Myopic Investor or Active Monitor? The Role of Institutional Investors in Corporate Innovation

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Abstract

We examine the role of institutional investors in firms' innovation strategies. We find that although institutional shareholding is positively related to the likelihood of patenting, it is not related to firms' exploratory innovation activities. Moreover, the presence of a block institutional holder or the holding by long-term investors has strong negative effect on exploratory innovations. Our study provides new insights to the role of institutional investors in firms' innovation decisions.

Keywords: institutional investors, corporate governance, exploratory innovation, patents

1. Introduction

Innovation is the powerhouse of economic growth. The governance of innovation in public companies has garnered a lot of interest lately. As one of the important mechanisms in corporate governance, institutional investors are believed to be influential in firms' innovation strategies; the views toward their role in innovation are however, mixed. One view claims institutions as short-term return chasers which may undermine firms' innovation effort (Kim, Krinsky & Lee, 1997; Lang & McNichols, 1997). Others argue that institutions serve as active monitors and can help incentivize managers to innovate more (Aghion, Reenen & Zingales, 2013).

In this paper we study the relationship between institutional shareholding and innovation. Instead of differentiating firm innovations by the number of patents or citations, we extend the research setting to study different types of innovations. From the management literature (e.g., March, 1991; McGrath, 2001), some innovations are incremental in nature, with more predictable effect on earnings ("exploitative" innovations); other innovations are experimental and pioneering, usually spanning over a longer term, and involve greater uncertainty ("exploratory" innovations). If institutional investors provide insulation to managers against the risk of being fired due to bad outcomes from innovation, as proposed in Aghion et al (2013), there should be a higher demand for institutional holding for firms' most innovative endeavor. We therefore expect a positive relation between institutional ownership and exploratory innovations. On the other hand, if institutions only go after short-term returns, they may want to avoid projects with long-term span and greater uncertainty; we would expect a negative relation between institutional ownership and exploratory innovations.

To measure the two different types of innovations, we adopt the classification used in the management literature. Exploratory innovations involve firms' reaching out of their existing knowledge territory. Empirically, these innovations can be proxied by the adoption of new knowledge that departs from a firm's existing knowledge base, which are often constructed from the information contained in the patents data (Ahuja & Lampert, 2001; McGarth & Nerkar, 2004; Phelps, 2010; Wang, Rodan, Fruin, & Xu, 2014). We combine the patent outcomes in the 2000-2004 period with COMPUSTAT firm financials and Thomson-Reuters 13f institutional ownership data in the prior period of 1994-1998. We find that although total institutional shareholding is positively related to the likelihood of patenting, there is no significant relationship between total institutional holding and exploratory activities. We also examine institutional investors with significant ownership in particular, since they are believed to be more effective monitors. We find that the presence of a block institutional holder is significantly positively associated with firms' tendency to patent; however, it also has a strong negative correlation with firm's exploratory innovation. Moreover,

different types of institutions have different effects on innovation, and some of our findings are consistent with previous studies. For instance, total institutional holding by pension funds and endowments tend to encourage both general and exploratory innovation. To our surprise, dedicated institutional holding discourages explorative activities, which is on the contrary to the conventional belief that long-termism works well with projects with longer horizons. Our study therefore provides new insights to the role of institutional investors in firms' innovation decisions.

The paper is organized as follows. Section 2 reviews the relevant studies and develops the hypothesis. Section 3 describes the sample and key measures. The main empirical results are presented in Section 4, and Section 5 concludes.

2. Literature Review

2.1 The Role of Institutional Investors in Innovation

There are different views about the role of institutional investors in firm innovation. In the first view, institutions are myopic and tend to wield pressure on management to secure high short-term profits at the expense of long-term projects such as value-enhancing innovations. For instance, Froot, Scharfstein and Stein (1992), Porter (1992), and Bushee (1998) indicate that institutional investors prefer firms with high current earnings to those with high R&D expenditure. As a result their presence may undermine innovation efforts. Similarly, Munari, Oriani and Sobrero (2010) and Graves (1988) both find negative relation between institutional ownership and R&D intensity.

The second view depicts institutions as more active -- they help resolve the managerial agency problem and therefore increase managers' incentive to innovate. The mechanisms for institutional investors' monitoring could vary. The quiet-life hypothesis argues that managers tend to shirk (Hart, 1983; Bertrand and Mullainathan, 2003), and institutional investors come in to force managers to innovate. The career-concern hypothesis posits that institutions assume a disciplining and reassuring role, by insulating mangers from the risk of being fired due to bad outcomes if innovation projects fail. Aghion et al (2013) finds supportive evidence for the career concern hypothesis, by documenting a positive relation between innovation and institutional ownership, and the relationship becoming stronger when product market competition is more intense.

Certain types of institutional investors may be more supportive of innovations. Long-term oriented institutional investors are often considered as more aligned with the time frame of innovation; on the opposite side, short-termism creates short-term pressure on management to meet short-term goals. A counter argument from a recent article in Economist questions the effectiveness of long-termism in supporting highly innovative industries; they propose that long-termism works better for incremental innovations. Bushee (1998) classifies institutional investors into "transient" and "dedicated" ones. He finds that "transient" investors tend to pressure managers to sacrifice long-term investment in order to meet short-term earning goals. Gao, Hsu, and Li (2014) finds that short-term investors discourage exploratory innovations. The finding by Aghion et al (2013) is mixed: the effects of dedicated and transient institutions are both positive on innovations.

Kochhar and Parthiban (1996) argue that institutions such as public pension, mutual funds, endowments, and foundations are more independent from the firms they invest in and are labeled as "pressure-resistant institutions"; on the other hand, insurance, banks, and nonbank trusts usually have a business relation with their investee and are "pressure-sensitive. The authors further find that pressure-resistant institutions are associated with greater innovation in terms of number of new products introduced, suggesting that these institutions acting as efficient governance devices.

The outcomes of innovation projects are highly uncertain -- research suggests that 40 to 90 percent of new product developments eventually fail (Note 1). Since innovation is a risky activity, monitoring costs should not be overlooked. Prior research suggests that high level of expenditure on research and development greater information asymmetry between insiders and outsiders, as R&D expenditure's idiosyncratic nature makes such firms difficult to understand and monitor (Aboody & Lev, 2000). As a result, highly innovative firms attract less institutional investment, because of their high level of information asymmetry (Porter, 1992).

2.2 Exploratory vs. Exploitative Innovations

The management literature theorizes the distinction between exploratory and exploitative innovation types. According to March (1991), exploitation is the refinement, enhancement and extension of existing technologies, whereas exploration is the experimentation with new alternatives, discovering and adoption of novel ideas that depart from its existing technology base. Exploitative learning entails less uncertainty, while exploration is considered as more long-term oriented and highly uncertain (McGrath, 2001). In March's words (March, 1991, p. 73): "Compared to returns from exploitation, returns from exploration are systematically less certain, more remote in time and organizationally more distant from the locus of action and adaptation .... The certainty, speed, proximity, and clarity

of feedback ties exploitation to its consequences more quickly and more precisely than is the case with exploration." Knowledge generated by exploration activities is often distant from the existing knowledge base of the firm (Katila & Ahuja, 2002), while exploitative learning builds closely on the existing knowledge base (McGrath, 2001).

2.3 Hypotheses

What are the predictions regarding the role of institutional investors in firms' explorative innovation activities according to the existing literature? Under the myopic investor view, institutional investors are more likely to avoid or discourage firms engaged in such innovations. Under the active monitor view, managers will need more insulation against the risk of failure as the innovation activities involve more uncertainty. Therefore we will expect a positive association between institutional shareholding and explorative innovations under the monitoring hypothesis and a negative relation under the myopic hypothesis:

Hypothesis 1a (monitoring of risky innovations): there is a positive association between institutional shareholding and explorative innovations;

Hypothesis 1b (myopic investor): there is a negative association between institutional shareholding and explorative innovations.

Monitoring risky projects is costly. However, institutional investors with significant shareholding in the firms should have more incentives to monitor and are also more likely to enjoy economies of scale in monitoring. If the monitoring hypothesis holds, we expect to observe more innovations with block institutional holder around.

Hypothesis 2 (costly monitoring): institutional block-holding is positively related to explorative innovations.

Existing studies suggest that institutions with longer time span tend to nurture innovation. The counter-argument is that long-termism works well only with incremental innovations but not effectively with other types of innovations. We therefore test:

Hypothesis 3 (dedicated investor): shareholding by dedicated institutional investors is positively related to exploratory innovations.

3. Sample and Variables

3.1 Measuring Exploratory Innovative Activities

Exploration is the experimentation with new alternatives, discovering and adoption of novel idea that departs from its existing technology base. Manifestation of the exploration process can be observed in the content of a firm's innovation outcome, whether innovation embodies knowledge that is novel relative to firm's extant knowledge. A few empirical studies (Ahuja & Lampert, 2001; Phelps, 2010; and Wang *et al*., 2014) examine the filing of patents and identify new technology domain added to patents. Such addition of new knowledge outside the firms' current knowledge set is interpreted as exploration.

In this study, we utilize a patent technology domain classification developed by Hall, Jaffe and Trajtenberg (2001) (hereby HJT), which aggregates over 400 main technology classes assigned by USPTO to patents into 36 two-digit technological categories. We use the HJT technology classification contained in firms' patents to construct a firm's stock of knowledge. Exploratory innovation is defined as the addition of new technology class adopted in firm's patents applied during the 2000-2004 period compared to its existing knowledge stock accumulated over the years between 1976, when NBER data became available, and 1999. We further label firms that applied patents with new technology classes during the period 2000-2004 as *exploratory* innovators, and firms that applied patents with existing technology classes as *exploitative* innovators. Firms with no new patents filed are defined as non-innovators.

3.2 Data and Sample

We relate firm characteristics and institutional ownership during the years of 1994-1998 to innovative activities in the latter period of 2000-2004. To facilitate our analysis, we utilize the matching files provided by the NBER PDP project. Through an elaborate matching process, the NBER PCP project links USPTO patents since 1976 to COMPUSTAT firms based on assignee names. The matching procedure produces a large number of assignee-organization matches (Note 2). In most cases the initial assignees are also the initial owners of patents; in the event of ownership changes through mergers/acquisitions, it is assumed that the patents go to the new owner. The project uses merger/acquisition information reported in the SDC database to track these dynamic changes in ownership changes. This enables us to link to COMPUSTAT firms even with ownership changes. For large organizations with multiple subsidiaries that individually apply for patents, we aggregate patent information based on GVKEY which identifies securities in COMPUSTAT.

Institutional ownership data is obtained from Thomson-Reuters Institutional Holding (13F) database, downloaded through WRDS (Note 3). Under the Securities Exchange Act of 1934 (Rule 13f), institutional investment managers who exercise investment discretion over accounts with publicly traded securities and who hold equity portfolios exceeding $100 million are required to file Form 13f within 45 days after the last day of each quarter. Investment managers must report all holdings in excess of 10,000 shares and/or with a market value over $200,000. We aggregate institutional holding within the same firm to construct variables on total institutional holding, block holding, and institutional ownership concentration. Quarterly institutional holding variables are then averaged for each firm-year combination.

Institutions are categorized by Thomson Financial into five types: banks, insurance companies, investment companies (mostly mutual funds), independent investment advisors, and others. The last category includes public and private pension funds, and endowments. We also use the classification developed by Bushee (1998) based on institutions' investment horizons: "transient" (for short-term investors), "dedicated" (for long-term investors) and quasi-indexers.

Firm financials and characteristics are from CompuStat. After merging patent data with CompuStat and Thomson Financials, and excluding utilities and financial services companies, the sample contains 6,737 public firms for the years of 1996-1999. We further exclude missing observations on key variables and left with 3,292 firms in the sample. Among these firms, 588 are exploratory (patented with new technology classes), 507 are exploitative, and the rest 2,197 firms did not apply for any patents within the 2000-2004 time window.

Table 1. Summary statistics

	Innovators (2000-2004)			**Non-innovator**
Prior period (1994-1998)	**Explore**	**Exploit**	**Difference (p-value)**	**(2000-2004)**
Number of firms	588	507		2197
Number of patents filed 2000-2004	261	54	0.000	0
Assets (million $)	4,122	1,339	0.000	602
R&D expenses/sales (%)	124	351	0.025	92.2
EBIT/asset (%)	5.14	-6.61	0.000	-8.33
Industry Herfindahl	0.066	0.068	0.710	0.099
Total institutional holding (%)	37.63	30.31	0.000	24.47
Dedicated holding	9.61	9.59	0.964	9.23
Transient holding	10.54	8.71	0.000	7.97
Holding by banks	5.28	3.92	0.000	3.13
Holding by insurance	2.62	2.19	0.018	2.06
Holding by investment companies	8.32	7.25	0.020	7.15
Holding by independent advisors	13.23	12.06	0.045	11.17
Holding by other	12.07	9.52	0.000	7.62
Indicator for block holder	0.79	0.80	0.643	0.71
Institutional holding concentration (Herfindahl)	0.015	0.014	0.498	0.014

Notes: Firms are classified based on the patenting outcomes observed during the years of 2000-2004. Firm characteristics and institutional holding are averaged for the prior period 1994-1998.

The differences between exploratory and exploitative firms are presented in Table 1. Firms that engage in exploratory innovations on average patent more than exploitive firms – with 261 new patents applied compared to 54 patents for the latter group. This implies that exploratory firms usually have a portfolio of innovations instead of simply focusing on exploratory activities. Larger firms are also more likely to explore – firms with exploratory innovation have an average of $4.1 billion in assets, while firms with exploitative innovations have only $1.3 billion in assets. This seems in contrary to the common belief that more pioneering innovations are concentrated in smaller firms (Note 4), which might apply to start-up firms, however it is not the case with publicly listed firms. Although R&D intensity (measured by R&D expenditure relative to sales) is important to patenting –R&D/sales ratio is much lower for firms that did not file for patents during the observation window - however, R&D intensity relates poorly to exploratory innovation. Firms with exploratory innovations have significantly lower R&D/sales ratio (124%) compared to firms with exploitative innovations (at 351%). We also observe that exploratory firms were more profitable in the prior period (1994-1998), with a 5.1% EBIT/Asset ratio compared to -6.6% for exploitative firms.

There are significant differences in institutional holding between the two types of firms. Total ownership by institutional investors is 34.5% among exploratory firms compared to 28.7% among exploitative firms. When we

break down total holding by the type of institutions, there is significantly higher holding in exploratory firms, by transient institutions or by endowments and universities. We do not find significant difference in institutional ownership concentration between the two groups of firms.

We draw from the innovation literature to identify the control variables that also influence firm's innovation strategies, including firm size (log of sales), R&D intensity (R&D expenditure to sales), firm profitability (EBIT to total assets), assets intangibility (intangibles to total assets), equity finance ratio (book value of equity relative to the book value of assets), and industry competitiveness (Herfindahl index calculated based on the 2-digit SIC industry sales).

4. Main Results

4.1 Institutional Ownership and Innovation

We first study the relationship between total institutional holding and innovation. Column 1 in Table 2 provides the logit regression estimates, with the dependent variable (variable "Innovator") being an indicator variable whether the firm filed any new patent in the later period during 2000-2004. The main explanatory variable "total holding" is the total percentage holding by all institutional investors. Both total institutional holding and firm characteristics are averaged for 1994-1998. The estimated coefficient for total holding indicates that an increase in total holding by 10 percent points will increase the odds of innovation by about 11.6% (statistically significant at 1% level). This result is consistent with the finding in Agion et al (2013) that institutional ownership is positively associated with innovation.

Table 2. Institutional ownership and innovation

		Explorative activities	
Dependent variable	**"innovator" indicator (1)**	**"explore" indicator (2)**	**number of new classes (3)**
Total holding	0.011***	-0.002	-0.001
	(0.002)	(0.003)	(0.002)
Firm size	0.251***	0.256***	0.543***
	(0.025)	(0.041)	(0.030)
RD intensity	0.024***	0.008*	0.022***
	(0.005)	(0.004)	(0.006)
Profitability	-0.657***	0.289	-0.714***
	(0.146)	(0.321)	(0.245)
Intangibility	-0.908***	-0.219	-1.311***
	(0.336)	(0.590)	(0.444)
% equity financed	0.652***	0.614**	1.118***
	(0.136)	(0.269)	(0.226)
Industry Herfindahl	-12.605***	-2.477**	-7.099***
	(1.097)	(1.181)	(0.809)
Observations	3,292	1,095	3,292
Pseudo R2	0.108	0.072	0.100

Notes: Standard errors are in parentheses; ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Columns 2-3 test alternative roles of institutional investors in risky innovations- whether they serve as active monitors or as myopic investors (as in *Hypothesis 1*). Under the monitoring hypothesis, in which institutional investors insulate risk and therefore encourage managers to take on risky projects, a positive association between institutional holding and innovation is expected; in the context of exploratory innovations which involves more uncertainty, the role of monitoring and risk insulation would be even more important. We therefore expect a positive association between institutional shareholding and exploratory innovations. Under the myopic hypothesis, institutions are focused on short-term gain and are not aligned with the features of exploratory innovations; a negative association between institutional holding and exploratory innovation is expected. In Column 2, the measure for exploratory innovation is an indicator if firms adopt new technology classes in the patents filed (variable "Explore"). This indicator is regressed on institutional holding and firm characteristics, for those firms which filed

new patents in the later period (i.e., "innovators"). The logit regression coefficient for total institutional holding is slightly negative and not statistically significant. Column 3 presents the negative binomial regression estimates, using the number of new technology classes adopted in the patents applied between 2000 and 2004 by the firm as the dependent variable. The sample includes firms that patented and those that did not file any new patent in the period. We use negative binomial regression since the number of new knowledge classes is highly skewed. The estimated coefficient for institutional holding is very similar to the estimate from the logit regression. These results are very different from the previous finding of relationships between institutional holding and innovation measured by number of patents or citations.

Among the other firm characteristics, larger firms, firms with greater R&D spending ratio and lower intangible assets ratio are more likely to innovate. Firms that are more equity financed tend to innovate, which is consistent with findings from previous studies that debt financing deters innovation (Atanassov, Nanda, & Seru, 2009). A competitive environment also encourages innovation, as shown by the negative and statistically significant coefficient for the industry Herfindahl index. Firms with higher profitability ratios are less likely to innovate.

4.2 Institutional Ownership Concentration and Innovation

Institutional investors with significant shareholding are believed to be more effective monitors due to costly monitoring and free-rider problems. We test *Hypothesis 2* in Table 3. The logit and negative binomial regressions in Table 3 are similar to those in Table 2, except that total institutional holding is replaced by an indicator variable for the presence of a block institutional investor with at least 5% holding in the firm. The estimated coefficient for block holder indicator implies that the presence of a block institutional holder significantly improves the odds of innovation by 33% (= $e^{0.289}$); however, the presence of a block institutional holder reduces the likelihood to explore (significant at a 1% level) as in Column 2. Column 3 presents the negative binomial regression estimates, the dependent variable being the number of new technology classes adopted in the patents filed during 2000-2004. Likewise, block investor is negatively related to the number of new knowledge classes acquired (significant at 10% level). The results are similar if we use the Herfindahl index of institutional ownership as an alternative measure for ownership concentration in these regressions (un-tabulated).

Table 3. Block institutional ownership and innovation

		Explorative activities	
	"innovator" indicator	**"explore" indicator**	**number of new classes**
Dependent variable	**(1)**	**(2)**	**(3)**
Block investor	0.289***	-0.435***	-0.238*
	(0.096)	(0.170)	(0.124)
Firm size	0.301***	0.254***	0.538***
	(0.023)	(0.038)	(0.029)
RD intensity	0.027***	0.007*	0.022***
	(0.005)	(0.004)	(0.006)
Profitability	-0.701***	0.378	-0.640***
	(0.148)	(0.326)	(0.248)
Intangibility	-0.758**	-0.234	-1.273***
	(0.332)	(0.589)	(0.439)
% equity financed	0.732***	0.661**	1.143***
	(0.140)	(0.270)	(0.224)
Industry Herfindahl	-12.733***	-2.425**	-7.240***
	(1.098)	(1.188)	(0.812)
Observations	3,292	1,095	3,292
Pseudo R2	0.103	0.076	0.100

Notes: Standard errors are in parentheses; ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 2 and Table 3 together suggest that institutional investors in general support innovation activities by increasing firms' likelihood to innovate; however, they do not support innovation activities that are exploratory in nature. This is especially true when there is block investor around.

4.3 Different Types of Institutional Investors

Here we test the common perception that institutions with longer time span tend to nurture innovation. There is abundant evidence that short-term focused institutional investors are more likely to exert pressure on management and tend to discourage innovation (Bushee, 1998; Gao et al., 2014). Kochhar and Parthiban (1996) also find that institutions less resistant with "pressure" tend to discourage innovation.

Table 4. Innovation and total institutional ownership by type of institutions

Dependent variable	**"innovator" indicator**		**"explore" indicator**		**Number of new classes**	
	(1)	(2)	(3)	(4)	(5)	(6)
Holding-banks	0.060***		0.003		0.012	
	(0.013)		(0.017)		(0.013)	
Holding-insurance	-0.005		0.003		-0.009	
	(0.017)		(0.030)		(0.019)	
Holding-investment	-0.012		-0.007		-0.012	
	(0.008)		(0.013)		(0.010)	
Holding-independent	-0.012**		-0.014		-0.022***	
	(0.006)		(0.010)		(0.007)	
Holding-other	0.036***		0.021**		0.032***	
	(0.006)		(0.009)		(0.007)	
Holding-dedicated		-0.011**		-0.024***		-0.031***
		(0.005)		(0.009)		(0.007)
Holding-transient		0.017***		0.016*		0.023***
		(0.005)		(0.009)		(0.007)
Firm size	0.262***	0.301***	0.254***	0.243***	0.500***	0.513***
	(0.033)	(0.026)	(0.051)	(0.042)	(0.035)	(0.030)
RD intensity	0.023***	0.030***	0.007	0.008	0.012*	0.020**
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.008)
Profitability	-0.593**	-0.575***	1.292***	0.697*	0.112	-0.375
	(0.236)	(0.182)	(0.482)	(0.380)	(0.366)	(0.284)
Intangibility	-1.195***	-1.051***	-0.423	-0.329	-1.392***	-1.342***
	(0.391)	(0.354)	(0.656)	(0.612)	(0.467)	(0.442)
% equity financed	0.748***	0.572***	1.019***	0.599**	1.177***	0.951***
	(0.203)	(0.157)	(0.343)	(0.290)	(0.270)	(0.239)
Industry Herfindahl	-11.888***	-13.379***	-1.864	-2.496**	-7.769***	-9.175***
	(1.244)	(1.186)	(1.280)	(1.255)	(1.013)	(1.075)
Observations	2,308	2,814	910	1,012	2,308	2,814
Pseudo R2	0.112	0.099	0.089	0.076	0.094	0.098

Notes: Standard errors are in parentheses; ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

In Table 4, we examine the effect on innovation from ownership by institution types. We aggregate institutional holding by types of institutions (banks, insurance companies, investment companies, independent advisors, and others), and by investment horizon (dedicated or transient). The logic regression estimates in Column 1-2 suggest that banks and "other" institutions are significantly positively related to the likelihood of innovation, while independent advisors display a negative relation; holding by dedicated institutions is negatively related to innovation, while "transient" holding is positively related to innovation.

Column 3-4 in Table 4 present the logit regression estimates of firms' likelihood to be engaged in exploratory innovation. The coefficient for "other" institutional holding is positive and statistically significant (at 5% level), and the coefficient for dedicated holding is still negative and statistically significant at 1% level. The negative binomial regression estimates in Column 5-6 indicate similar relationships.

Table 5. Innovation and block institutional ownership by type of institutions

Dependent variable	**"innovator" indicator**		**"explore" indicator**		**Number of new classes**	
	(1)	(2)	(3)	(4)	(5)	(6)
Block-banks	-0.099		0.016		-0.050	
	(0.106)		(0.166)		(0.129)	
Block -insurance	0.045		-0.118		-0.130	
	(0.117)		(0.180)		(0.142)	
Block -investment	-0.042		-0.166		-0.207*	
	(0.096)		(0.156)		(0.121)	
Block -independent	-0.122		-0.200		-0.361***	
	(0.094)		(0.153)		(0.122)	
Block -other	0.780***		0.044		0.576***	
	(0.093)		(0.163)		(0.121)	
Block -dedicated		0.191**		-0.254*		-0.237**
		(0.091)		(0.153)		(0.115)
Block -transient		0.193**		0.024		0.089
		(0.087)		(0.142)		(0.111)
Firm size	0.288***	0.297***	0.256***	0.253***	0.538***	0.543***
	(0.024)	(0.023)	(0.039)	(0.038)	(0.029)	(0.029)
RD intensity	0.026***	0.026***	0.008*	0.008*	0.022***	0.022***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.006)	(0.006)
Profitability	-0.715***	-0.717***	0.361	0.365	-0.674***	-0.658***
	(0.149)	(0.148)	(0.326)	(0.326)	(0.247)	(0.248)
Intangibility	-0.878***	-0.759**	-0.217	-0.239	-1.306***	-1.267***
	(0.335)	(0.332)	(0.590)	(0.588)	(0.436)	(0.439)
% equity financed	0.669***	0.715***	0.654**	0.614**	1.137***	1.122***
	(0.137)	(0.139)	(0.270)	(0.268)	(0.224)	(0.224)
Industry Herfindahl	-12.274***	-12.715***	-2.457**	-2.459**	-6.709***	-7.186***
	(1.100)	(1.099)	(1.189)	(1.188)	(0.804)	(0.809)
Observations	3,292	3,292	1,095	1,095	3,292	3,292
Pseudo R2	0.120	0.104	0.075	0.074	0.105	0.100

Notes: Standard errors are in parentheses; ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 5 shows the estimated relationship between block holder type and innovation. Block holding by type of institutions is a dummy variable if there is an investor of a particular type with at least 5% ownership. We find that the effect of a block holder of "other" type is both economically and statistically significant: it increases the odds of filing for new patent by 118%, and the expected number of new technology classes acquired by 57%. A dedicated block holder increases the likelihood of firms' patenting, but lowers the tendency and extent to explore.

The results in this section suggest that, different from common perception, dedicated holding does not necessarily support firms' experimenting and learning. We continue to find supportive role of "other" institutions, which are mostly endowments and pension funds.

5. Discussion and Conclusions

In this paper, we examine the role of institutional investors in public firms' innovation decisions. Previous research suggests institutions are either myopic investors or active monitors. By looking into the different types of innovations- exploratory versus exploitative innovations, we get some new insights about institutional investors.

We find that total institutional holding or block institutional holding is positively related to firm's patenting activities in a later period. This supports the view of institutions being active monitoring. However, this supportive role of institutions in innovation is not found for firms' exploratory innovation activities: we do not observe any empirical association between total institutional shareholding and exploration, and a block holder even significantly reduces the possibility and extent of exploratory innovation. This suggests that while institutions may support general innovation by actively monitoring and insulating managers from the risk of failure, they do not encourage explorative activities which carry greater risk. If risky innovations are deterred by high monitoring costs, having a block holder does not seem to help either; on the contrary it significantly discourages such type of innovation. One possible explanation is that managers of institutional investors are subject to career concern as well. There is evidence that some fund managers put loss aversion as the top priority, and do so by successfully managing the downside risk (Bodnaruk & Simonov, 2014). Examined over 2,800 American mutual funds, Porter and Trifts (2014) find the key to a long career in fund management is to avoid underperformance, instead of achieving superior performance. As a result, they will avoid firms that are too risky which can increase their downside risk. Exploratory innovation is one potential source of greater uncertainty.

We also find that different types of institutions have different associations with innovation: total holding and block holding by endowment and pension funds enhance innovation in general and the exploratory type. With dedicated institutional investors, their total shareholding is negatively related to the number of patents, but a dedicated block holder is positively related to the number of patents. The common argument is that long-termism is good for value-enhancing long-term projects, such as research and development efforts since the term is more aligned. Long-term investors also have the edge to better observe and understand the operations. Short-termism of shareholders tends to put a pressure on management to succumb to short-term goals. However, this argument does not apply to exploratory innovations. As a recent article in Economist claims, "long-termism works well in stable industry to foster incremental innovations, but not well in fast-growing industries". Our empirical finding is supporting this view, that even long-termism may not necessary work for certain innovations.

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Notes

Note 1. http://dupress.com/articles/behavioral-finance-insights-innovation

Note 2. The analysis in this paper may be affected by matching errors and omissions. According to Hall, Jaffe and Trajtenberg (2001), the matching represents 50-65% of US originated patents. Also, not all inventions are patented.

Note 3. Wharton Research Data Services (WRDS) is used in preparing this study. This service and the data available thereon constitute valuable intellectual property and trade secrets of WRDS and/or its third-party suppliers

Note 4. "Small entrepreneurial firms are the source of most radical innovations. Large companies have a tough time getting it done" (Schumpeter, 1934).