.336*** (0.000)	1.933*** (0.001)
Industry Fixed Effects	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.003
Observations	943	926	900
Adjusted R <sup>2</sup>	0.485	0.495	0.494

**Appendix Table IA7: CEO Risk-Taking Incentive and Innovation Search Strategy in  
Leading Two or Three Years**

This table reports how FAS 123R affects the firms' innovation search strategy in leading two or three years. The sample consists of CEOs in non-financial and non-utility firms during 2002–2008 (excluding 2005). We follow Balsmeier, Fleming, and Manso (2016) to construct the innovation search variables. In columns (1), the dependent variable is technological proximity in year t+2 and year t+3 in Panel A and B, respectively. Technological proximity measures how similar are a firm's patents filed in year t compared to its existing patent portfolio up to year t-1. In columns (2)-(4), the dependent variables are the natural logarithm of one plus the number of patents in year t+2 in Panel A and year t+3 in Panel B that fall in the top 1%, 2nd-10th%, non-top 10% but cited at least once, of the citation distribution within each patent class in a year, respectively. In columns (5), the dependent variable is the natural logarithm of one plus the number of patents in year t+2 in Panel A and year t+3 in Panel B that are not cited. *Post-123R* is a dummy variable that equals one for observations in the post-FAS 123R period (2006–2008), and equals zero for observations in the pre-FAS 123R period (2002–2004). P-values based on robust standard errors are reported in parentheses under the corresponding estimated coefficients. \*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level, respectively.

**Panel A: Innovation Search Strategy in Year t+2**

Dependent Variables	(1) <i>Technological Proximity</i> <sub>t+2</sub>	(2) Top 1% <sub>t+2</sub>	(3) Top 2%-10% <sub>t+2</sub>	(4) Non-Top 10% <sub>t+2</sub>	(5) No Citation <sub>t+2</sub>
<i>Post-123R*HighAccImpact</i> ( $\beta_1$ )	0.034** (0.014)	-0.050*** (0.001)	-0.107*** (0.001)	0.120 (0.146)	0.081* (0.096)
<i>Post-123R</i> ( $\beta_2$ )	0.024** (0.022)	-0.037*** (0.000)	-0.188*** (0.000)	-0.923*** (0.000)	0.194*** (0.000)
<i>HighAccImpact</i>	-0.036*** (0.000)	0.082*** (0.000)	0.213*** (0.000)	0.296*** (0.000)	0.195*** (0.000)
<i>Ln(Sales)</i>	-0.063*** (0.000)	0.063*** (0.000)	0.196*** (0.000)	0.557*** (0.000)	0.411*** (0.000)
<i>Ln(PPE/EMP)</i>	-0.025*** (0.000)	0.031*** (0.000)	0.0726*** (0.000)	0.119*** (0.000)	0.134*** (0.000)
<i>Tobin's Q</i>	-0.016*** (0.000)	0.022*** (0.000)	0.0728*** (0.000)	0.148*** (0.000)	0.105*** (0.000)
<i>Ln(1+Tenure)</i>	0.018*** (0.000)	-0.008** (0.028)	-0.0163** (0.036)	-0.0381* (0.082)	-0.038*** (0.002)
<i>Inst.Ownership</i>	0.058*** (0.001)	-0.155*** (0.000)	-0.416*** (0.000)	-0.835*** (0.000)	-0.645*** (0.000)
<i>HHI</i>	0.201 (0.517)	-0.936*** (0.001)	-2.376*** (0.000)	-8.481*** (0.000)	-4.052*** (0.000)
<i>HHI^2</i>	-0.718 (0.625)	3.627*** (0.002)	10.17*** (0.000)	32.44*** (0.000)	17.980*** (0.000)
Industry Fixed Effects	YES	YES	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.000	0.004	0.000
Observations	6,263	6,263	6,263	6,263	6,263
Adjusted R <sup>2</sup>	0.441	0.160	0.441	0.412	0.441

**Panel B: Innovation Search Strategy in Year t+3**

Dependent Variables	(1) <i>Technological Proximity</i> $t+3$	(2) Top 1% $t+3$	(3) <i>Top 2%-10% Not Top 10%</i> $t+3$	(4) $t+3$	(5) <i>No Citation</i> $t+3$
<i>Post-123R*HighAccImpact</i> ( $\beta_1$ )	0.024* (0.075)	-0.030* (0.057)	-0.076** (0.021)	0.094 (0.249)	0.105** (0.023)
<i>Post-123R</i> ( $\beta_2$ )	0.014 (0.184)	-0.032*** (0.002)	-0.149*** (0.000)	-0.618*** (0.000)	0.271*** (0.000)
<i>HighAccImpact</i>	-0.025** (0.016)	0.075*** (0.000)	0.208*** (0.000)	0.309*** (0.000)	0.148*** (0.000)
<i>Ln(Sales)</i>	-0.062*** (0.000)	0.073*** (0.000)	0.225*** (0.000)	0.581*** (0.000)	0.384*** (0.000)
<i>Ln(PPE/EMP)</i>	-0.022*** (0.000)	0.032*** (0.000)	0.078*** (0.000)	0.104*** (0.001)	0.120*** (0.000)
<i>Tobin's Q</i>	-0.016*** (0.000)	0.024*** (0.000)	0.078*** (0.000)	0.137*** (0.000)	0.086*** (0.000)
<i>Ln(1+Tenure)</i>	0.017*** (0.000)	-0.005 (0.138)	-0.017** (0.034)	-0.058*** (0.007)	-0.040*** (0.001)
<i>Inst. Ownership</i>	0.056*** (0.001)	-0.186*** (0.000)	-0.480*** (0.000)	-0.930*** (0.000)	-0.593*** (0.000)
<i>HHI</i>	0.130 (0.665)	-1.021*** (0.001)	-2.823*** (0.000)	-9.024*** (0.000)	-3.602*** (0.000)
<i>HHI^2</i>	-0.143 (0.920)	4.566*** (0.001)	12.440*** (0.000)	36.170*** (0.000)	15.120*** (0.001)
Industry Fixed Effects	YES	YES	YES	YES	YES
P-value of F-Test: $\beta_1 + \beta_2 = 0$	0.000	0.000	0.000	0.021	0.000
Observations	5,961	5,961	5,961	5,961	5,961
Adjusted R <sup>2</sup>	0.445	0.172	0.456	0.416	0.431