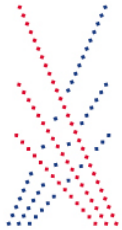

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Differences in Institutional Ownership Structure across Countries: How Institutional Environment Influences the Impact of Institutional Investors on Innovation

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Summary

The impact of different institutional investor types and two institutional environment dimensions on innovation investment and performance were studied. Professional investment fund ownership was positively related to investment in innovation while negatively related to innovation performance. Pension fund equity exhibited no direct relationship with both innovation investment and innovation performance. Executive ownership was positively related to the innovation investment but unrelated to innovation performance. Results further suggest that the impact of professional investment fund ownership on innovation investment and innovation performance is contingent upon the degree of minority investor protection and the strength of the rule of law.

Introduction

The presence of institutional investors on the financial arena has been growing considerably in the past decades and nowadays more than 50 % of the US corporate equity belongs to institutional investors, such as professional investment funds, pension funds, mutual funds, investment bankers, insurance companies. Because these investors actively engage in trading firms' shares on the financial markets as well as in predicting the trends in the stock market and most financial sectors, they are a very powerful and influential stakeholder.

Extant research has found institutional investors to be an impactful determinant for firms' strategies and strategic decision making, innovation and productivity growth, international diversification and for global US competitiveness (Hill and Hansen, 1989, Graves, 1988, Mitroff, 1987, Hill et al., 1988b, Tihanyi et al., 2003, Kochhar and David, 1996). While scholars agree on the importance of institutional investors, they vary in their understanding exactly how institutional ownership impacts managerial decision making. Prior research dating back 30 years and more has found that "the short-termism" of institutional investors and their "chasing the return" mindset may be detrimental to innovation and as a consequence, to the global competitiveness of US firms. The literature also implies that as institutional investors own considerable chunk of corporate equity they cannot easily dispose of, they may be motivated to use it to actively monitor the managers of these corporations and entice them to pursue long-term opportunities, including innovation.

The ongoing debate about the impact of institutional investors on firm strategies has triggered further exploration into their role and importance as a corporate governance mechanism. Scholars have argued that institutional investors are more complex than just a corporate governance mechanism as they are not homogenous and that their effect on firm strategies varies, depending on their time horizons and incentives (Tihanyi et al., 2003, Bushee, 1998a, Hoskisson et al., 2002, Brickley et al., 1988). Yet, the question, "How much, and under what conditions institutional investors encourage or impede innovation", still remains.

One way to reconcile the opposing perspectives on the impact of institutional investors on innovation, is to examine the effect of contingencies in the external environment that may be able to explain the conflicting findings. Alternatively, the variance in the impact of institutional ownership on innovation may be due to the complexity of the innovation construct. In this study, we contribute to the work on institutional investors by introducing two contingencies in the environment that moderate the relationship between institutional investors and innovation investment and performance. We test the proposed model in a sample of 705 firms from 18 countries for a 12 year period of time.

We extend prior research on the role of institutional investors from an institutional perspective by examining the relationships among different types of investors, the strength of minority investor protection and the rule of law, as aspects of the institutional context and specific innovation dimensions. We did this in response to calls in existing research for more fine-grained analysis of the institutional environment. Furthermore, by incorporating two separate measures of innovation, innovation investment and innovation performance, we try to

overcome the limitations of using a single, non-dynamic measure, reflecting the innovative activity of the firm.

THEORETICAL MODEL DEVELOPMENT

In this study we follow the assumption that different institutional investors, such as professional investment funds and pension funds, which represent the two most active categories of investors, may have differential impact on both innovation investment and performance. A large volume of previous research has looked at institutional investors as a homogenous group when studying the effect of institutional ownership on innovation. They have based their theoretical models on the premise that all institutional investors have the same interests, expectations and behavior towards the firms they are vested in (Aghion et al., 2013, Hill and Hansen, 1989, Hill and Snell, 1989, Lee, 2005, Choi et al., 2011, Wright et al., 1996). Few studies, however, have been active in exploring the possible differences in time horizons, investment preferences and motivation of different institutional investors (Hoskisson et al., 2002, Johnson and Greening, 1999, Kochhar and David, 1996). Figure 1 summarizes our proposed theoretical model with the hypothesized relationships between institutional investor types, innovation investment and performance and the contingency variables of the institutional context: rule of law and minority investor protection.

Insert Figure 1 about here

Innovation Investment and Innovation Performance

The idea that innovation is an important source of economic growth dates back to the introduction of the Schumpeterian theory of economic development. In today's global world innovation can help firms build an immediate competitive advantage. According to Schumpeter, large, monopolistic firms are the most likely driving forces behind innovation, because they have the resources and the motivation. Empirical tests however, have failed to produce conclusive evidence for these arguments partly because of the complexity of the innovation phenomenon.

Research grounded in the "process" view of innovation acknowledges that it is not a one-time project but a long-term organizational commitment that evolves over time while passing through certain stages: input, process and output. In the light of the "evolution" perspective, extant research distinguishes between innovative inputs or efforts and innovative outputs, or performance (Fisher and Temin, 1973, Ahuja et al., 2008). The two concepts are quite distinct as they are subjected to different considerations. Innovative effort, the summative investment in R&D, depends on a pre-planned framework of financial indicators and metrics, aligned with the strategic planning of the organization. Here, the level of managerial input and discretion is quite significant. Innovative output, the output of innovation, on the other hand, has to do with research productivity and performance of the organization. These two concepts are reflective of different underlying research questions, thus there is a clear need to distinguish them from one another (Henderson, 1993).

In this paper we follow the sentiments of prior research and argue that using one-dimensional construct for innovation is a flawed approach as it seems there are at least two distinct concepts: (1) innovation investment and (2) an innovation performance. The innovation investment captures the innovative effort or the innovation input of an organization as it strives to develop a research effort portfolio. The innovation performance has to do with the outcome of innovation and applied research that has been delivered as a result of the innovation investment, applied by the organization. Each of the distinct dimensions within the concept of innovation is important and relevant and should not be ignored or assumed away.

Ownership Structure and Types of Institutional Investors

The pursuit of innovation in organizations and how much to invest in it is a strategic decision that is left to the discretion of managers and owners, and as such, is dependent on the ownership structure of the organization (Baysinger et al., 1991, Lee, 2005). Prior research has explored the impact of ownership structure on innovation efforts and output with a number of mixed finding.

Alongside Porter, a plethora of scholars have linked decline in competitiveness of nations to the level of institutional ownership and its impact on innovation (Graves, 1988, Porter, 2011, Mitroff, 1987). These researchers follow the "myopic investor" hypothesis, which argues that when greater proportion of ownership is concentrated in the hands of institutional investors vs. is dispersed among individual investors, then those institutional owners have more power and are more likely to exercise it and closely monitor the decision making process. As those investors are short-term oriented and are looking for fast gains, it is highly likely that the managers of the firms would have very little incentive to invest in projects that have a pay – off way in the future, such as innovation, as they are pressured by the owners to also show short-term or "fast" gains.

Furthermore, scholars have also suggested that the greater institutional ownership means greater monitoring and control on the managers, which restricts managerial discretion over the process of decision making. The outcome is that when managers are subject to such a scrutiny, they will be less willing to take on more risky projects such as innovation thus further impacting the innovative activity of the firm.

Lastly, scholars whose research is grounded in the information asymmetry arguments, believe that institutional investors would negatively affect the pursuit of innovation because of the complexity and the uncertainty of innovation. According to Bushee (1998), institutional investors cannot properly predict long term firm performance or the value of a long term innovation project due to the higher uncertainty in the generation of income streams. As a result, institutional investors are more likely to focus and invest in more easily predicted and understood performance measures and projects.

An alternative research stream, rooted in the "superior investor hypothesis", posits that institutional ownership have beneficial impact on the innovative activity of the firm because institutional investors tend to evaluate their options more carefully than individual investors (Kochhar and David, 1996, Hill et al., 1988b). That is, institutional investors tend to make better

investment decisions and thus are likely to invest in firms that pursue innovation and other long-term growth opportunities.

Similarly, scholars have examined other institutional investor benefits, such as being proactive and voicing their concerns. Scholars have proposed that larger institutional investors have more power but also are vulnerable as they own large chunks of stocks and have more to lose so that drives them to be "active" and diligent in their monitoring functions. As a result they pressure executives into the pursuit of more innovative projects, despite managers' preferences simple, short term "no-risk" projects.

Overall, prior research has offered competing hypotheses and have found support for opposite relationships between institutional ownership and innovation. We argue that the mixed findings can be explained with the different investment preferences of institutional owners as well as their different goals in the pursuit of innovation. We posit that for certain types of institutional ownership there would be a greater likelihood for positive impact on the investment in innovation but not on the innovation performance. Similarly we believe that certain types of institutional investors are more likely to encourage both investment in innovation as well as the research productivity of the firm. Lastly, we anticipate that some of the inconsistent findings in prior research may be due to the complexity of the environment in which strategic decisions about innovation or other long-term opportunity projects are made. We argue that these conflicting predictions can be reconciled through the introduction of a moderating variable.

The Importance of Institutions

Recent data ranks organizations from the US, India, China, Indonesia, France, South Korea, Thailand and Chile, among the 20 most innovative companies in the world (Forbes, 2018). About 40 % of these firms are operating in an environment outside of the so called network of "developed" countries. We echo prior research beliefs that Innovation is a complex phenomenon and posit that its relationship with the ownership structure of the organization may be context dependent as innovation is embedded within the institutional environment.

Organizations do not operate in vacuum, instead their choices are shaped by the formal and informal institutions in their environment (Khanna and Palepu, 1997). Institutions are one type of environmental constraint, devised by humans, that influences the interactions among actors (North, 1990). They include social norms and rules that are not specifically coded in any legislation, as well as codified rules and regulations, both reducing uncertainty and transaction costs (Goltz et al., 2015). Institutions can inhibit and encourage innovation. Despite the great volume of studies examining innovation and its determinants, much of the literature explores innovation in the context of advanced economies. Recent research investigates innovation as it is embedded in the context of developing countries. In this paper we build on the two separate but related research streams and attempt to examine innovation in its natural context, where organizations from both developing and developed countries co-exist and pursue innovation.

While prior research conceptualizes the institutional environment impact on the economic activity in general, as either positive or negative, empirical evidence, from studies examining the impact of IP protection, suggests that certain dimensions of the institutional environment might

exhibit variability in the magnitude and the direction of their influence. In a recent paper exploring the impact of IP protection on Innovation, Kanwar and Evenson (2003) find that a regime of stronger intellectual property protection is a driver of innovative activity (Kanwar and Evenson, 2003), because stronger IP protection increases the appropriability of Innovation (Allred and Park, 2007). Yet, the intellectual property protection may harm knowledge collaboration and technology exchanges and thus indirectly may inhibit innovation, due to the increased transaction costs and the bureaucratic regulations in accessing the protected technologies (Allred and Park, 2007). We argue that the institutional environment might have more complex impact on the country's economy that previously understood.

Our focus is first and foremost on how formal institutions impact the investment in innovation as well as its productivity, because the effects of country-level formal institutions on the innovative activity of the firm has been under-explored. At the same time, there are good reasons to believe that formal institutions are fundamental for the R&D investment and research productivity of the firm as the main purpose of institutions is considered to be the reduction of uncertainty(North, 1990). Strong formal institutions and law enforcement, that mitigate the uncertainty inherent in the process of innovation, govern the processes of patent application and IP protection, and regulate participants in an economic exchange, are likely to encourage the development of innovation. We draw on existing research to identify specific institutional environment dimensions that might moderate the relationship between institutional ownership and innovation: the rule of law and the strength of minority investor protection (Inoue et al., 2013).

The rule of law dimension is grounded in the idea that the level of development of the market and the economy as well as whether the fundamental economic mechanisms are favorable to business investors and entrepreneurs, could help the economy to thrive and be successful (Chen et al., 2010). Business thrives in environments that offer predictability, transparency, stability and established rule of law (Meyer et al., 2009, Ferguson, 2013, North, 1990). Rule of law has been used as a measure of the quality of institutions and governance (Porta et al., 1998). Strongly enforced rule of law is linked to reduced perceived risks from threats such as expropriation and has also been found to affect economic growth. It is the rule of law that differentiates the effective institutional environment from that pertinent to a "stationary state", or one that has stopped to grow (Ferguson, 2013).

The minority investor protection, captures not just the origin of the legal system but also the level of development of the country's financial market, its banking system and its fundamental regulatory mechanisms (Inoue et al., 2013). The extent of legal protection of investors in a country is also found to be inversely related to dispersion of ownership. The weaker the legal protection of investors, the less likely it will be for small investors to participate on these markets, this leading to a strong trend in ownership concentration. However, the poor investor protection results in fewer investors offering their capital to firms that need it. As a consequence poor investor protection makes it more difficult for firms to raise capital (Porta et al., 1998).

HYPOTHESES

Differences in Ownership Structure

Agency Theory has dominated the theoretical "arena" of modelling and predicting the relationship between owners and decision makers on one hand, and organizational strategies and performances on the other. The agency theory will posit that the institutional ownership is a corporate governance mechanism that attempts to align the divergent interests of owners and managers. Because institutional owners are vested in the well-being of a corporation, they will have an incentive, expertise and enough manpower to monitor, control, and actively exercise a pressure on decision-makers, should they attempt to depart from the building shareholder wealth philosophy and follow a more-inefficient but less-risky strategic behavior.

The underlying assumption of the Agency theory is that although the group of institutional owners is quite diverse, their preferences and behavior will be homogenous. All banks, insurance companies, mutual funds, investment funds, among others will put the same type and intensity of pressure on decision makers and will drive organizations in the same direction. Yet, scholars have begun to question this assumption and have tried to explore the differences in institutional ownership (Hoskisson et al., 2002, Tihanyi et al., 2003, Bushee, 1998a). They have argued that institutional investors are a diverse set of organizations with different powers for monitoring and control of managers (David et al., 1998). Furthermore, they have different inclination to influence decision makers, and different preferences for firm strategies (Tihanyi et al., 2003).

Overall, extant research has looked into two major types of institutional ownership differences. The first category of differences is driven by the heterogenius preferences in investment horizons and labels investors as short-term oriented or professional investment funds and long-term oriented or pension (public) funds (Hoskisson et al., 2002, Tihanyi et al., 2003). The second category is based on investors and corporations with reciprocal business relationship and was propagated in the literature by Brickley, Lease and Smith (1988) and Kochnar and David (1996) among others. When institutional investors are also involved in a business-type relationship with the corporations in which they invest, they may be tempted to exercise less power over the decision makers because they depend on the corporation for business. This research stream identifies two types of institutional investors: "pressure-sensitive" (involved in a business relationship with the corporation is which they are investor), and "pressure-resistant" where no business connections are present. Banks and insurance companies are considered pressure sensitive investors, while pension funds, mutual funds, endowments and foundations fall into the category of pressure – resistant institutional investors. In this paper we focus on investigating the difference within the pressure resistant category, since prior research had found that pressure resistant institutions have stronger influence on innovation that pressure sensitive institutional investors (Kochhar and David, 1996, Tihanyi et al., 2003).

Professional Investment Funds

Professional investment funds, such as mutual funds, investment banks, etc., are considered a major group of "pressure-resistant" institutional investors in the extant literature. Scholars find they are more interested in stocks with high–visibility (Falkenstein, 1996). In addition, the turnover of their portfolios was found to be more frequent. Professional investment funds are known as short-term oriented institutional owners because they expect results quickly, mainly due to the incentive mechanisms that are in place to resolve the agency problem (Zahra,

1996). These owners are likely to pursue initiatives with short-term time horizon and payout opportunities. The nature of their business orientation will pressure them to forgo long-term growth opportunities, as found in extant research (Hoskisson et al., 2002, Tihanyi et al., 2003, Graves, 1988, Bushee, 1998b, Lee and O'neill, 2003).

Furthermore, researchers have argued that managers are pressured by different corporate governance mechanisms, such as analysts' forecasts, compensation schemas, etc. to try to meet investors' expectations. Because managers' bonuses are tied to the quarterly profitability numbers, they are further motivated to focus on achieving the short-term goals rather than worry about future growth prospects of the firm. Scholars also find support for the positive relationship between the frequency of evaluation of managerial performance and the short-term investment horizons of these managers. In their study, Chaganti and Damanpour (1991) argue that because fund managers are assessed quarterly, they promote short-term investment horizons over long-term more risky projects that result in more ground-breaking innovations and as a consequence the innovative activity of the firm is negatively impacted (Chaganti and Damanpour, 1991).

By their own definition, the short-term institutional owners are less likely to react in support of strategic initiatives with longer time horizons, thus effectively relying on investments with shorter-term payout opportunities but incremental in terms of their contribution to the firm's profitability. Existing research has previously discussed the issues of top management being focused on the short-run projects. Managers are often times seen with "tied hands" because they need to do what their most powerful shareholders, such as the professional investment fund shareholders, who are likely to push them to avoid uncertain long-term growth opportunity projects with long payback periods (Hill et al., 1988a, Graves, 1988).

Lastly, as suggested by the "myopic investor" perspective, because of the takeover threat looming larger when firms are underperforming, managers prefer to minimize the likelihood of institutional owners disposing of their large chunks of ownership, and are forced to cut back on risky long-term investments (Kochhar and David, 1996).

Yet, if that were to be the case, there would be no firm innovation or any long-term growth-related activity in any organization with institutional ownership. However, scholars whose research is grounded in the efficient Market theory argue, that shareholders and investors are rational and that they very well understand that if firms continuously forgo long-term growth opportunities that would lead to loss of firm value (Jensen, 1988).

Similarly, "the superior investor" perspective finds support for the idea that institutional investors have enough manpower and expertise (compared to individual investors) and are capable of thorough evaluation of the long-term growth opportunity strategy that a firm is pursuing. Therefore, scholars have suggested, that the likelihood of institutional owners dropping their chinks of ownership is quite small and immaterial. Moreover, if institutional owners dispose of large blocks of equity, that will result in huge reduction of the stock price of the ownership and potentially hurting the profitability of the equity owners. Lastly, even if institutional investors manage to sell their investment in a firm, they are still required to be well-diversified, so they have to find new "profitable" firms to invest in really fast, which eventually will become quite challenging. Therefore, because of the potential loss for the institutional owners along with their inability to easily find other "profitable" investment opportunities,

institutional investors are likely to remain vested in firms that pursue some long-term opportunity growth.

As the investment in R&D is a long-term growth opportunity but is not as big of a commitment as the investment in new product development and patent applications, we anticipate that short-term oriented investors, such as the professional investment funds are likely to prefer firms that simply invest in R&D rather than firms that are engaged in more radical type of innovative activity. Therefore, we expect that the proportion of professional investment fund ownership will be positively related to the investment in innovation, measured with R&D expenditures, but negatively related to the innovative performance of the firm, which we capture in terms of number of patent application. Thus we formally propose:

Hypothesis 1a*: The greater the proportion of professional investment fund ownership in a firm, the greater the investment in R&D.*

Hypothesis 1b*: The greater the proportion of professional investment fund ownership in a firm, the lower the number of its patents.*

Extant research finds that the legal protection of minor investors in a country is extremely important determinant for the development of its financial markets while also for the value of the firms' assets. La Porta and colleagues (2002) establish significant empirical link between stronger minority investor protection and higher valuation of corporate assets in a country. Because expropriating of the profits of minor shareholders by controlling shareholders is costly, in the sense that minor investors are then discouraged from buying financial assets in these countries, thus effectively leading to higher cost of capital and underdeveloped financial market. When a law limits or restricts such expropriation, the effect is that minor institutional owners are willing to invest in financial assets, which then stimulates a greater cash-flow investment in publicly traded corporations and improvement of the value of their assets (La Porta et al., 2002).

However, in contexts with stronger minority investor protection, many institutional owners would be encouraged to actively participate in the financial markets. As a consequence, there will be a shift in the ownership structure of the firm, such that an increased number of minor shareholders will substitute the smaller number of large block holders. The danger of dispersed ownership is that minor shareholders are not as effective in their monitoring of managers as the large "chunk" shareholders are. As the "agency conflict" controlling mechanisms are weakened, our expectation is that managers are going to cut back on innovation, both investment in R&D and innovative performance, since they have no incentive to pursue innovation and they are risk averse.

Therefore, we anticipate that the stronger minority investor protection will weaken the positive impact of professional investment funds on R&D investment and strengthen the negative effect on the number of patents. Thus we formally propose:

Hypothesis 2a: *The strength of minority investor protection of the country will negatively moderate the relationship between the firm's proportion of professional investment ownership and its R&D investment.*

Hypothesis 2b: *The strength of minority investor protection of the country will negatively moderate the relationship between the firm's proportion of professional investment ownership and its number of patents.*

Public Pension Funds

Pension funds, on the other hand, have a more conservative approach to strategic decision making, and are more focused on the long term growth and development. In support of that argument, Hoskisson and colleagues (2002) find that long-term ownership promotes and encourages innovation (Hoskisson et al., 2002).

Scholars have also found that managers of pension funds commonly pursue a "buy-and-hold" type of strategy, and that they put strong emphasis on the long term yields. In the corporate governance literature, they are often referred as long-term institutional owners who are inclined to follow a longer investment horizon and as such tend to look for long-term growth opportunities within the firms in which they invest (David et al., 2001, Bushee, 1998b, Tihanyi et al., 2003). Pension funds were found to be more financially sophisticated than mutual fund investors, which implies they are even more "superior investor" than the professional investment funds.

As a consequence, pension fund managers are motivated to boost yields over longer time horizons and are likely to support both the investment in innovation as well as the launch of innovative projects. In general, we anticipate that the proportion of pension fund ownership will be positively related to the innovative activity of the firm, both in terms of R&D investment and number of patents. Thus we formally propose:

Hypothesis 3a*: The greater the proportion of pension fund ownership in a firm, the more likely it is for the firm to invest in R&D.*

Hypothesis 3b*: The greater the proportion of pension fund ownership in a firm, the greater the number of its patents.*

Formal institutions impact the investment in innovation as well as its productivity as the main purpose of institutions is considered to be the reduction of uncertainty (North, 1990). Strong formal institutions and law enforcement, that mitigate the uncertainty inherent in the process of innovation, govern the processes of patent application and IP protection, and regulate participants in an economic exchange, are likely to encourage the development of innovation.

When the economy is strong and business regulations are favorable to investors and entrepreneurs, that encourages the economy to thrive and be successful (Chen et al., 2010). Business thrives in environments that offer predictability, transparency, stability and established rule of law (Meyer et al., 2009, Ferguson, 2013, North, 1990).

The rule of law has also been used as a measure of the quality of institutions and governance (Porta et al., 1998). Strongly enforced rule of law is linked to reduced perceived risks from threats such as expropriation and has also been found to affect economic growth. It is the rule of law that differentiates the effective institutional environment from that pertinent to a "stationary state", or one that has stopped to grow (Ferguson, 2013).

Yet, the rule of law might carry certain unintended negative effects on the productivity of the innovative activity. Strong rules and regulations may discourage and even harm the knowledge collaboration and technology exchanges and thus indirectly may inhibit innovation, due to the increased transaction costs and the bureaucratic regulations in accessing the protected technologies (Allred and Park, 2007).

Since the strong rule of law will encourage growth of the economy and will strengthen the development of the financial markets, we anticipate that firms will likely have easy access to capital and that will allow them to pursue more innovative strategy. Therefore we expect that the rule of law will encourage investment in R&D. In contrast, we believe that the stronger rule of law will make the investment in new product introduction and patent application even more burdensome and too big of a commitment, therefore we anticipate that firms that are engaged in more radical type of innovative activity are more likely to engage into something less time consuming, which will impact the firm's innovation performance. Furthermore, the speed with which innovations are brought to the market nowadays is so high that many decision makers may be willing to forgo a long-term groundbreaking innovation project and focus on some more incremental type of innovation but that is available sooner for strategic reasons. We propose that the effects of pension fund ownership will be stronger when it comes to R&D investment but will mitigate its positive effect on the innovative performance of the firm. Thus we formally propose:

Hypothesis 4a: *The strength of the rule of law in the country will positively moderate the relationship between the firm's proportion of pension fund ownership and its R&D investment.*

Hypothesis 4b: *The strength of the rule of law in the country will negatively moderate the relationship between the firm's proportion of pension fund ownership and its number of patents.*

METHODS

Sample and Analysis

To test the proposed model, we use all public firms in the COMPUSTAT North America and Global from 2006 to 2013. Following prior research, we measure risk using the coefficient of variation (CV) over the five-year period preceding each of the eight sample years, which restricts the sample to firms for which data is available for at least 5 years (Minton and Schrand, 1999). Our final sample consisted of 705 firms from 18 countries. Out of the total number of 705 firms in the sample, approximately 41 % were from Europe or 285 firms and 59 % or 420 had their headquarters in the North American region.

We supplemented the COMPUSTAT data with additional data sources including Datastream for beta and Tobin's Q values, Factset for ownership data, ESPACENET for global patents data, and The Global Competitiveness Report data on the index. We tested our model, utilizing two separate dependent variables, and following prior studies, we run a linear regression for the R&D intensity and negative binomial regression for the number of total patents.

Measures

Investment in Innovation. Using COMPUSTAT North America and Global data, R&D intensity, was calculated as the ratio of R&D expenditures over sales.

Innovative Output. To measure the innovation activity levels, we obtained from ESPACENET the count of the number of patents of the firm. The database is a free global source of public patent information. We used the count of patent application and the year the patents applications were filed. Prior research has already dealt in a specific manner with the issue of patent applications vs. patents granted. Prior research has found evidence of a strong correlation between the number of patents granted and the number of patent applications filed (Hall et al., 2007).

Institutional investor variables. Data on the categorization of institutional owners for the institutional investor type variables were obtained from the Factset database. Institutional ownership referred to as ***professional investment funds*** is calculated as the percentage of the firm's stock owned by institutions with shorter investment horizons. These institutions are: Investment Advisers, Hedge Funds, Mutual Funds and Private banking/Wealth management. Institutional ownership is considered as publicly managed fund or ***pension fund*** category if specific type of institutions had ownership in the respective firm. This variable is calculated as the percentage of the firm's stock owned by institutions with longer investment horizons, such as pension funds, insurance companies and retirement funds.

Data for the Rule of Law and the Minority Investor Protection indices were obtained from the Global Competitiveness Database.

Control Variables. Consistent with previous research, that has looked into the impact of ownership on innovation, we focus on corporate governance variables, and firm specific characteristics that are found to impact pursuit of innovation, such as: (1) growth, measured as Tobin's Q on the basis of an seven-year rolling period, preceding each of the nine sample years from 2006 to 2013, (2) liquidity, calculated as the ratio of current assets to current liabilities, using the same 8 year rolling period; (3) the ratio of firm debt scaled by the firm size measured by the total assets; and (4) leverage measured as the total long and short term debt, scaled by the total assets. Other control variables were also obtained and used in the analysis, following well established measures: firm size, firm age, industry (3 digit NAICS code), country of origin of the firm revenue, CEO duality, board size, and executive compensation.

Results

Insert Table 1 about here

Table 1 shows the correlation matrix and the descriptive statistics for our sample. On average, the firms in the sample are strongly innovation and technology oriented, as the average R&D intensity was 1.39 of the sales. The main reason for such high R&D intensity is that we simultaneously restricted the sample to data availability of R&D and number of patents for

European and US firms for at least 5 years, thus effectively biasing the sample towards firms that consistently report both innovative measures, which are predominantly large technology and innovation oriented firms. The levels of dispersion in terms of the firm's patenting activity are very high. While within the sample, firms on average applied for 43 patents; some applied to zero patents while others applied to close to 2,000 patents. The correlations matrix (table 1) indicates that each of the measures of innovation is significantly positively correlated with the other one, indicating potential similarity among these variables. More specifically, there is a high correlation between total patents and R&D intensity (0.59; $p < 0.05$).

Additionally, significant correlations exist between a number of the control and independent variables within the model, which may indicate a multicollinearity problem. Since leverage and debt size are calculated in a similar way and are both measures of the level of debt the firm has to bear, we dropped the leverage variable from the analysis. We then run the VIF analysis and the mean VIF was 1.95, while the maximum for any variable in the model was not exceeding 4.14. These numbers are well below the cut off value of 10 for the regression model.

Insert Table 2 about here

Table 2 presents results of the hypothesis tests. Overall, three of the eight hypotheses were statistically significant in the predicted direction at a significance level of .05 or better, while two hypothesis were marginally significant at 0.10 level of significance.

The sets of Hypothesis 1 and 3 tested the direct effect of different types of institutional ownership on the investment in innovation (measured by R&D intensity) and the innovative output of the firm, measured by the number of patents. Hypothesis 1a suggested that the impact of short-term institutional ownership on the firm's R&D intensity would be positive. Hypothesis 1a was marginally supported. Professional investment funds were positively and significantly related to the investment in innovation at the 0.10 level of significance (.02, $p < .10$). Hypothesis 1b implied the impact of short-term institutional ownership or the proportion of professional fund ownership on the firm's number of patents would be negative. The results in Table 2 offer negative and significant effect at $p < 0.05$. Therefore, we find support for Hypothesis 1b. Pension funds ownership do not appear to significantly affect the innovation investment. Thus, Hypothesis 3a was not supported. Similarly, pension funds were not significantly related to the output of innovation (Hypothesis 3b).

Hypotheses 2a and 2b, and Hypotheses 4a and 4b test the proposed moderating effect of minority investor protection and the rule of law on the relationship between the type of institutional ownership and innovation investment and performance. Results are offered in Table 2. As expected, the positive impact of professional investment fund ownership on R&D investment was mitigated by the strength of the minority investor protection of the country. The results in Table 2 offer negative and significant effect at $p < 0.05$. Therefore, we find support for Hypothesis 2a. Similarly, the negative impact of short-term institutional ownership on the firm's number of patents is further compounded by the strength of the minority investor protection of

the country. The results in Table 2 offer negative and marginally significant effect. Therefore, Hypothesis 2b is marginally supported.

In Hypothesis 4a, we proposed that the country's rule of law will positively impact the pension fund ownership effect on R&D investment. The results in Table 2 offer positive and significant effect. Thus, we find support for Hypothesis 4a. However, the impact of long-term institutional ownership on the firm's number of patents was not found to be positively moderated by the strength of the rule of law of the country (Hypotheses 4b). Hypothesis 4b was not supported.

Discussion

This study was strongly motivated by the integration of two theoretical perspectives regarding prospects of different institutional investors and their possibly differential relationships with a firm's innovation investment and performance. The study had several important findings. First, although previous studies have tended to combine all institutional investors into one category, the results of this study support our contention that it is necessary to consider different types of institutional investors to more precisely examine their differing impacts. Second, most previous research investigating innovation has likewise tended to equate the innovation with use of the R&D investment as well as the number of patents. Although we found a positive and significant correlation between the R&D expenditures and number of patents ($r = .59$, $p < .05$), our results suggest that the impact of the different investor types on different innovation dimensions is not homogenous so a model with two innovation measures, capturing both dimensions of innovation investment and innovation performance was more appropriate.

Our results suggest that different types of institutional investors have different goals for the firms in which they invest, which impacts in a different manner the innovation investment and the innovation performance. Previous scholars have found that institutional investors with short-term horizons might be detrimental for the long-term innovative activity of the firm and the long-term perspective investors may be beneficial for the pursuit of innovation. Our findings offer a more fine-grained perspective, detailing that the short-term investors are actually strengthening the investment of innovation, while not necessarily focusing their efforts in the pursuit of a ground-breaking type of innovation. Furthermore, we don't find any direct effect of the long-term investors on innovation. In other words, when firms make decisions about R&D investments, the decisions are likely to be favorable if large institutional investors are among the firm's powerful shareholders and the decisions were not related to groundbreaking innovations. For more serious commitments to innovation, strong and powerful stakeholders, looking for short-term profits and trying to avoid risky investments might turn into a strong inhibitor of the innovative activity of the firm.

Under certain conditions of the institutional environment though, we find the effect of short term and long term institutional investors on innovation to shift in its direction and strength. When the minority investor protection is strong, the short term horizon investors are stifling the innovation investment as well as the innovation performance. Also, when the strength of the rule of law is strong, we find that the presence of long-term investors becomes a strong motivator for decision makers to pursue both greater investment in innovation as well as more

serious commitment to a more groundbreaking type of innovation, thus improving the chances of firms to stronger innovation performance.

Implications

In terms of implications to theory, we contribute to the extant research in a number of ways. First, this study advances the extant research on institutional ownership and corporate governance by demonstrating that the choices whether or not to pursue innovation are affected by the powerful influence that different types of institutional investors exercise on the firm's management body. Furthermore, our study illustrates the moderating impact of the strength of minority investor protection and the rule of law on the link between institutional ownership and the decision to innovate. By injecting the moderating impact of the strength of minority investor protection and the rule of law into the link between type of ownership and innovation, we respond to calls in existing research for more fine-grained and nuanced analysis of the institutional environment. Next, by differentiating between two dimensions of innovation investment and performance, this research offers insights into the relationship between type of ownership and innovation at different levels of commitment.

In terms of contribution to practice, this study shed light on how context specific factors – such as legal protection of minority investor rights of the country and the rule of law, might interfere and change the overall picture. Managers need to understand very well the implications of globalization and how to properly manage and anticipate problems, stemming from doing business in different institutional environments. This study explores the impact of institutional factors that need to be accounted for when considering whether or not to invest in countries. In a way, this study also contributes to bringing attention and the focus on context and context dependent variables in an effort to improve better adaptation and management of the dynamism in the environment.

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Table 1: Correlation and Descriptive Statistics Table

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1	R&D Intensity	1.37	17.42												
2	Patents	43.32	139.43	0.59											
3	Tobin's Q	1.34	0.42	0.22	-0.27										
4	Firmage 1	29.74	16.93	-0.08	-0.04	0.30									
5	Liquidity	3.19	1.91	-0.06	-0.06	0.06	-0.05								
6	Debt size	0.30	0.46	-0.05	-0.19	-0.02	-0.01	0.04							
7	Leverage	0.16	0.21	-0.06	-0.14	0.08	-0.02	0.07	0.91						
8	Indep BoD	0.66	0.31	0.27	-0.22	0.17	0.24	0.02	-0.08	0.18					
9	CEO duality	0.43	0.55	-0.13	-0.17	0.10	-0.05	0.06	0.04	0.11	0.05				
10	Exec Ownership	1.14	3.37	-0.19	0.15	-0.21	-0.32	0.08	0.04	-0.25	0.23	0.29			
11	Institutional Ownership	0.47	0.43	0.08	-0.21	0.09	-0.01	-0.02	0.00	0.12	0.10	0.13	-0.15		
12	Long Term Inst Ownership	0.19	0.13	0.32	-0.04	0.05	-0.03	0.07	-0.01	0.02	-0.02	0.06	0.10	0.01	
13	Short Term Inst Ownership	0.39	0.27	0.47	-0.36	0.07	-0.18	0.19	-0.09	0.08	0.26	0.10	0.14	0.07	0.27
14	Cash Flow Volatility	0.41	14.85	-0.03	-0.24	0.06	-0.01	-0.13	-0.07	-0.08	0.03	-0.10	-0.12	0.04	0.51
15	Rule of Law	0.31	0.46	-0.02	-0.23	0.13	-0.04	-0.12	0.09	0.28	0.15	0.17	-0.32	-0.16	-0.06
16	Minority protection index	5.24	0.48	0.14	0.06	0.14	-0.10	-0.27	-0.26	-0.20	0.00	-0.10	0.24	0.05	0.15

Table 1. (*Continued*)		**13.**	**14.**	**15.**
14	Cash Flow Volatility	0.41		
15	Rule of Law	-0.26	-0.10	
16	Minority protection index	0.21	0.24	-0.32

Table 2 – Regression Summary

VARIABLES	Full Model R&D intensity	Full Model Number of Patents (1 year lag)
Firm Age	-0.08** (0.03)	-0.000 (.00)
Exec Ownership	-0.14** (0.06)	0.01 (0.02)
Debt Size	-1.27*** (0.01)	-0.01 (0.01)
CEO duality	-0.65*** (0.01)	-0.000 (0.00)
Independence of BoD	0.47*** (0.01)	-0.018* (0.01)
Tobin's Q	0.63*** (0.01)	-0.05* (0.03)
Liquidity	-0.05* (0.03)	-0.01 (0.03)
Rule of Law	0.15*** (0.01)	-0.05** (0.02)
Minority_Protection	0.00 (0.01)	0.00 (0.02)
Short Term Institut Owner (Professional)	0.02* (0.005)	-0.03** (0.01)
Long Term Institut Owner (Pension)	0.01 (0.00)	-0.49 (0.37)
Short Term*Minority	-0.009** (0.01)	-0.001* (0.18)
Long Term*Rule of Law	0.06* (0.07)	-0.09 (0.07)
Constant	-5.17* (2.75)	0.04* (0.02)
Observations	2035	1537
R-squared	0.19	

Robust standard errors
in parentheses
***p<0.01, **p<0.05, *p<0.10

FIGURE 1
Theoretical Model