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The relationship between a firm's ownership structure, governance, and innovation

Erica J. Wagner
DePaul University

The Relationship between a Firm's Ownership Structure, Governance, and Innovation

by
Erica J. Wagner

A dissertation submitted in partial fulfillment
of the requirements for the degree of
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Major Professor: Thomas Berry, Ph.D.
Sébastien Michenaud, Ph.D.
Grace Lemmon, Ph.D.

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Thomas Berry, Ph.D., Committee Chair

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Sébastien Michenaud, Ph.D., Committee Member

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Grace Lemmon, Ph.D., Committee Member

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An Abstract of

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Firm innovation is key for many companies to continuously thrive in the marketplace. Unfortunately, there are drawbacks to making innovative investments because of the upfront costs and riskiness of future returns. This creates conflicts because managers are under pressure to meet short-term earnings forecasts. A managers' short-term focus on a firm's business strategy may not be in the best interests of the shareholders' long-term vision of a firm. For this reason, a strong corporate governance system can trigger an increased level of monitoring of the decision-making of managers so that it's aligned with shareholders' goals. Often, a firm's long-term strategy focuses on firm innovation. A major influencer of a firm's innovative strategy is its ownership structure. This research specifically focuses on the impact of ownership concentration, institutional ownership, activist investors, large passive investors, and Board of Director composition on firm innovation. Key components of a firm's organizational structure, such as ownership concentration and Board member composition, are analyzed to explain the variance

of innovation when other variables are controlled. Based on a sample of technology firms, the findings show that publicly-traded information technology firms' level of passive investors and percentage of independent Board members are significant relative to firm innovation. There are also important findings from the unsupported variables, which are the firm's ownership concentration of shareholders, activist investors, and institutional investors. Finally, inferences are drawn from these results as to whether a firm's ownership structure and governance affect a firm's long-term strategy.

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List of Abbreviations

Activist	Activist Investor
Apple	Apple Incorporated
Board	Board of Directors
Board members	Members of the Board of Directors
Equity owners	Shareholders
GAAP	Generally Accepted Accounting Principles
HHI	Herfindahl-Hirshman Index
Independent Board member	Member of the Board and not a firm executive
Non-Independent Board member	Member of the Board and a firm executive
IT firms	Firms in the Information Technology industry
Managers	Business managers
Microsoft	Microsoft Corporation
Qualcom	Qualcom Incorporated
ROA	Return on Assets
ROE	Return on Equity
ROI	Return on Investment
R&D	Research and Development
Stockowners	Shareholders
USPTO	US Patent Trade Office

Preface

The competitive environment in economic markets is changing so firms must adjust their focus at a rapid pace to experience growth. The nature of firm growth is a heterogeneous, complex, and dynamic process that involves economic, social, and cultural factors (Delmar, Davidsson, & Gartner, 2003; Wong, Ho, & Autio, 2005) and often requires a sound long-term strategy. Many firms place a greater emphasis on meeting short-term results over adhering to a sustainable long-term strategy, which is known as short-termism (Graham & Campbell, 2001). Contenders of firm short-termism discuss the potential impacts of this phenomenon, such as discouragement for business managers from undertaking investments in innovation that yield returns in the long-term. Business decisions that result from short-termism, which include decreased spending on innovative activities, add to the volatility of capital markets through rapid shifts in investment (Sappideen, 2011).

An innovative strategy requires synergy creation between technologies, organizational structures, and operational processes to generate firm value, but there are complexities because innovative activities are typically long-term, risky, changeable, intensive, and idiosyncratic in nature (Holmstrom, 1989). Innovative initiatives are delayed at firms because of the pressure to meet short-term earnings expectations, which are influenced by firm stakeholders (Baysinger, Kosnik, & Turk, 1991; Kahan & Rock, 2007; Appel, Gormley, & Keim, 2015). A firm's organizational structure, which includes the Board and business managers, is influenced by the firm's stockholders. The most influential stockowners are the highly concentrated

ones. Highly concentrated stockowners are often institutional investors, activist investors, and passive investors as well. This research dissemination attempts to offer insights related to the relationship between ownership structure, firm governance, and level of innovative activity at publicly-traded IT firms.

Literature Review and Hypothesis Development

1.1. Research Question

How, if at all, are a firm's ownership structure, governance, and level of innovative activity related?

1.2. Statement of Problem

Innovation is key for firms to have a long-term competitive advantage from other firms in the market (Tian, & Wang, 2014). Strategic investment in innovative activities is important for a firm to generate future economic returns (Franko, 1989), but investments in innovative activities involve a high probability of failure (Holmstrom, 1989). In publicly-traded companies, the pressure to report regular income profits induces managers to focus on the short-term firm strategy (Porter, 1992), which means that innovative activities are decreased because the benefits are typically observed in the long-term. Firms trying to compete in the marketplace with innovation need an organizational structure that continuously and uninterruptedly supports innovative investment (Chen, Hsu, & Huang, 2010) despite competing business objectives.

While innovation is necessary for some firms to grow, there are managers who focus on strategies other than innovative ones. A firm's ownership structure additionally influences a firm's innovative strategy because stockowner type indicates the degree to which investors have influence over the Board and the firm's strategy (Phan, Markman, & Balkin, 2016). Three critical influencers of management's decisions are highly concentrated shareholders, institutional

investors, and the Board (Baysinger, Kosnik, & Turk, 1991). Bushee (1998) contends that the large ownership concentration by a few institutional investors allows them to monitor managers to ensure that managers choose innovative projects that maximize long-term value rather than focus on meeting short-term earnings goals. Hill and Snell (1988) find a higher proportion of non-independent Board members positively affects a firm's level of innovative investment. While ownership concentration and Board member composition influence a firm's ownership structure, there are other significant investor types as well.

Other influential stakeholders in a firm's organization structure are active and passive investors. In fact, activist investors are key players in both corporate governance and corporate control (Kahan & Rock, 2007). Not only is this the case with activist investors, Appel, Gormley, & Keim (2016) suggest that large passive investors play a key role in influencing firms' governance choices, which affects a firm's level of innovation. *A firm's organizational and ownership structure influences a firm's level of innovation, which impacts its long-term strategy and results.*

1.3. Literature Review

1.3.1. Innovation. Wang and Ahmed (2004) define innovation as the process of developing new products, services, methods of production, market segments, sources of supply, and organizational forms. Shah and Chattopadhyay (2014) highlight that innovation occurs when a new replicable process is formed and is not a reinvention of an existing process or product; innovative processes are actions that satisfy customer needs and preferences and are neglected by rivals (Hilman &

Kaliappen, 2015). Successful innovative projects increase a firm's competitive advantage in the long-term and serve as a critical driving force for firm survival and growth (Schumpeter, 1934), but this is not without difficulties.

Innovative projects are often complex, and the benefits from innovative activities are typically realized over long-term horizons. Holmstrom (1989) argues that innovation is difficult to manage, has uncontrollable outcomes, and is limited by bureaucracy and financial constraints. There are other deterrents to successful innovative projects, such as conflicts of interest between stockholders and managers, which are predominately driven by pressure for managers to meet short-term earnings expectations.

Many firms suffer from agency problems, which arise when shareholders and managers have different goals and interests for the firm (Jensen & Meckling, 1976). The agency conflict is mitigated with a strict process of monitoring a manager's ability to make business decisions that are solely focused on meeting short-term earnings targets, which is typically done by the Board and highly-concentrated shareholders (Jensen & Meckling, 1976). The strict monitoring of management by shareholders is an example of a control process that occurs due to the separation between firm ownership and control of business decisions; this concept is highlighted by the incentive alignment effect.

The incentive alignment effect relates to the separation of firm ownership and control and triggers stockowner confidence in the business decisions of managers when managerial incentives are aligned with the interests of stockowners (Jensen &

Meckling, 1976). The incentive alignment effect is advantageous for several different firm strategies. For example, the incentive alignment effect is helpful when a firm has an innovative strategy because both managers and stockowners are motivated to focus on firm innovation despite the risks. Investment in innovative activities is a high-risk and high-return strategy, and many innovative activities do not lead to long-term ROI increases despite the potential for future high profits (Mansfield, 1969). Therefore, an innovative strategy can lead to lower short-term profits.

Even when managers are focused on the firm's long-term strategy, they always face pressures to meet short-term earnings expectations. There are trade-offs between innovation and short-term earnings performance. For example, managers are reluctant to invest in long-term innovative projects because of high failure rates that lead to short-term decreases in share price and net income (Mansfield, 1968). Investors may not promote a firm strategy that is focused on innovation due to limited understanding of the benefits that are associated with this strategy, which is an example of information asymmetry (Aboody & Lev, 2000).

Information asymmetry leads managers to forego investments in innovation to boost short-term earnings performance and appease shareholder investment preferences, and this can be caused by the lack of information about the potential financial benefits that are from a firm's innovative activities (Dechow & Sloan, 1991). Bebchuck and Stole (1993) show that when managers lack information or understanding about long-term innovative projects, they are more motivated to spend less on them. A firm's innovative activities are heavily monitored by managers, the

Board, and stockholders to alleviate information asymmetries and enable all stakeholders to make informed decisions about innovative investments. If these projects are successful, the innovative process leads to a patented product.

1.3.2. Patents. A patent is a legal device that gives firms the proprietary right to an invention for commercial purposes and results from innovative activities (Foray, 2010). The extent to which firms use patents to protect their intellectual property rights is a central issue in the economics and legalities associated with innovation (Nicholas, 2010; 2011), and the inventor must openly disclose the technical details on the invention in exchange for patent rights (Foray, 2010). Patents provide patent owners with exclusive rights, so they can choose when to make an investment with the patented product or concept. This shows how patents create valuable real options (Bloom & Van Reenen, 2002). Patents are comparable to real options because they create the right, not the obligation, to realize the value of the underlying asset (Cotropia, 2009). Patents and innovations have firm benefits, but it's key for these initiatives to be monitored by members of a firm's corporate governance system.

1.3.3. Corporate governance. When analyzing a firm's innovation strategy, it is important to understand the firm's corporate governance model as well. A firm's corporate governance bridges the separation of stockowners, who are the risk-bearers, and managers, who are the decision-makers (Jensen & Meckling, 1976). Corporate governance research focuses on the stockowners of a firm and suggests that innovative activity is enabled when there is a conducive ownership structure. This is because a firm's ownership structure influences the allocation of funds, the

collaboration between stockowners and managers, and the cooperation of controlling and minority stockowners, which typically leads to improved internal control processes and financial results (Berle & Means, 1932). Jensen and Meckling (1976) posit that the ownership structure of a firm is a function of the information asymmetries and agency costs that occur because of the separation of ownership and control between stockowners and managers (Francis, 1995). A firm's corporate governance model helps align the preferences between stockowners and managers, which becomes increasingly important when there is a high level of ownership concentration by a few shareholders.

1.3.4. Ownership concentration. Highly concentrated stockowners monitor managers to ensure that their decisions are in the best interests of the company (Perry & Rainey, 1988). Highly concentrated shareholders have incentives to monitor management's decisions closely, so they focus on the firm's long-term performance because of the amount of capital they have invested in the firm (Alchian, & Demsetz, 1972). Highly concentrated shareholders also have an ability to influence management. Cubin and Leech (1983) find that highly concentrated stockowners have more power over management than less concentrated stockholders. Highly concentrated stockholders influence a firm's strategies and decision-making processes (Perry & Rainey, 1988).

There is a positive correlation between ownership concentration by a few shareholders and incentive alignments between themselves and managers, which causes the highly concentrated shareholders to be entrenched in the firm's daily

activities (Fama & Jensen, 1983a). The incentive alignment effect implies that equity ownership belonging to a few shareholders gives them an incentive to optimize firm performance because it increases their personal wealth (Tsao & Chen, 2012). Incentive alignment problems arise due to the separation of ownership and control at publicly-traded companies (Berle & Means, 1932), which leads to reductions in long-term firm value as managers make decisions for their own personal benefit (Levitas, Barker, & Ahsan, 2011). Highly concentrated stockowners attempt to reduce incentive alignment problems as they become more entrenched in a firm by gaining more knowledge about the firm's daily activities.

As stockownership becomes more concentrated by a few shareholders, the concentrated shareholders become more informed on the firm's daily activities because of the stockowners' financial interest in the firm; this is known as the entrenchment effect (Tsao & Chen, 2012). Morck, Shleifer, and Vishny (1988) indicate that the entrenchment effect is frequently observed when stockowners are highly concentrated owners. There are mixed findings related to whether highly concentrated stockowners become entrenched in a firm and impact the level of innovative activities. Tsao and Chen (2012) find a negative correlation between the level of investments in innovative activities and ownership concentration. Unlike Tsao and Chen (2012), Hill and Snell (1988) report a significant, positive relationship between the amount of R&D expense and concentration of equity ownership by a few shareholders, which suggests that highly concentrated stockowners encourage corporate investment in innovative activities. Francis and Smith (1995) additionally

find a positive correlation between ownership concentration and innovation, which suggests that highly concentrated stockowners, such as institutional investors, prefer long-term firm strategies.

1.3.5. Institutional investor. Institutional investors are financial institutions, such as mutual funds, hedge funds, pension funds, banks, insurance companies, foundations, and endowments that hold a significant amount of equity in publicly-traded companies (Zhang & Gimeno, 2016). The increase in stockownership from institutional investors has significantly impacted corporate governance over the past several decades. To support this, institutional investors account for approximately 10% of traded equity in 1970 and over 60% of traded equity in 2006 (Aghion, Van Reenen & Zingales, 2009). The increase of institutional investor stock ownership presents a unique opportunity to bridge the information asymmetries between stock ownership and management (Lipton, 1987). This is driven by an increased level of monitoring and influence by institutional investors and impacts the level of firm investment in innovative activities.

There is evidence that long-term institutional ownership is positively associated with firm innovation (Zahra, 1996). An explanation for this is that institutional investors have a fiduciary obligation to maximize long-term value for their customers, so they emphasize investment in firm innovation (Davis & Thompson, 1994). Institutional investors pre-commit to long-term holding strategies rather than short-term focused ones so firm innovation is often a focus (Useem, 2015). When institutional investors prefer an innovative firm strategy, they have a large

amount of influence to get firms to adhere to an innovative strategy because a sell-off by an institutional investor will significantly drive down a firm's stock price (Davis & Thompson, 1994). The influence on a firm's strategy by managers helps to minimize the effects of managerial myopia.

Managerial myopia theory refers to the underinvestment by managers in long-term, high-risk projects, such as R&D (Bushee, 1998). Stein (1988; 1989) explains the increase in managerial myopic behavior by the short-term earnings preferences of shareholders, even when stockowners are rational investors. According to the managerial myopia theory, institutional investors value short-term financial benefits over long-term potential gains (Kochhar & David, 1996). Unlike many researchers, Graves (1988) finds a negative correlation between institutional investors and innovation; a plausible explanation for this is that money managers at institutions are reviewed and rewarded based on short-term periodic performance measures. The prevalence of institutional investors at publicly-traded companies has shifted many firms' corporate governance models and ownership structures, but activist investors are an even more dramatic driver of change at firms.

1.3.6. Activist investor. Investor activism refers to actions taken by investors to pressure managers to do what the activist investor wants them to do (Parthiban, Hitt, & Javier, 2001) by using a strategy where an activist investor purchases a large stake in a firm with the open intent of influencing the firm's policies and business activities (Klein & Zur, 2006). An activist investor is a shareholder who wants a ROI that is larger than if the activist investor is passive. An activist investor takes direct

action to get firms to change their behaviors to get a higher ROI (MacGregor & Campbell, 2008). Investor activism highlights the dissatisfaction of shareholders on firm performance, which forces managers to focus on shareholder demands and the inadequacy of managerial decisions (Parthiban et al., 2001).

Investor activism serves as a catalyst for change in an organization, has dramatic effects on firm performance, and acts as a trigger to decrease managerial power. Investor activism makes managers more responsive to the needs of investors through increased monitoring by the activist investor and the Board (Parthiban et al., 2001). Activist investors also work directly with managers. Activist investors recommend specific courses of action to management. If managers contest the recommendations, an activist investor tries to persuade management to follow the recommendations by enlisting other shareholders to suggest the activists' course of action, seek a legal remedy, or launch a proxy battle (MacGregor & Campbell, 2008). Activist investor proposals typically have one of the following characteristics:

- Preference of short-term financial results and short-term focused shareholders;
- Emphasis on investments other than capital spending, R&D expense, acquisitions, and entrepreneurship;
- Emphasis on shareholders over stakeholders (MacGregor & Campbell, 2008).

Despite the findings from MacGregor and Campbell (2008), activist investors profit from industries that are heavily vested in R&D and innovation, such as firms in the IT industry. In 2014, IT firms accounted for 20% of the firms that were an activists' target; this was more than firms from any other industry outside of firms in

the financial services industry (Ovide & Clark, 2015). Some noteworthy activist investors are Carl Icahn and Jana Partners. These activist investors have amassed a large percentage of ownership interest in several large IT firms, such as Apple, Qualcom, and Microsoft, with the goal of altering each targeted firm's excessive spending on innovative projects (Ovide & Clark, 2015). When investing in IT firms, activist investors focus on strategic rather than excessive investment in innovation. Brav, Jiang, Song, & Tian (2016) support this by finding that a firm is more efficient on spending for innovative activities after the activist investor targets the firm.

Investments in innovation are discretionary and can be perceived by an activist investor as wasteful spending by managers (Phan et al., 2016). Many activist investors perceive unpredictable outcomes associated with the innovative process; they often conclude that there is a more active and efficient reallocation of the priorities set in the innovative process than the existing model (Brav, Jiang, Partnoy, & Thomas, 2008a; 2008b). This means that activist investors help managers to re-prioritize how capital is allocated to innovative projects. While there are mixed research findings on whether activist investors prefer innovative firms, the impact of passive investors on firm innovation is researched as well.

1.3.7. Passive investor. Many institutions are passive investors and do not buy or sell shares to influence management's decisions (Appel et al., 2016). On the other hand, researchers argue that passive investors trigger idle shareholder engagement and weakened corporate governance (Kapadia, 2017). There are mixed

conclusions about the effectiveness of manager monitoring by passive investors (Appel et al., 2016).

Passive investors typically side with management's decisions on a firm's strategy more often than activist investors who motivate managers to adhere to investor preferences (Kapadia, 2017). Unlike Kapadia (2017), Appel et al. (2016) find that the amount of equity owned by passive investors is negatively correlated with the percentage of votes in support of management proposals and positively correlated with the percentage of votes in support of governance-related shareholder proposals. Activist and passive investors have input in a firm's strategy, but the Board seeks to drive initiatives that are independent of shareholder preferences.

1.3.8. Board. Board members drive a firm's corporate governance initiatives by negating any decision that demonstrates a lack of good faith for shareholders and other stakeholders (Man & Wong, 2013); this is set forth in the corporate by-laws. Corporate by-laws grant Board members the authority to endorse management initiatives, evaluate managerial performance, and direct management based on the criteria that best reflects shareholder interests (Fama & Jensen, 1983a). The Board serves as a safeguard that ensures that managers are acting in the best interests of shareholders and primary owner of a firm's governance system (Williamson, 1984); the Board has governance over a firm's innovative activities as well.

Many researchers suggest that the Board routinely reviews innovative projects when analyzing the firm's resource allocation methods (Casper & Matraves, 2003; Chung, Wright, & Kedia, 2003; Jensen, 1993; Wright & Kroll, 2002). The Board must

approve the annual budget and strategic plan submitted by management, which means they always directly influence the allocation of resources to innovative activities (Phan et al., 2016). The Board also monitors managements' activities beyond the approval of budgets and strategic plans. The two main functions that the Board performs are to monitor and to advise management (Gu & Zhang, 2016).

By monitoring and counseling management, the Board helps to link the interests of shareholders, who invest capital in a firm, and managers, who make decisions intended to create firm value (Monks & Minow, 2011). Proponents of the agency theory suggest that monitoring is best done by independent Board members so there are no motivations to ignore certain managerial behaviors (Fama & Jensen, 1983a; Fama & Jensen, 1983b; Hoskisson, Hitt, Johnson, & Grossman, 2002), which includes a short-term focus from a firm's managers. The Board is expected to promote strategies that benefit both stockholder short and long-term wealth (Baysinger et al., 1991) so they do advise on innovative strategies.

The Board facilitates successful innovative projects by offering knowledge and advisement on innovative projects to a firm's management team (Xie & O'Neill, 2013). A non-independent Board member, who is also part of the firm's operations, has a better understanding of the firm's daily activities and is more effective than independent Board members at supporting an innovative strategy to increase long-term firm value (Zahra, 1996). Baysinger and Hoskisson (1990) also find that a Board that is independent will shy away from entrepreneurial activities, such as innovative ones, when advising on long-term strategies.

Unlike independent Board members, non-independent Board members have access to information that is relevant to assessing managerial competence and the strategic desirability of innovative initiatives (Baysinger & Hoskisson, 1990). Firms that are focused on innovation are constantly facing uncertainty related to future technological advancements within the firm, and managers are unwilling to provide funding to innovative initiatives because of the potential for lack of future income gains (Baysinger & Hoskisson, 1990). By including non-independent Board members in strategy planning sessions, managers are more motivated to focus on innovative strategies because non-independent Board members have more knowledge about a firm's daily activities related to innovation.

Fama and Jensen (1983a) find that the separation of ownership and control at a firm between stockowners and managers is properly governed when Board members independently monitor the decisions of managers. Some theorists argue that independent Board members skew the direction of managerial effort from optimal risky innovative strategies to more conservative ones despite many shareholder preferences for the optimal risky ones (Baysinger & Hoskisson, 1990). On the other hand, independent Board members are more likely to protect the interests of shareholder' preferences for innovative activities because their personal wealth is not tied to the outcomes of those decisions (Phan et al., 2016). While the Board drives a firm's corporate governance, managers steer a firm's strategy, which includes the amount of capital that is invested in firm innovation.

1.3.9. Manager. An agency problem arises because managers are focused on unprofitable or short-term strategies that are not parallel with shareholders' long-term company vision (Jensen & Meckling, 1976). Managers make decisions about future investments that impact the current share price, perceived employment growth, and increased compensation and benefits (Bushee, 1998). These decisions are not always in the firm's best interests. This is known as the managerial myopic theory and relates to the pressures that managers have, which causes them to sacrifice long-term interests to boost short-term profits (Lee, 1997). Only the top managers in an organization determine the strategy related to matters such as innovation and financial leverage, which is why corporate governance is so important (Bantel & Jackson, 1989).

A corporate governance model offers incentives to managers to focus on innovation, and there needs to be careful monitoring for innovative activities to be profitable (Hoskisson et al., 2002). He and Wang (2009) support this concept by describing two key features of innovative-intensive firms as having a high degree of information asymmetry between stockowners and managers and possessing substantial managerial discretion for making decisions about the deployment of innovative knowledge. Managers are incentivized to invest in projects with faster payoffs, which are often projects other than innovative ones, because of the potential for increased short-term returns (Zeng & Horn-Chern, 2011). After all, returns from innovative projects often require considerable time and do not facilitate managerial short-term goals (Laverty, 1996). While a firm's corporate governance influences the

level of innovative activities, a firm's status as being publicly-traded influences the level of innovative activities as well.

1.3.10. Public versus private IT firms. Firm innovation is crucial for privately-held firms to be competitive in the marketplace (Wright, Hoskisson, Filatotchev, & Buck, 1998). Bernstein's (2015) research shows that once a firm goes public, the amount of firm innovation decreases. Bernstein (2015) theorizes that once a firm goes public, the strategy changes related to the level of innovative activities. To support this, managers are more motivated to engage in innovation when a firm is private versus public (Francis & Smith, 1995; Wright, Robbie, Chiplin, & Albrighton, 2000a; Wright, Hoskisson, Busenitz, 2000b). A positive relationship between private ownership and innovation is driven by an easing of the effects of the agency conflict theory (Xie, 2012).

Private ownership is an effective way to solve the agency problem because of a better alignment between stockholders and managers, which leads to strong incentives to create more wealth for the firm and each other (Xie, 2012). The privatization of a firm offers a supportive governance model that fosters innovative business activities and serves as a corporate restructuring method (Ahlstrom & Bruton, 2002). Firms are privately-held because they believe that this will improve firm performance. Privately-held firms maximize innovative initiatives to dominate in various market segments because details of innovative activities are hidden from potential competitors when a firm is privately-held (Aggarwal & Hsu, 2013).

It is expected that stockholders and managers are more motivated to focus on innovative strategies at privately-held companies (Wright et al., 2000b). Research shows that firms pursuing an IPO realize a decline in the quality of their innovations once they go public due to inventor departures and post-IPO productivity decreases (Bernstein, 2015). Harvard economist, F.M. Scherer, suggests that there is more of an affinity for innovative risk-taking from smaller privately-owned firms over corporations; this helps to explain why many of the most important innovations have originated outside of large corporations (Crouch, 2008). As is seen, most researchers confirm that private firms focus on innovation more than public firms.

1.4. Hypothesis

H_1: A firm's ownership and organizational structure significantly impacts a firm's level of innovation when a firm's Leverage, ROA, and Book to Market Value of Equity are controlled, all else being equal.

The separation of ownership and control in publicly-traded corporations creates differing views of the ideal firm strategy from the perspectives of the manager and stockholder (Jensen & Meckling, 1976). Shareholders, for the most part, are focused on helping to foster long-term firm value despite the goal of managers to gain personal benefits such as power, status, and wealth by focusing on meeting short-term financial goals (Jensen & Meckling, 1976). Highly-concentrated stockowners, such as activist, passive, and institutional investors, work closely with managers to pursue a firm strategy that creates long-term value that is often focused on innovative activities (Chen, Li, Shapiro, & Zhang, 2014).

A firm's corporate governance defines the roles of each member in a firm's organization structure of the Board, managers, shareholders, and other stakeholders, and this sets the rules for making decisions on corporate affairs (Ramaswamy, Ueng, & Carl, 2008). From an agency perspective, firms with a high number of independent Board members are more likely to make extensive evaluations of strategic decisions and management behavior (Luo, 2007), which includes the amount of capital to allocate on firm innovation.

H_2: As the level of ownership concentration by a few shareholders increases at a publicly-traded IT firm, the level of innovative activities increases, all else being equal.

Large shareholders mitigate agency problems that are driven by the misalignment of goals between investors and managers (Prowse, 1990), which includes conflicting interests regarding a firm's strategy (Lee, 1997). When stockowners have a highly concentrated stockownership interest, it is easy for them to coordinate change at a firm and demand information from management, which overcomes information asymmetries (Berle & Means, 1932). Francis and Smith (1995) find a positive correlation between ownership concentration and R&D expenses. Similarly, Lee (2005) offers empirical evidence that shows that ownership concentration by a few shareholders affects firm innovation.

H_{3a}: When a publicly-traded IT firm has at least one activist investor vested in the firm, the level of innovative activities decreases, all else being equal.

As it pertains to publicly-traded firms, short-termism refers to companies that focus on being profitable in the short-term with little regard to whether the business decisions they make will decrease firm value in the long-term; this typically entails a decrease in spending on innovative activities (Rose & Sharfman, 2014). Activist investors are often accused of suffering from short-termism to obtain a quick ROI (Kahan & Rock, 2007). Clifford (2008) provides evidence that firms that are targeted by activist investors experience increases in operating profitability, leverage, and a dividend yield, but a decrease in cash levels (Brav, Jiang, & Kim, 2009). Based on this research, the level of spending on firm innovation decreases at firms to increase a firm's operating profitability.

H_{3b}: When a publicly-traded IT firm has at least one passive investor vested in the firm, the level of innovative activities decreases, all else being equal.

Appel et al. (2016) find that there are several reasons why passive investors seek to improve firms' governance choices and performance, which are primarily motivated by fund fees that are received in relation to the performance of assets under management. An increase in passive investors is associated with an improvement in a firms' future performance (Appel et al., 2016). Also, passive investors create an environment that might be conducive for activist investment. Activist investors are known to gauge the support of a firm's largest passive institutional investor base before pursuing demands from managers (Appel et al., 2016). Because of this, passive investors influence firm spending on innovation simply by enticing activist investors

to target the same firms that they own. In turn, passive investors directly and indirectly increase the level of spending on firm innovation.

H_4: As the number of shares owned at a publicly-traded IT firm by institutional investors increases, the amount of innovative activities increases, all else being equal.

Many researchers show that institutional investors value investment in innovative activities (Baysinger et al., 1991; Hansen & Hill, 1991; Kochhar & David, 1996; Zahra, 1996). This is explained by the fact that institutional investors prefer holding shares of stock in the long-term (Useem, 2015). Institutional investors also have legal obligations to their investors to have a portfolio that maximizes returns (Useem, 2015) so they favor companies that make innovative investments that are likely to improve long-term performance. Prahalad (1994) suggests that many institutional investors cannot sell their ownership stake in a firm without significantly lowering the firm's stock price (Lee, 1997). This puts pressure on managers to adhere to institutional investor requests, which are typically to focus on the firm's long-term strategy, such as an innovative one.

H_5: Once an IT firm is a public-traded company (as opposed to being private), the level of patents and innovation decreases, all else being equal.

When firms are privately held, the agency issues associated with the separation of ownership and control are not as severe as publicly-traded companies because the owners are also managers (Aggarwal & Hsu, 2013). Private ownership is an effective method to solving the agency problem because of the alignment between the stockowner and manager, which creates incentives to create more

personal wealth (Xie, 2012). Because of this, private ownership is expected to have a positive impact on innovation (Zahra, 1995), and there are many reasons for this phenomenon. There is pressure at publicly-traded companies to control costs, which leads to decreased spending on innovative activities. Innovation at publicly-traded firms is undervalued because investors may not fully price the potential increase in firm value that result from innovative activities (Cohen, Diether, & Malloy, 2013). Based on these facts, it is more beneficial for private firms to invest in innovation in comparison to publicly-traded firms.

H_6: As the number of non-independent Board members increases, a publicly-traded IT firm has an increased number of innovative activities, all else being equal.

The Board is one of the key influencers of corporate governance, which helps to balance the agency conflicts resulting from the separation of ownership and control (Berle & Means, 1932; Williamson, 1984). Hill and Snell (1989) report a significant negative relationship between independent Board members and the level of innovation. This is explained by the fact that independent Board members have less knowledge of the businesses in comparison to non-independent Board members. With less access to information, independent Board members are less willing to focus on innovative strategies because they have a higher perceived risk of innovative projects. A non-independent Board member better understands the importance of a firm's innovative activities and perceives these as being less risky than an independent Board member.

2. Data and Descriptive Statistics

2.1. Sample of Attributes

For all the hypotheses, the dataset is from the NASDAQ's website, which lists 3,195 firms. All companies not in the technology sector are excluded from the sample, which decreases the number of firms in the sample to 433. Five companies are subsequently excluded from the sample because they don't have market capitalization numbers readily available, which decreases the sample to 428. The 100 firms with the largest market capitalization make up the sample population for hypotheses 1, 2, 3_a, 3_b, 4 and 6. During the data collection phase, there are 22 additional firms excluded from the sample due to the following reasons:

- Foreign (Non-US) issuer that does not file SEC 10-K,
- Sample lacks Board member data,
- Sample does not have or lacks some years of SEC 10-K filings,
- Company divests during one of the sample years, and
- Company launches an IPO during one of the sample years.

The sample population is 77 firms. For Hypothesis 5, the sample consists of IT firms that became publicly-traded firms from 2008 to 2016, which is an initial sample to 66. Any firms that had no patents issued are excluded as well. The final sample size is 29.

2.2. Variable Measurement

Appendix A provides summary information related to the Independent, Dependent, and Control Variables. This section provides detailed information about these sources.

2.2.1. Independent Variables.

2.2.1.1. Activist Investor. SEC Schedule 13D requires investors, who intend to influence corporate control, to disclose their ownership and intent within 10 days of having a sizable percentage of equity ownership in a public-traded firm (Brav et al., 2009). The SEC Schedule 13D filing is an important source for understanding investor activism since it provides information about the identity of the filer, filing date, ownership, cost of purchase, and most importantly, the purpose of the investment (Brav et al., 2009). As such, an organization's SEC Schedule 13D filing is the source used to gather the level of activist investors for each firm in the sample.

2.2.1.2. Passive Investor. A passive shareholder buys and holds shares of stock and sells them when the investment goal is met or a more attractive use for the funds comes along (MacGregor & Campbell, 2008). SEC Schedule 13G is a quarterly filing for an investor who passively holds a beneficial ownership interest in a firm with no intent to directly influence change at the firm (Giglia, 2016). As such, an organization's SEC Schedule 13G filing is used to measure large passive investors.

2.2.1.3. Institutional Investor. Any financial institution exercising discretionary management of investment portfolios over $100 million in qualified securities is required to report those holdings quarterly to the SEC using Schedule 13F (Appel et al., 2016). Legislative history indicates that "institutional trading also has an impact on brokerage services and on the securities industry," and it is reasonable to conclude that the SEC Schedule 13F disclosures help to foster a safer and informed securities market (Pekarek, 2007). Institutional investors own a large

equity percentage of stock in firms so their SEC Schedule 13F reports are heavily monitored. As such, an organization's SEC Schedule 13F filing is used to measure institutional investors.

2.2.1.4. Independent Board Member. Prior to a firm's Annual Shareholders' Meeting, shareholders receive a Proxy Statement, which is required by the SEC under Section 12 of the Securities Exchange Act of 1934. The Proxy Statement provides information so that shareholders can make informed decisions at an annual or special stockholder meeting. The Proxy Statement includes voting information, background information on Board members, executive compensation details, a list of the members of the Board audit committee, and a breakdown of audit and non-audit fees that are paid to the firm's primary auditor. Proxy Statements also provide information about Board member composition. Independent Board members are not on the top management team and do not have a past relationship with the firm. Non-independent Board members are top management team members who are part of the firm's existing daily operating function.

2.2.1.5. Ownership Concentration. Ownership concentration is an important variable and a frequently used measurement of HHI. The HHI is calculated using the following formula (Ginevičius & Čirba, 2007; 2009):

$$HHI = \sum_{i=1}^{N} d_i^2 ,$$

d = the market share of i-th enterprise

N = the total number of enterprises in market

The values of the HHI are between zero, which signifies a market with perfect competition where each firm in a population owns an equal percentage of ownership of the market, and one, which constitutes a pure monopoly where one firm dominates the market (Krivka, 2016). The HHI is a cumulative concentration indicator using the market shares of the enterprises as their weights (Krivka, 2016). For purposes of this study, the HHI is used to calculate ownership concentration, which is the percentage of equity ownership by highly concentrated shareholders divided by total common equity stockownership of shares outstanding at a firm. There are other methods of using the HHI to calculate ownership concentration. For example, Demsetz and Lehn (1985) calculate the HHI by calculating the ownership concentration of the top five and top 20 shareholders.

2.2.2. Control Variables.

2.2.2.1. Leverage. A firm's leverage shows how much of a company's assets belongs to creditors versus shareholders. This is an important metric because it can drive whether firms make an investment in innovative activities. Phillips (1995) shows that firms with considerable amounts of debt in comparison to equity must focus on short-term cash flow generation to cover the debt obligations rather than make investments in innovative activities. There are indications that the relationship between debt-financing and innovative investment is negative (Ortega-Argiles, Moreno, & Caralt, 2005). Other previous studies suggest that firms prefer equity-financing to debt-financing of R&D activities (Chen et al., 2010).

2.2.2.2. ROA. Firm performance influences spending on innovation (Chaney & Devinney, 1992). This is typically measured with one of two performance indicators, which are ROA and ROE. ROA is a metric for operating performance and reflects the earning power of a business (Bebchuk, Brav, & Jiang, 2015). Firm operating performance is important because a poorly performing firm has no choice but to cut spending on innovative activities to improve net income results and maintain existing share price.

2.2.2.3. Market to Book Value of Equity. Market value of equity is the total dollar market value of company's outstanding shares and is calculated by multiplying the company's current stock price by its number of outstanding shares. The book value of equity is the value of stockholder's equity as reflected on a firm's balance sheet. The market to book value of equity figure represents the difference between what the market assesses to be the economic value of common equity and what the financial statements under GAAP report (Beaver & Ryan, 1993).

2.2.3. Dependent Variable.

2.2.3.1. Innovation. Patents serve as a metric of the effectiveness of a firm's innovative activities (Levitas et al., 2011). Schmookler (1962; 1966), and Sokoloff (1988) agree that patent counts are the standard measure for innovation (Moser, 2016). Patents inform a firm's shareholders and stakeholders of the innovative capabilities of the firm, which reduces information asymmetries between stockowners and managers (Levitas & McFadyen, 2009).

A firm's size influences the amount of expenditures on innovation (Baysinger & Hoskisson, 1989). Many researchers suggest that a firm's size may be an important determinant of R&D expense and innovation because of economies of scale, and many empirical studies find that smaller firms generate more innovation per dollar of R&D expense than larger ones (Kim, Lee, & Marschke, 2009). There are studies that depict the opposite of this, which is summarized by the Schumpeterian hypothesis. The Schumpeterian hypothesis is based on the premise that large firms are more innovative than small ones for the following reasons:

- Large firms benefit from economies of scale and scope that make them more competitive in comparison to their smaller competitors;
- Large firms benefit from complementarities and spillovers between different departments;
- Large firms are favored by capital markets for the financing of risky innovative projects (Peeters & de la Potterie, 2006).

For these reasons, the Dependent Variable is a measure of innovation, and this is calculated by dividing patents by number of employees.

2.3. Methodology

Hypothesis H_1, H_2, H_{3a}, H_{3b}, H_4, H_6: Patent data is gathered for the top 100 publicly-traded IT firms from the USPTO's website for the period of 2005 through 2015. Each company in the sample is listed as the Assignee Name on the patent application. Patent issue date is the metric that defines the year that the patent is counted; patent issue date is chosen over application date because this is the date

that the innovative activities can be deployed under patent protection laws. The number of stock shares from SEC Schedules 13-D, 13-F, and 13-G filers is gathered annually for the period of 2005 – 2015. This data is collected using two different methods with the following process:

2005 through 2015 data – 13-F

The data is sourced from WhaleWisdom, which is an aggregator of publicly available financial information related to financial institutions who are required by law to file forms with the SEC. WhaleWisdom collects these figures daily. WhaleWisdom's data collection process is done in-house and is automated with little to no human intervention.

2006 through 2015 data – 13-D and 13-G

The data is collected from WhaleWisdom.

2005 data – 13-D and 13-G

WhaleWisdom does not have data for 2005; this data is sourced from the SEC's website.

Board member information is from the SEC's website in the annual Schedule 10-K documents. Each firm's end-of-year share prices are sourced from the Yahoo

finance website. All other financial metrics are from the Mergent Online, which is a financial database system.

Hypothesis H_5: Patent data for the IT firms in the sample is from the USPTO website. The initial population is the top IT firms that are traded on the NASDAQ Exchange and listed on the NASDAQ's website. The collection period of the data is from 2008 to 2016 and excludes any pre-2007 data, so results aren't skewed by the U.S. stock market crash. In 2007, The U.S. stock market experienced the worst crash in financial history since the Great Depression (Meric, Welsh, Weidman, & Marmon, 2011). After the data collection phase, an average is calculated for each sample to create the Independent and Dependent Variables pre and post IPO.

3. Empirical Results

Summary Statistics: Table 1.1 summarizes the summary statistics for the data (excluding Hypothesis 5). The mean number of patents is 108, but there is a firm in the population with 3,161 patents in a year. The sample population comprises of larger firms so the average balance sheet figures for total assets, total liabilities, and total equities is large. The average assets, liabilities, and equity (in millions) are respectively 6,800.59, 2,935.34, and 3,836.49. The average net income of the sample population is 1,057.01. The average R&D expense / sales is 467.25, but the standard deviation is 1,397.38. The average number of employees is 10,101, and the maximum number of employees is 221,700.

H_1: A firm's ownership and Board structure significantly impacts a firm's level of innovation when a firm's Leverage, ROA, and Book to Market Value of Equity are controlled, all else being equal.

The results indicate if the Control Variables (Year (2006 – 2015), Leverage, ROA, and Market to Book Value of Equity) and the Independent Variables (Institutional Investor, Passive Investor, Activist Investor, Independent Board Member, and Ownership Concentration) predict the variances in the level of firm innovation (Patents / # of Employees). As in seen in Table 1.2, there is a significant F-test ($F(19, 750) = 3.48$, $p < .01$) so we can interpret R^2 (0.08) as significant. Therefore, 8.00% of a firm's level of innovation is explained by the Independent Variables and Control Variables. The significant regression coefficients are Passive Investor ($b = 0.51$) and Independent Board Member ($b = 0.29$). Therefore, Hypothesis 1 is partially supported.

H_2: As the level of ownership concentration increases at a publicly-traded IT firm, the level of innovative activities increases, all else being equal.

The results indicate if Control Variables (Year (2006 – 2015), Leverage, ROA, and Market to Book Value of Equity) and the Independent Variable (Ownership Concentration) predict the variances in the level of firm innovation (Patents / # of Employees). As is seen in Table 1.2, the model has a significant F-test ($F(3, 647) = 2.15$, $p < .01$)) so we interpret the R^2 (0.04) as significant. 4.00% of innovation is explained by the Independent Variable and the Control Variables. The significant

regression coefficients are ROA (b = 11.22), Market to Book Value of Equity (b = -8.23), and Year 2014 (b = 8.14). Therefore, Hypothesis 2 is not supported.

H_{3a}: When a publicly-traded IT firm has at least one activist investor vested in the firm, the level of innovative activities decreases, all else being equal.

The results indicate if the Control Variables (Year (2006 – 2015), Leverage, ROA, and Market to Book Value of Equity) and the Independent Variable (Active Investor) predict the variances in the level of firm innovation (Patents / # of Employees). As is seen in Table 1.2, the model has a significant F-test ($F(3, 185) = 2.01$, $p < .05$)). The R^2 (.04) is significant, and 4.00% of the variance of a firm's level of innovation is explained by the Independent Variables and Control Variables. The only significant regression coefficient is ROA (b = 11.40). Therefore, Hypothesis 3_a is not supported.

H_{3b}: When a publicly-traded IT firm has at least one large passive investor vested in the firm, the level of innovative activities decreases, all else being equal.

The results indicate if the Control Variables (Year (2006 – 2015), Leverage, ROA, and Market to Book Value of Equity) and the Independent Variable (Passive Investor) predict the variances in the level of firm innovation (Patents / # of Employees). As is seen in Table 1.2, the model has a significant F-test ($F(3, 647) = 2.35$, $p < .01$)), and the R^2 (0.04) is significant, and 4.00% of the variance of a firm's level of innovation is explained by the Independent and Control Variables. In examining regression coefficients related to Hypothesis 3_b, several regression coefficients are significant: ROA (b = 12.75), Year 2014 (b = 8.57), Passive Investor (b

= 8.26), and Market to Book Value of Equity (b = -7.58). Therefore, Hypothesis 3_b is supported.

H_4: As the number of shares owned by institutional investors at a publicly-traded IT firm increases, the level of innovative activities increases, all else being equal.

The results indicate if Control Variables (Year (2006 – 2015), Leverage, ROA, and Market to Book Value of Equity) and the Independent Variable (Institutional Investor) predict the variances in the level of firm innovation (Patents / # of Employees). As is seen in Table 1.3, the model has a significant F-test ($F(3, 647) = 2.16$, $p < .01$)) so we can interpret the R^2 (0.04) as significant. 4.00% of the variance of innovation can be explained by the Independent and the Control Variables. The regression coefficients that are considered significant include ROA (b = 10.64), Market to Book Value of Equity (b = -8.43), and Year 2014 (b = 8.04). Therefore, Hypothesis 4 is not supported.

H_5: Once an IT firm is a public-traded company (as opposed to being private), the level of patents decreases, all else being equal.

As can be seen in Table 1.3, the means between post-IPO and pre-IPO are respectively 1.19 and 0.45. The standard deviations between post-IPO and pre-IPO are 0.60 and 0.56. As in seen in Table 1.4, the model includes the Independent Variable ANOVA results (Pre-IPO) and Dependent Variable (Post-IPO). The model did not have a significant F-test ($F(0, 13) = 4.11$, $p > 0.05$). There are no significant regression coefficients. Therefore, Hypothesis 5 is not supported.

H_6: As the number of non-independent Board members increases, a publicly-traded IT firm has an increased number of innovative activities all else being equal.

The results indicate if Control Variables (Year (2006 – 2015), Leverage, ROA, and Market to Book Value of Equity) and the Independent Variable (Independent Board Member) predict the variances in the level of firm innovation (Patents / # of Employees). As is seen in Table 1.2, the model has a significant F-test ($F(3, 646) = 3.90$, $p < .01$)) so we interpret the R^2 (0.07) as significant, and 7.00% of the variances in innovation are explained by the Independent and the Control Variables. The significant control variable regression coefficients are Independent Board Member (b = -18.02) and ROA (b = 11.15). Therefore, Hypothesis 6 is supported.

4. Discussion

Based on regression results, a firm's percentage of equity ownership by large passive investors influences its level of innovative activities. Black (1992) supports these findings and states that there is an incentive for passive managers to improve their overall performance because fund fees are based on the financial performance of assets under management. Unlike the findings from Black (1992), Appel et al. (2016) find little evidence of a change in a firms' debt issuances, capital expenditures, R&D expenses, or acquisitions when a large passive investor is present. Aghion et al. (2013) also find that there is no association between a firm's level of large passive investors and firm innovation.

Based on regression results, a firm's number of independent Board members (as opposed to non-independent ones) influences its level of innovative activities.

Osma (2008) posits that independent Board members are likely to question managerial decisions and constrain cuts on innovative activities. An increase in independent Board members facilitates and improves the monitoring of managers, which helps to ensure that they undertake profitable innovative activities (Chen, 2013). This is supported.

Based on the regression results, it is unsupported that a firm's percentage of ownership concentration by highly concentrated shareholders impacts a firm's level of innovative activities. These findings are contradictory to the findings by Hill and Snell (1988) who report a significant, positive relationship between the level of R&D spending in 94 large research-intensive companies and highly concentrated owners. Francis and Smith (1995) also find a positive correlation between ownership concentration by a few shareholders and R&D spending. One plausible explanation for this is that R&D spending is the measure of innovation rather than patent count. Unlike Hill and Snell (1988) and Francis and Smith (1995), Chandler (1990) finds that a high concentration of equity ownership by a few stockholders leads to risk avoiding choices like minimizing spending on innovation. Unfortunately, the unsupported findings of this research do not support this either.

Based on the regression results, it is unsupported that the percentage of equity ownership by a firm's institutional investors impacts the level of firm innovation. This is unlike Graves' (1988) findings, which shows a negative correlation between institutional ownership and R&D spending. The unsupported findings are contradictory to Eng and Shackell (2001) who find a positive correlation between

institutional ownership and the amount of R&D at firms. Aghion et al. (2015) find a positive correlation between the amount of equity ownership by institutional investors and firm innovation. Some researchers suggest that institutional investors emphasize short-term financial results, which implies less spending on innovative activities (Drucker, 1986; Mitroff, 1987). The unsupported finding from this research does not necessarily contradict this conclusion, but it doesn't support the finding either.

Based on the regression results, it is unsupported that a firm's percentage of equity ownership by activist investors impacts the level of firm innovation. This is contrary to critics of activist investors who claim that activist investors focus on short-term gains at the expense of long-term shareholder value (Kahan & Rock, 2007; Brav et al., 2008). The findings in this research study are contradictory to Aghion et al. (2013) who find a positive correlation between a firm's level of institutional investors and firm innovation. Interestingly, the results from this research are supported by (Brav et al., 2016) who observe that R&D spending drops significantly during a five-year period after an activist investor has a substantial ownership stake in a firm, but the level of innovative outputs, which is measured by patent counts and citation counts per patent, does not drop. These findings suggest that activist investors trigger efficient investments in innovation.

Based on the regression results, IT firms do not perform less innovative activities after an IPO is launched, and the firm goes public. These findings are not consistent with Ferreira, Manso, and Silva (2014) whose results show that private

firms take more risks, invest more in new products and technologies, and pursue more radical innovations. Similarly, Zahra (1995) finds that private ownership has a positive impact on firm innovation. Many other researchers support the notion that private ownership contributes to firm innovation (Francis & Smith, 1995; Wright et al., 2000a; Weight et al., 2000b).

5. Importance of this Research

The aim of this research is to support the notion that a firm's ownership structure and governance model impacts the level of innovative activities that occur, which is also influenced by the decisions made by managers. The separation of ownership and control in large publicly owned firms has induced potential conflicts between the interests of managers and stockholders (Baysinger et al., 1991; Berle & Means, 1932; Marris, 1964); this impacts the amount of capital funds that are allocated innovative activities. A firm's ownership structure influences the amount of innovation that occurs at firms, but it is unclear which ownership structure model is the most conducive for an innovative strategy to be successfully deployed (Chen et al., 2012).

There is contradicting evidence related to how the Board's composition and the firm's ownership structure impact the level of innovative activities that occur at a firm. Firms must innovate to remain competitive in the market and thrive in the long-term. Unfortunately, short-term earnings results are important too, which is often the focus of managers. This research supports Baysinger et al. (1991) who posit that the knowledge about the impact of institutional investors, which includes both

active and passive investors and independent Board members, on strategic strategies, such as innovative ones, is still very limited.

6. Further Research

Research shows that innovative companies have some common traits. Dominant themes in innovative firms are that they are focused on inventive and pioneering ideas (Miller, 1993). An innovative firm's general approach to doing business is to be faster and execute at a larger scale and more frequently. Further research needs to be done to determine how high the returns in the long-term are at innovative firms in comparison to non-innovative ones.

There needs to be further research on the impact of Board composition on a firm's strategy. Gender diversity on Boards is a widely researched topic due to some surprising statistics that women account for only 16.9% of Board members of Fortune 500 companies and 11.9% of Board members in Russell 3000 firms (Pargendler, 2016). Hoobler, Masterson, Nkomo, & Michel (2016) use meta-analysis to measure the direct effects that women's representation in positions such as CEOs, top management teams, and the Board, have on financial performance. The researchers suggest that women's leadership affects a firm's financial performance. This is a perfect example of a topic that can be expanded upon.

There needs to be further research on the ease at which firms can successfully innovate post-IPO versus when they have a private-ownership structure. Spiegel and Tookes (2008) and Ferreira et al. (2014) show that there is a significant correlation between public versus private status of a firm and the nature and extent of innovation

activities. Guo and Zhou (2016) find that firms with greater expansion and progress of their product pipelines in the first three years of IPOs have greater abnormal returns during the same period. Guo and Zhou (2016) also suggest that innovation capability is critical to stock performance and firm survival. These are interesting topics to further explore.

7. Limitations

1. Patent data fails to capture innovation that occurs outside of the patent system.

Patents are the outputs of innovative activities; R&D expenses are the inputs of innovative activities (Chemmanur, Loutskina, & Tian, 2014). Firm innovation does not necessarily need to be patented because companies might rely on trade secrecy of their invention over obtaining a patent. Kamien and Schwartz (1982) find that there are shortcomings with patent statistics because many patents never commercialize or are used for minor modifications of existing products.

Despite this limitation, the goal of this research is to gauge innovative activities that are unique to the firm so patent data is the most appropriate measure of firm innovation. There are several studies that use patent data as a measure of firm innovation (Kogan, Papanikalaou, Seru, & Stoffman, 2012; Seru, 2014). Chemmanur et al. (2014) justify this approach because patent data captures actual innovation output and the effectiveness of a firm's use of its innovation inputs, which is typically measured by R&D expense.

2. **The use of the HHI as a proxy for ownership concentration is inaccurate because of the difficulties of fully accounting for every concentrated stockowner at a firm (Krivka, 2016).**

The HHI is important for purposes of this analysis, but every concentrated shareholder is not captured. This data is sourced from the SEC Schedules 13-F, 13-G, and 13-D. A different approach to measuring ownership concentration is seen in Aghion et al. (2015) where the HHI measure is based on the ownership concentration of the top five shareholders.

3. **The data source for activist investors, institutional investors, and passive investors has a potential for data error.**

Most of the data related to each samples' SEC filings is sourced from WhaleWisdom. WhaleWisdom collects their data within the company, and the process is entirely automated with little or no human intervention. Without human oversight, there is a greater risk that the data error exists since we are relying on the filer to provide accurate information.

4. **The patent issue date is used rather than patent application date when collecting patent data for the sample.**

In this research, patent issue date is used. This is the date when all R&D activities are legally sanctioned and validated to allow the patent's assignee to have the exclusive use of the patented idea or product, and an innovative output is confirmed. Contrary to this approach, Griliches, Pakes, and Hall (1988) find that the

choice of application (rather than grant) year better captures the actual time of innovation.

5. **Patent data is used to measure innovation versus R&D expense.**

A firm's R&D expense is the input variable for innovation; these are the upfront costs that are spent for innovative activities to occur and potentially improve a firm's value (Chemmanur et al., 2014). Patents are the output variable of innovation; patents occur once the innovative activity has created a business concept or product that a firm or person wants to have sole proprietary rights to use. Because patents are the measure of innovation rather than R&D expense, there are variances in results of research studies that use R&D expense as the measure of firm innovation. For example, Hill and Snell (1998) find a meaningful relationship between R&D expense and the level of equity ownership by institutional investors. The findings in this research do not support the notion that there is a relationship between firm innovation, as measured by patents, and the level of equity ownership by institutional investors.

6. **The sample population consists only of IT firms that are traded on the NASDAQ stock exchange.**

The findings of this research will be different if the sample population is gathered on firms that are in different industries or traded on different stock exchanges. In Schmidt and Fahlenbrach (2016), the sample is the index constituents for the Russell 1000 and Russell 2000 indices, which serves as an alternative source for company

data. This limitation can always be alleviated by changing the sample population in further research.

8. Appendix

Appendix A

Descriptive Summary of All Variables in Hypothesis 1-4 and 6

Variable Type	Variable Type	Method	Source
Independent Variable	Activist Investors	% ownership	13-F Filings from SEC's website and Whale Wisdom
Independent Variable	Institutional Owners (Passive)	% ownership	13-G Filings from SEC's website and Whale Wisdom
Independent Variable	Institutional Owners (Active)	% ownership	13-D Filings from SEC's website and Whale Wisdom
Independent Variable	Board of Directors	Independent Board Members / Total Board Members	Annual Proxy Filings from SEC's Website
Independent Variable	Ownership Concentration	Herfindahl-Hirschman Index	Filings from SEC's website, WhaleWisdom, and Mergent Online
Control Variable	R&D expense / sales	R&D expense / Annual Sales	Mergent Online
Control Variable	Leverage	Total Debt / Total Equity	Mergent Online
Control Variable	ROA	Net Income / Total Assets	Mergent Online
Control Variable	Market to Book Value of Equity	(Company Share Price * Outstanding Shares) / (Value of Equity – Preferred Stock Equity)	Mergent Online
Dependent Variable	Patents	(Number of Patents) / Number of Employees	US Patent Website

References

Aboody, D., & Lev, B. (2000). Information Asymmetry, R&D, and Insider Gains. *The Journal of Finance, 55*(6), 2747-2766.

Aggarwal, V. A., & Hsu, D. H. (2013). Entrepreneurial Exits and Innovation. *Management Science*, *60*(4), 867-887.

Aghion, P., Van Reenen, J., & Zingales, L. (2013). Innovation and Institutional Ownership. *The American Economic Review, 103*(1), 277-304.

Ahlstrom, D., & Bruton, G. D. (2002). An Institutional Perspective on the Role Culture in Shaping Strategic Actions by Technology-focused Entrepreneurial Firms in China. *Entrepreneurship: Theory and Practice*.

Alchian, A., & Demsetz, H. (1972). Production, Information Costs, and Economic Organization. *American Economic Review, 62*, 777-795.

Appel, I., Gormley, T., & Keim, D. (2016). Passive Investors, Not Passive Owners. *Journal of Financial Economics, 121*(1), 111-141.

Bantel, K., & Jackson, S. (1989). Top Management and Innovations in Banking: Does the Composition of the Top Team Make a Difference? *Strategic Management Journal, 10*, 107-124.

Baysinger, B., & Hoskisson, R. E. (1989). Diversification Strategy and R&D Intensity in Multiproduct. *Academy of Management Journal, 32*(2), 310.

Baysinger, B., & Hoskisson, R. E. (1990). The Composition of Boards of Directors and Strategic Control: Effects on Corporate Strategy. *The Academy of Management Review, 15*(1), 72-87.

Baysinger, B., Kosnik, R., & Turk, T. (1991). Effects of Board and Ownership Structure on Corporate R&D Strategy. *The Academy of Management Journal, 34*(1), 205-214.

Beaver, W., & Ryan, S. (1993). Accounting Fundamentals of the Book-to-Market Ratio. *Financial Analysts Journal, 49*(6), 50-56.

Bebchuk, L. A., Brav, A., & Jiang, W. (2015). The Long-Term Effects of Hedge Fund Activism. *Columbia Law Review, 115*(5), 1085-1155.

Bebchuk, L. A., & Stole, L. A. (1993). Do Short-Term Objectives Lead to Under- or Overinvestment in Long-Term Projects? *The Journal of Finance, 48*(2), 719-729.

Berle, A., & Means, G. (1932; 1968). The Modern Corporation and Private Property. New York. The Macmillan Company.

Bernstein, S. (2015), Does Going Public Affect Innovation? The Journal of Finance, 70: 1365–1403.

Black, B., (1992). Agents Watching Agents: The Promise of Institutional Investor Voice. *UCLA Law Review 39*(4), 811–893.

Bloom, N., & Van Reenen, J. (2002). Patents, Real Options and Firm Performance. *The Economic Journal, 112*(478), C97-C116.

Brav, A., Jiang, W., & Kim, H. (2009). Hedge Fund Activism: A Review. *Foundations and Trends in Finance, 4*(3).

Brav, A., Jiang, W., Partnoy, F., & Thomas, R. (2008a). The Returns to Hedge Fund Activism. *Financial Analysts Journal, 64*(6), 45-61.

Brav, A., Jiang, W., Partnoy, F., & Thomas, R. (2008b). Hedge Fund Activism, Corporate Governance, and Firm Performance. *The Journal of Finance, 63*(4), 1729-1775.

Brav, A., Jiang, W., Song, M., & Tian, X. (2016). *How does Hedge Fund Activism Reshape Corporate Innovation?* Cambridge: National Bureau of Economic Research, Inc.

Bushee, B. J. (1998). The Influence of Institutional Investors on Myopic R&D Investment Behavior. *The Accounting Review, 73*(3), 305-333.

Casper, S., & Matraves, C. (2003). Institutional Frameworks and Innovation in the German and UK Pharmaceutical Industry. *Research Policy*, *32*(10), 1865-1879.

Chandler, A. (1990). *Scale and Scope. The Dynamics of Industrial Capitalism,* Cambridge, MA: The Belknap Press.

Chaney, P., & Devinney, T. (1992). New Product Innovations and Stock Price Performance. *Journal of Business Finance & Accounting*, 19, 677–695.

Chemmanur, T., Loutskina, E., & Tian, X. (2014). Corporate Venture Capital, Value Creation, and Innovation. *The Review of Financial Studies, 27*(8), 2434-2473.

Chen, H. (2013). CEO Tenure and R&D Investment: The Moderating Effect of Board Capital. *The Journal of Applied Behavioral Science, 49*(4), 437-459.

Chen, H. L., Hsu, W. T., & Huang, Y. S. (2010). Top Management Team Characteristics, R&D Investment and Capital Structure in the IT Industry. *Small Business Economics, 35*(3), 319-333.

Chen, V., Li, J., Shapiro, D., & Zhang, X. (2013). Ownership Structure and Innovation: An Emerging Market Perspective. *Asia Pacific Journal of Management, 31,* 1-24.

Chung, K., Wright, P., & Kedia, B. (2003). Corporate governance and market valuation of capital and R&D investments. *Review of Financial Economics*, *12*(2), 161-172.

Clifford, C. (2008). Value creation or destruction? Hedge funds as shareholder activists. *Journal of Corporate Finance, 14*(4), 323–336.

Cohen, L., Diether, K., & Malloy, C. (2013). Mis-valuing Innovation. Rev. Finance Studies, 26, 635–666.

Cotropia, C. (2009). Describing Patents as Real Options. *Journal of Corporation Law, 34*(4), 1127-1149.

Crouch, D. (2008). The Patent Lottery: Exploiting Behavioral Economics for the Common Good. *Geo. Mason L. Rev.*, *16*, 141.

Cubin, J., & Leech, D. (1983). The Effect of Shareholder Dispersion on the Degree of Control in British Companies: Theory and Measurement. *Economic Journal, 93*, 351-369.

Davis, G. F., & Thompson, T. A. (1994). A Social Movement Perspective on Corporate Control. *Administrative Science Quarterly, 39*(1), 141-173.

Dechow, P. M., & Sloan, R. G. (1991). Executive Incentives and the Horizon Problem: An Empirical Investigation. *Journal of Accounting and Economics, 14*(1), 51–89.

Delmar, F., Davidsson, P., & Gartner, W. B. (2003). Arriving at the High-Growth Firm. *Journal of business venturing*, *18*(2), 189-216.

Demsetz, H., & Lehn, K. (1985). The Structure of Corporate Ownership: Causes and Consequences. *Journal of Political Economy, 93*(6), 1155-1177.

Drucker, P. (1986). To End the Raiding Roulette Game. *Across the Broad, 23*(4), 1986, 30-39.

Eng, L., & Shackell, M. (2001). The Implications of Long-term Performance Plans and Institutional Ownership for Firms' Research and Development (R&D) Investments. *Journal of Accounting, Auditing & Finance*, *16*(2), 117-139.

Fama, E. F., & Jensen, M. C. (1983a). Separation of Ownership and Control. *Journal of Law and Economics. 26*(2), 301-325.

Fama, E. F., & Jensen, M. C. (1983b). Agency Problems and Residual Claims. *Journal of Law and Economics, 26*, 327-347.

Ferreira, D., Manso, G., & Silva, A. (2014). Incentives to Innovate and the Decision to Go Public or Private. *The Review of Financial Studies, 27*(1), 256-300.

Foray, D. (2010). A Primer on Patent and Innovation. *Management International, 14*(3), 19-27.

Francis, J. (1995). Agency Costs and Innovation: Some Empirical Evidence. *Journal of Accounting and Economics, 19*, 383-409.

Francis, J., & Smith, A. (1995). Agency Cost and Innovation Some Empirical Evidence. *Journal of Accounting and Economics. 19*(2-3), 383-409.

Franko, L. G. (1989). Global Corporate Competition: Who's Winning, Who's Losing and the R&D Factor as One Reason Why. *Strategic Management Journal, 10*, 449-474.

Giglia, K. (2016). A Little Letter, A Big Difference: An Empirical Inquiry into Possible Misuse of Schedule 13G/13D Filings. *Columbia Law Review, 116*(1), 105-145.

Ginevičius, R., & Čirba, S. (2007). Determining Market Concentration. *Journal of Business Economics and Management, 8*(1), 3-10.

Ginevičius, R., & Čirba, S. (2009). Additive Measurement of Market Concentration. *Journal of Business Economics and Management, 10*(3), 191-198.

Graham, J., & Harvey, C. (2002). How do CFOs make Capital Budgeting and Capital Structure Decisions? *Journal of Applied Corporate Finance*, *15*(1), 8-23.

Graves, S. (1988). Institutional Ownership and Corporate R&D in the Computer Industry. *Academy of Management Journal. 31*(2), 417-428.

Griliches, Z., Pakes, A., & Hall, B. (1988). The Value of Patents as Indicators of Inventive Activity, Working paper No. 2083, *National Bureau of Economic Research*.

Gu, Y., & Zhang, L. (2016). Busy Directors and Corporate Innovation. *Journal of Business and Educational Leadership, 6*(1), 49-62.

Guo, R., & Zhou, N. (2016). Innovation Capability and post-IPO Performance. *Review of Quantitative Finance and Accounting, 46*(2), 335-357.

Hansen, G., & Hill, C. (1991). Are Institutional Investors Myopic? A Time-series Study of four Technology-driven Firms. *Strategic Management Journal, 12*(1), 1-16.

He, J., & Wang, H. (2009). Innovative Knowledge Assets and Economic Performance: The Asymmetric Roles of Incentives and Monitoring. *The Academy of Management Journal, 52*(5), 919-938.

Hill, C. & Snell, S. (1988). External Control, Corporate Strategy, and Firm Performance in Research-Intensive Industries. *Strategic Management Journal, 9*(6), 577-590.

Hilman, H., & Kaliappen, N. (2015). Innovation Strategies and Performance: Are They Truly Linked? *World Journal of Entrepreneurship, Management and Sustainable Development, 11*(1), 48-63.

Holmstrom, B. (1989). Agency Costs and Innovation. *Journal of Economic Behavior and Organization. 12*(3), 305–327.

Hoobler, J., Masterson, C., Nkomo, S., & Michel, E. (2016). The Business Case for Women Leaders: Mete-Analysis, Research Critique, and Path Forward. *Journal of Management,* 1-27.

Hoskisson, R. E., Hitt, M. A., Johnson, R. A., & Grossman, W. (2002). Conflicting Voices: The Effects of Institutional Ownership Heterogeneity and Internal Governance on Corporate Innovation Strategies. *The Academy of Management Journal, 45*(4), 697-716.

Jensen, M. C. (1993). The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems. *The Journal of Finance*, *48*(3), 831-880.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structures. *The Journal of Political Economics. 98*(2), 225-264.

Kahan, M., & Rock, E. (2007). Hedge Funds in Corporate Governance and Corporate Control. *University of Pennsylvania Law Review, 155*(5), 1021-1093.

Kamien, M., & Schwartz, N. (1982). Market Structure and Innovation (Cambridge University Press, Cambridge).

Kapadia, R. (2017). Passive Investors are Turning Active. *Barron's, 97*(28), 1.

Kim, J., Lee, S., & Marschke, G. (2009). Relation of Firm Size to R&D Productivity. *International Journal of Business and Economics, 8*(1), 7-19.

Klein, A., & Zur, E. (2006). Hedge Fund Activism. *NYU Working Paper No. CLB-06-017.*

Kochhar, R., & David, P. (1996). Institutional Investors and Firm Innovation: A Test of Competing Hypotheses. *Strategic Management Journal, 17*(1), 73-84.

Kogan, L., Papanikalaou, D., and Stoffman, N. (2012). Technological Innovation and Growth. Working Paper, MIT.

Krivka, A. (2016). On the Concept of Market Concentration, the Minimum Herfindahl-Hirschman Index, and its Practical Application. *Panoeconomicus, 63*(5), 525-540.

Laverty, K. (1996). Economic "Short-Termism": The Debate, The Unresolved Issues, and The Implications for Management Practice and Research. *Academy of Management Review, 21*(3), 825-860.

Lee, P. (1997). A Comparison of Ownership Structures, R&D Intensity, and Innovations of U.S., German, and Japanese Firms. UMI Number: 9803626. Dissertation submitted to the Faculty of the University of North Carolina at Chapel Hill.

Levitas, E., Barker, V., & Ahsan, M. (2011). Top Manager Ownership Levels and Incentive Alignment in Inventively Active Firms. *Journal of Strategy and Management, 4*(2), 116-135.

Levitas, E., & McFadyen, M. (2009). Managing Liquidity in Research-Intensive Firms: Signaling and Cash Flow Effects of Patents and Alliance Activities. *Strategic Management Journal*, *30*(6), 659-678.

Lipton, M. (1987). Corporate Governance in the Age of Finance Corporatism. *University of Pennsylvania, 136*(1), 1-72.

Luo, Y. 2007. Global Dimensions of Corporate Governance. Malden, MA: Blackwell.

MacGregor, J., & Campbell, I. (2008). Dealing with Investor Activism: Investors seek Cash Returns from Pushing your Buttons -- There are Things you can do to Prepare for an Attack. *International Journal of Disclosure and Governance, 5*(1), 23-35.

Man, C., & Wong, B. (2013). Corporate Governance and Earnings Management: A Survey. *Journal of Applied Business Research, 29*(2), 391-418.

Mansfield, E. (1968; 1969). *Industrial Research and Technological Innovation: An Econometric Analysis*. Edwin Mansfield. New York.

Marris, R. (1964). *The Economics of Capital Utilisation* (No. 10). CUP Archive.

Mergent Online Website.
http://www.mergentonline.com.ezproxy.depaul.edu/basicsearch.php.

Meric, G., Welsh, C., Weidman, S., & Marmon, R. (2011). The Effects of the 2008 Stock Market Crash on the Managerial Behavior, Financial Characteristics, and Competitiveness of Large U.S. Corporations. *Journal of Global Business Issues, 5*(1), 11-20.

Miller, D. (1993). The Architecture of Simplicity. *Academy of Management Review, 18*(1), 116-138.

Mitroff, I. (1987). Business Not as Usual, Jossey-Bass, San Francisco, CA.

Monks, R. A., & Minow, N. (2011). Corporate Governance, John Wiley & Sons, 2011.

Morck, R., Shleifer, A., & Vishny, R. W. (1988). Management Ownership and Market Valuation: An Empirical Analysis. *Journal of Financial Economics. 20,* 293-315.

Moser, P. (2016). Patents and innovation in economic history. *Annual Review of Economics*, *8*, 241-258.

Nasdaq List of Publicly-Traded Companies.
http://www.nasdaq.com/screening/company-list.aspx.

Nicholas, T. (2010). What drives Innovation? *Antitrust Law Journal, 77*(3), 787-809.

Nicholas, T. (2011). Did R&D Firms Use to Patent? Evidence from the First Innovation Surveys. *The Journal of Economic History, 71*(4), 1032-1059.

Ortega-Argiles, R., Moreno, R., & Caralt, J. (2005). Ownership Structure and Innovation: Is there a Real Link? *The Annals of Regional Science,* 39, 637-662.

Osma, B. (2008). Board Independence and Real Earnings Management: The Case of R&D Expenditure. *Corporate Governance: An International Review, 16*(2), 116-131.

Ovide, S., & Clark, D. (2015). Tech Firms seek Ways to Fend Off Activist Investors; Some have Surrendered, but Others are Fighting Back with Tactics like Granting Founders Special Stock. *Wall Street Journal.*

Pargendler, M. (2016). The Corporate Governance Obsession. *Journal of Corporation Law, 42*(2), 359-402.

Parthiban, D., Hitt, M. A., & Gimeno, J. (2001). The Influence of Activism by Institutional Investors on R&D. *Academy of Management Journal, 44*(1), 144-157.

Peeters, C., & de la Potterie, B. (2006). Innovation Strategy and the Patenting Behavior of Firms. *Journal of Evolutionary Economics*, *16*(1-2), 109-135.

Pekarek, E. (2007). Hogging the Hedge? "Buldogs" 13F Theory may not be so Lucky. *Fordham Journal of Corporate & Financial Law, 12*(6), 1079-1181.

Perry, J., & Rainey, H. (1988). The Public-Private Distinction in Organization Theory: A Critique and Research Strategy. *The Academy of Management Review. 13*.

Phan, P., Markman, G., Balkin, D. (2016). How Corporate Governance Affects Innovation in the Pharmaceutical Industry. In Phan, P. Editor. *Academic Entrepreneurship – The Johns Hopkins University Series on Entrepreneurship* (155-184). Cheltenham, UK & Northhampton, MA: Edward Elgar Publishing Limited & Edward Elgar Publishing, Inc.

Phillips, G. (1995). Increased Debt and Industry Product Markets: An Empirical Analysis. *J. Financial Economics. 37*(2), 189-238. Porter, M. (1990). The competitive advantage of nations. *Harvard Business Review. 68*(2), 73-93.

Porter, M. (1992). Capital Disadvantage: America's Failing Capital Investment System. *Harvard Business Review, September-October.*

Prahalad, C. (1994). Corporate Governance or Corporate Value Added: Rethinking the Primacy of Shareholder Value. *Journal of Applied Corporate Finance*. 40-50.

Prowse, S., (1990). Institutional Investment Patterns and Corporate Financial Behavior in the United States and Japan. *Journal of Financial Economics, 27*(43-66), 1994.

Ramaswamy, V., Ueng, C., & Carl, L. (2008). Corporate Governance Characteristics of Growth Companies: An Empirical Study. *Academy of Strategic Management Journal, 7*, 21-33.

Rose, P., & Sharfman, B. (2014). Shareholder Activism as a Corrective Mechanism in Corporate Governance. *Brigham Young University Law Review, 2014*(5), 1015-1051.

Sappideen, R. (2011). Corporate Governance and the Surrogates of Managerial Performance. *UNSWLJ*, *34*, 136.

Schmidt, C., & Fahlenbrach, R. (2016). Do Exogenous Changes in Passive Institutional Ownership affect Corporate Governance and Firm Value? *Journal of Financial Economics. 124*(2), 285-306.

Schmookler, J. (1962). Changes in Industry and in the State of Knowledge as Determinants of Industrial Invention. *National Bureau of Economic Research, Inc.* 195-232.

Schmookler, J. (1966). Invention and Economic Growth. Cambridge, Mass.: Harvard University Press.

Schumpeter, J. (1934). *The Theory of Economic Development*. Cambridge, Mass: Harvard University Press.

Seru, A. (2014). Firm Boundaries Matters: Evidence from Conglomerates and R&D Activity. *Journal of Financial Economics, 111*, 381-405.

Shah, M., & Chattopadhyay, N. (2014). Innovation in Procurement from Rural India using Enterprise Mobility Strategy: A Case Study. *World Journal of Entrepreneurship, Management and Sustainable Development, 10*(2), 143-153.

Sokoloff, K. L. (1988). Inventive activity in early industrial America: evidence from patent records, 1790–1846. *The Journal of Economic History*, *48*(4), 813-850.

Spiegel, M., & Tookes, H. (2008). Dynamic Competition, Innovation and Strategic Financing. Working Paper, Yale University.

Stein, J. (1988). Takeover Threats and Managerial Myopia. *Journal of Political Economy, 96*(1), 61-80.

Stein, J. (1989). Efficient Capital Markets, Inefficient Firms: A Model of Myopic Corporate Behavior. *The Quarterly Journal of Economic, 104*(3), 655-669.

Tian, X., & Wang, T. (2014). Tolerance for Failure and Corporate Innovation. *The Review of Financial Studies, 27*(1), 211-255.

Tsao, S., & Chen, G. (2012). The Impact of Internationalization on Performance and Innovation: The Moderating Effects of Ownership Concentration. *Asia Pacific Journal of Management, 29*(3), 617-642.

US Patent Trademark Office's website. https:www.uspto.gov.

Useem, M. (2015). *Investor Capitalism.* John Wiley & Sons, Ltd.

Wang, C., & Ahmed, P. (2004). The Development and Validation of the Organisational Innovativeness Construct using Confirmatory Factor Analysis. *European Journal of Innovation management*, *7*(4), 303-313.

WhaleWisdom Website. www.whalewisdom.com.

Williamson, O. (1984). The Economics of Governance: Framework and Implications. *Journal of Institutional and Theoretical Economics,* 195-223.

Wong, P. K., Ho, Y. P., & Autio, E. (2005). Entrepreneurship, Innovation and Economic Growth: Evidence from GEM data. *Small business economics*, *24*(3), 335-350.

Wright, M., Hoskisson, R. E., Busenitz, L. W., & Dial, J. (2000b). Entrepreneurial Growth through Privatization: The Upside of Management Buyouts. *Academy of Management Review, 25(*3), 591-601.

Wright, M., Hoskisson, R. E., Filatotchev, I., & Buck, T. (1998). Revitalization Privatized Russian Enterprises. *Academy of Management Executive, 12(*2), 74-85.

Wright, P., & Kroll, M. (2002). Executive Discretion and Corporate Performance as Determinants of CEO Compensation, Contingent on External Monitoring Activities. *Journal of Management and Governance*, *6*(3), 189-214.

Wright, M., Robbie, K., Chiplin, B., & Albrighton, M. (2000). The Development of an Organisational Innovation: Management Buy-outs in the UK, 1980–97. *Business History*, *42(*4), 137-184.

Xie, C. (2012). How does Privatization affect Innovation? An Integrative Model. *Journal of Strategic Innovation and Sustainability, 8*(2), 80-93.

Xie, X., & O'Neill, H. (2013). Boards as Resource Providers and Monitors for Research and Development. *Journal of Business Strategies, 30*(2), 180-204.

Yahoo Finance Website. https://finance.yahoo.com/.

Zahra, S. A. (1996). Governance, Ownership, and Corporate Entrepreneurship: The Moderating Impact of Industry Technological Opportunities. *The Academy of Management Journal, 39*(6), 1713-1735.

Zeng, T., & Horn-Chern, L. (2011). Ownership structure and R&D spending: Evidence from china's listed firms. *Chinese Management Studies, 5*(1), 82-93.

Zhang, Y., & Gimeno, J. (2016). Earnings Pressure and Long-Term Corporate Governance: Can Long-Term Oriented Investors and Managers Reduce the Quarterly Earnings Obsession? *Organization Science, 27*(2), 354-372.

9. Tables and Figures

Table 1.1
Summary Statistics for the OLS Regression (t-test) Model (Hypothesis 1-4 and 6)

This table presents the summary statistics for the sample of 770, which represents 77 publicly-traded IT firms over a period of 2005-2015. The statistics are calculated at the firm level.

						Percentiles (%)		
	Mean	*Mediam*	*Std. Deviation*	*Minimum*	*Maximum*	*25*	*50*	*75*
Patents	108.29	-	394.91	-	3,161.00	-	-	36.00
Assets	6,800.59	938.26	23,801.52	21.43	290,479.00	432.51	938.26	3,517.42
Liabilities	2,935.34	326.85	11,448.72	-	171,124.00	116.23	326.85	1,420.10
Equity	3,836.49	637.02	12,767.68	-	123,549.00	241.96	637.02	2,135.66
Net Income	1,057.01	88.36	4,364.83	0.23	53,394.00	32.45	88.36	356.33
R&D / Sales	467.25	86.38	1,397.38	10.64	10,062.00	43.21	86.38	237.83
# of Employees	10,101.15	2,494.00	22,636.30	111.00	221,700.00	987.50	2,494.00	7,455.75

N = 770

** Assets, Liabilities, Equity, Net Income, and R&D / Sales are in millions*

*** All variables but Patents and # of Employees are in dollars ($)*

Table 1.2
OLS Regression (t-test) Results for Hypotheses 1-4 and 6

This table presents the Standardized Coefficients, t-values, N, r^2, and F-test for the sample of 770, which represents 77 publicly-traded IT firms over a period of 2005 – 2015. The statistics were calculated at the firm level. All variables (Years 2006 – 2015, Institutional Investor, Passive Investor, Activist Investor, Independent Board Member, Ownership Concentration, Leverage, ROA, and Market to Book Value of Equity) are treated as Independent Variables, and Innovation is the Dependent Variable. These are the regression results for all hypotheses but the fifth hypothesis.

	1	2	3_a	3_b	4	6
Dependent Variable: Innovation						
Control Variables:						
2006	0.38	1.66	(2.95)	1.57	1.67	(2.08)
	36.91	34.46	(60.80)	32.59	34.68	(43.89)
2007	0.38	1.13	(0.70)	1.09	1.20	(0.04)
	25.74	23.19	(14.41)	22.45	24.74	(0.94)
2008	0.38	1.41	(1.13)	1.04	1.56	(0.05)
	21.57	28.79	(23.32)	21.12	31.76	(1.10)
2009	0.38	2.34	(0.90)	2.61	2.30	0.64
	43.33	48.27	(18.63)	53.91	47.26	13.46
2010	0.38	0.77	(1.48)	0.84	0.81	(1.19)
	2.95	15.93	(30.56)	17.48	16.67	(25.10)
2011	0.38	4.39	2.38	4.06	4.52	2.42
	70.28	90.50	49.01	83.81	93.21	50.95
2012	0.38	4.87	2.69	5.19	4.85	2.62
	87.75	100.22	55.64	107.28	99.72	55.03
2013	0.38	4.91	2.73	5.06	4.92	3.02
	89.12	101.27	56.46	105.05	101.71	63.58
2014	0.38	8.14*	5.93	8.57*	8.04*	6.28
	160.81	167.87	122.82	177.92	165.69	132.37
2015	0.38	7.54	5.48	7.84	7.49	6.39
	154.36	154.67	113.50	162.32	153.55	134.53
Leverage	0.06	(6.45)	(5.89)	-6.34	(6.40)	(6.33)
	(133.96)	(145.47)	(131.68)	(143.40)	(144.33)	(145.07)
Return on Assets	1.33	11.22***	11.40***	12.75***	10.64***	11.15***
	305.23	294.89	299.29	331.83	277.49	297.66
Market to Book Value of Equity	0.03	(8.23)*	(8.80)	(7.58)*	(8.43)*	(6.65)
	(139.43)	(183.03)	(194.36)	(168.25)	(187.61)	(149.71)
Independent Variables						
Ownership Concentration	0.91	5.50				
	(98.49)	151.89				
Activist Investor	0.87		(2.55)			
	(68.64)		(70.06)			
Passive Investor	0.51**			8.26**		
	218.08			224.52		
Institutional Investor	0.98				5.70	
	111.28				156.24	
Independent Board Member	0.29***					(18.02)***
	(512.73)					(509.26)
N	770	770	770	770	770	770
r^2	0.08	0.04	0.04	0.04	0.04	0.07
F-test	3.48***	2.15***	2.01**	2.35***	2.16***	3.90***

*This table represents OLS regression data, which is comprised of the Standardized Coefficent (t-value). All coefficients and t-values have been multiplied by 100. *p < 0.10; **p < 0.05; ***p < 0.01.*

Table 1.3
Summary Statistics for the Hierarchical Regression Model (Hypothesis 5) – Pre / Post IPO

This table presents the summary statistics for 29 publicly-traded IT firms over a period of 2008 – 2016. The summary statistics are calculated at the firm level. There are no Control Variables. The Independent Variable is Pre-IPO patent data, and the Dependent Variable is Post-IPO patent data.

	Innovation		
	Mean	*Std. Dev*	*N*
Post-IPO	1.19	0.60	29.00
Pre-IPO	0.45	0.56	29.00

Table 1.4
Regression Results for the Hierarchical Regression Model (Hypothesis 5) – Pre / Post – IPO Data

This table presents the regression statistics for 29 publicly-traded IT firms over a period of 2008 – 2016. The regression statistics are calculated at the firm level. There are no Control Variables. The Independent Variable is Pre-IPO patent data, and the Dependent Variable is Post-IPO patent data.

Innovation - Post - IPO				
	B	*Beta*	*t*	*p*
(Constant)	0.94		4.95	0.00
Pre-IPO	0.55	0.51	2.03	0.07
F	4.11			
R^2	0.26			
N = 29				
p > .05				