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Increase in takeover protection and firm knowledge accumulation strategy

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Abstract

Research summary: We argue that the extent to which a firm faces takeover threats affects its knowledge structure. In particular, takeover threats may lead to managers' reluctance to adopt a strategy toward firm-specific knowledge accumulation because implementing this strategy requires them to acquire specialized skills, which are at risk under takeover threats. Conversely, takeover protection leads to an increase in firm-specific knowledge. Further, the relationship between takeover protection and firm-specific knowledge is positively moderated by managerial ownership, which helps align managerial interests with those of shareholders. But the relationship is negatively moderated by managerial tenure, as long-tenured managers have already committed to their firms. Using a differences-in-differences method with Delaware antitakeover rulings in the mid-1990s as an exogenous shock, we found results supporting these arguments.

Managerial summary: We examined how changes in the Delaware antitakeover rulings in mid-1990s affected the knowledge structure of firms incorporated in Delaware. We reasoned that with a greater level of takeover protection, top managers of those firms incorporated in Delaware felt higher job security, thus providing them stronger incentives to make strategic decisions toward the development of firm-specific knowledge and to make corresponding human capital investments in specialized skills. Empirically, firms incorporated in Delaware were found to have an increase in the level of firm-specific knowledge in their knowledge structure after the mid-1990s. Furthermore, our analysis suggests that the role of takeover protection on top manager incentives is particularly salient when the managers are awarded with more company shares and when the managers have shorter organizational tenure.

Keywords: takeover protection, firm-specific knowledge, firm-specific human capital, top managers, exogenous event

INTRODUCTION

The classical agency theory considers takeover threat as an external corporate governance mechanism that constrains managerial misconducts (Jensen, 1986; Jensen and Ruback, 1983). According to this view, an increase in takeover threat can enhance the disciplining power of market for corporate control, and thus, reduce agency costs (Jensen, 1986; Jensen and Ruback, 1983; Rosett, 1990). Conversely, takeover protection likely leads to greater agency cost. Empirically, some studies have found evidence consistent with the agency view (e.g., Bebchuk, Cohen, and Ferrell, 2009; Bhagat and Jefferis, 1991; Gompers, Ishii, and Metrick, 2003). For example, Gompers *et al*. (2003) and Bebchuk *et al*. (2009) documented a negative relation between the number of antitakeover provisions that a firm has in place and the market-based measures of firm performance.

However, the classical agency view of market for corporate control has been challenged by some other scholars (e.g., Hanley, 1992; Pontiff, Shleifer, and Weisbach, 1990; Shleifer and Summers, 1988), who argue that takeovers may lead to breach of implicit contracts between the target firm and its stakeholders, which can hurt the firm's value creation in the long run. Such breach of implicit contracts is often evidenced by managerial turnover, pension plan expropriation, and downsizing of target employees after hostile takeovers (e.g., Brockner, 1988; Hanley, 1992; Ippolito and James, 1992; Pontiff *et al*., 1990). Along these lines, Agrawal and Knoeber (1998) found a positive relationship between the presence of takeover threat and managerial compensation. This suggests that managers are compensated more when there is less assurance of their job security, indicating the additional cost borne by firm owners when the implicit contract with managers is lacking. Also, a more recent study by Kacperczyk (2009) found that takeover threat is associated with managers' short-term orientation in decision-making. The implicit contracts argument implies that takeover protection may benefit the firm since it helps facilitate the establishment of implicit contracts between the firm and its various stakeholders, which is often critical for long-term value creation for shareholders (Shleifer and Summers, 1988).

The existence of the two contrasting views motivates us to dig deeper into the fundamental mechanisms through which takeover protection may affect firm value creation. Following the resource-based view of the firm (Barney, 1991; Peteraf, 1993; Wenerfelt, 1984), we maintain that the firm's knowledge structure is a key strategic variable linking takeover protection with firm value. Furthermore, to reconcile the different views, we posit that boundary conditions may exist for takeover protection to generate value for the firm.

Based on these premises, this article aims to fill two gaps in the literature. First, we examine the effects of takeover protection through a new lens, that is, the knowledge structure of the firm. Mostly conducted in the area of finance, existing studies on takeover protection often focus on its impact on managers themselves or firm-level financial outcomes, including, for example, managerial ownership (Agrawal and Knoeber, 1998; Davis, 1991), CEO dismissal (Faleye, 2007), and firm financial

performance (Bebchuk *et al*., 2009; Gompers *et al*., 2003). What has been relatively overlooked, however, is how the influence of takeover on firm-manager relationship may consequentially affect firm strategies with regard to its critical resources such as knowledge base. Given that a focal interest of strategic management is firm resource positions (Barney, 1991; Peteraf, 1993; Wenerfelt, 1984) and that top managers play important roles in accumulating and deploying firm resources (Hambrick, 2005), it is critical to understand how the threat of takeover, or the absence of it, may affect top managers' strategic decision regarding firm resources. Only until recently, some studies have started to look at how takeover protection affects innovation outcomes (e.g., Atanassov, 2013; Chemmanur and Tian, 2014; Sapra, Subramanian, and Subramanian, 2014). However, their focuses have been on changes in the general quantity/quality of innovative knowledge; and their empirical results are quite mixed.[1] The current study, in contrast, examines how takeover protection affects changes in the *structure* of innovative knowledge. In particular, building on existing studies, this article examines how an increase in takeover protection affects a firm's strategic shift toward the accumulation of firm-specific (vis-à-vis general) knowledge resources, through its influence on top managers' job security and incentives.

Particularly, we argue that the accumulation and deployment of firm-specific knowledge often require the firm's top managers to invest in corresponding specialized managerial skills. Takeover threat increases the likelihood of a manager being replaced, rendering his or her investment in specialized skills obsolete (Agrawal and Knoeber, 1998). Therefore, when under the threat of takeover, top managers with foresight may be unwilling to help the firm to adopt a strategy toward the development of a greater level of firm-specific knowledge assets. On the contrary, if some mechanisms are in place to mitigate this concern, managers will become more willing to embrace a strategy based on firm-specific knowledge assets.

Second, we take into consideration of the arguments from both agency theory and implicit contract perspectives, and provide a contingency view on the role of market for corporate control. While there are still ongoing debates between these two theoretical perspectives, little effort has been made to reconcile the different views. We posit in this article that these two views are not necessarily mutually exclusive. Takeover protection may both bring benefits to the firm by facilitating the establishment of implicit contracts and reduce firm value by giving managers greater discretion to act in a self-serving manner. Thus, some basic alignment of interests between managers and owners may serve as a scope condition for takeover protection to generate desirable strategic outcomes for the firm. In particular, we argue that although takeover protection mitigates managers' concerns and leads to a strategic shift toward the acquisition of firm-specific knowledge, it may simultaneously weaken the disciplinary role of market for corporate control (Jensen, 1993). Therefore, when managerial interests are aligned with

[1] While Atanassov (2013) found that an increase in takeover protection in negatively related to innovation, Chemmanur and Tian (2014) found the opposite. Sapra *et al*. (2014), on the other hand, found that there is a U-shaped relationship between the two.

those of the firm owners through incentive mechanisms such as managerial ownership, top managers are more motivated to acquire skills necessary for implementing strategies based on firm-specific knowledge.

In addition, managers' incentives to adopt strategies based on firm-specific knowledge assets may also vary with their existing human capital investments in the firms. Therefore, we further examine the role of top manager's organizational tenure in influencing the effect of takeover protection on firm strategy regarding knowledge assets. For top managers who have longer tenure in their firms, it is more likely that they have already acquired specialized skills and have commitment to their firms, which help facilitate a strategy toward firm-specific knowledge accumulation. Thus, to some extent, managerial tenure may be considered as a substitute for takeover protection in providing managerial incentives to implement a strategy based on firm-specific knowledge. Accordingly, we expect that, in contrast to managerial stock ownership, managerial tenure in a firm would negatively moderate the effect of takeover protection on firm-specific knowledge.

To best capture these ideas, we examine the hostile takeover context in the United States. In particular, we investigate a setting that resembles a natural experiment—Delaware rulings against hostile takeovers in 1996, during which there was an exogenous change in takeover protection for Delaware-incorporated firms but not for firms incorporated elsewhere. This change provides an ideal opportunity to study the effect of takeover protection on firms' shifts of knowledge accumulation strategy.

BACKGROUND AND HYPOTHESES

Firm-specific knowledge and managerial skills investment

A firm's knowledge assets are often considered to be a critical resource for firm survival and prosperity (Coff, 1997; Grant, 1996; Kogut and Zander, 1992). Knowledge assets are often classified into two types: general and specific. General knowledge is not exclusively applicable to one business setting and is thus widely accessible by many firms. Therefore, a firm's economic gain from general knowledge is often unsustainable in the long run. In contrast, the value of firm-specific knowledge assets varies with firm settings (Becker, 1975; Williamson, 1985). Thus, firm-specific knowledge assets cannot be transferred to other business settings without a significant loss in value. This gives competitive firms less incentive to imitate or expropriate such assets (Dierickx and Cool, 1989; Helfat, 1994; Pavitt, 1991). Even if rival firms are motived to imitate firm-specific knowledge, it is often more difficult to do so, as the rival firms will have to obtain the firm-specific features and routines on which the knowledge is established (Helfat, 1994; Wang, He, and Mahoney, 2009).

Therefore, although knowledge assets in general tend to diffuse across firms, compared with general knowledge, firm-specific knowledge is more likley to generate superior performance for the firm

(Barney, 1991; Ghemawat, 1986). Consistent with this argument, some previous studies have found that self-citations of a firm's own patents, an indicator of the level of firm-specificity of knowledge, is associated with greater market value of the firm (Hall, Jaffe, and Trajtenberg, 2005; Wang and Chen, 2010; Wang *et al*., 2009).

A strategy associated with a greater level of firm-specific knowledge involves both the accumulation and deployment of such knowledge, which typically require top managers to exert a greater level of firm-specific effort by developing and utilizing the corresponding specialized managerial skills. First, acquiring firm-specific knowledge is often accompanied by local search based on a firm's existing knowledge stock (Rosenkopf and Nerkar, 2001; Wang and Chen, 2010). A successful local search, in turn, requires skills specialized to each firm setting. Although top managers may not need to acquire as much specialized technical skills as R&D employees do, they still need to have a good understanding of the knowledge structure involved to not only "know the right questions to ask his subordinates" but also know "how to evaluate the answers" (Castanias and Helfat, 1991; Katz, 1974).

Second, top managers' investment in specialized skills is needed not only in directing firm-specific knowledge accumulation process, but also in generating various "services" from those knowledge resources (Kor, Mahoney, and Michael, 2007; Penrose, 1959). For example, Building on Penrose (1959); Kor and Mahoney (2005) argue that the effectiveness of firm R&D investment is affected by managers' skills in searching for superior opportunity set for the firm's knowledge assets. The more firm-specific are the managers' skills, the more precisely can the managers assess the likelihood of success among multiple avenues of application of firm knowledge assets. Accordingly, managers with specialized skills are better able to devote resources to those avenues that are most likely to achieve success (Kor and Mahoney, 2005). Similarly, in the context of this article, we expect that specialized managerial skills are critical in transforming firm-specific knowledge into superior firm performance.

Third, implementing a strategy of accumulating and deploying firm-specific knowledge is often associated with a greater need for top managers to build close relations with key technical employees, whose technical skills are essential for the success of implementing a strategy based on firm-specific knowledge. Good manager-employee relations help obtain the mutual understanding and trust necessary to motivate those employees to cooperate in successfully implementing the firm's strategies (Wang *et al*., 2009). Relationship asset itself is likely to be specialized (Coffee, 1986; Williamson, 1985), as developing tacit and intimate knowledge about team members involves managerial experiences that are team-specific in time and place (Kor, 2003; Kor and Mahoney, 2005).

In sum, when a firm accumulates and deploys firm-specific knowledge assets, the complementary managerial skills required are also likely to increase in their specificity. Such skills are more valuable in the context of a particular firm than in any other firms, and thus, distinct from generic managerial skills and industry-related skills (Becker, 1964; Castanias and Helfat, 1991). Accordingly, managerial

incentives and actions to acquire such skills can be a key to the success of a strategy based on firm-specific knowledge assets.

Takeover threat and the knowledge accumulation strategy of a firm

Similar to other types of firm-specific investments, such as employees' firm-specific skills or human capital, top managers' specialized skills are imperfectly redeployable or valued less in the external labor market than within the firm (Becker, 1975; Williamson, 1985). A critical concern about the value of investing in such firm-specific managerial skills may surface as managers are *ex ante* more willing to acquire general skills to make themselves more mobile in the external labor market. Such a concern may easily intensify when the managers face a high level of job insecurity.

A typical market mechanism that may jeapordize managers' job security is the threat of hostile takeover. According to previous studies (e.g., Agrawal and Walking, 1994; Martin and McConnell, 1991), over 60 percent of the target firms' CEOs lost their jobs over a three-year period after the takeover. Moreover, CEOs of target firms who lost their jobs generally failed to find another senior executive position in any public corporation within three years after the bid. Hence, top managers have a reason to fear the loss of the value of their skills in the event of takeover, especially if the skills are specialized to individual firms. Moreover, while contracting between the managers and shareholders often allows managers some rents to compensate their investments in specialized skills, the threat of takeover interferes with such contracting and reduces the reliability of shareholder assurances. As a result, managerial investment in specialized skills has greater potential of losing its value when takeover protection is weaker (Shleifer and Summers, 1988).

Therefore, managers who are subject to high takeover threats may decide to prevent the firm from pursuing the strategy toward more firm-specific knowledge, in which case their personal investments in specialized skills are required to increase accordingly. Instead, they would rather adopt a firm strategy of accumulating a higher level of general knowledge assets, even though it may not be in the best interest of shareholders. In this case, governance provisions that support and protect managers should be in place in order for top managers to be rest assured in investing in firm-specific human capital (Knoeber, 1986; Lambert and Larcker, 1985). Takeover protection can be considered such a provision. When there is an increase in takeover protection, the managers will be more assured of the value of their specific investments, and as a result, they will be more likely to adopt a firm-level strategy based on a higher level of firm-specific knowledge. And, such a strategic shift will be reflected on the firm's knowledge structure and resource configuration. We thus propose:

Hypothesis 1: With an increase in takeover protection, a firm is more likely to experience an increase in the level of firm-specific knowledge assets.

The moderating role of managerial ownership

We have just argued that takeover protection increases the managerial incentive to acquire specialized skills, leading to a firm's strategic shift toward a greater emphasis on firm-specific knowledge. However, increased job security may also give managers greater discretion to pursue other personal agendas (Jensen and Meckling, 1976; Shen and Cho, 2005), which may divert some of the managerial attention and effort away from acquiring necessary skills, including specialized ones. For example, Jensen (1993) argues that in the absence of takeover threats, managers may not have a strong incentive to engage in value-enhancing activities. Therefore, although takeover protection reduces managers' concerns about losing the value of their specialized skills, it may also decrease their incentive to exert efforts to acquire such skills in the first place, deterring the managers from making the necessary strategic shift toward a greater emphasis on firm-specific knowledge.

Therefore, the challenge is to make managers less concerned about losing the value of their specialized investments by having antitakeover devices, but at the same time to constrain their incentives to pursue their self-interests at the shareholders' expense. One solution is to directly link managers' investments in specialized skills to rent appropriation by granting them stock ownership. From the agency viewpoint, managerial ownership serves as a form of interest alignment between managers and owners because managers' personal gains are tied to the economic value of the firm. Equity ownership may prevent managers from engaging in self-interested agency behavior, such as shirking in exerting effort to acquire specialized skills (Demsetz and Lehn, 1985; Jensen and Meckling, 1976). Also, from the perspective of property rights (e.g., Demsetz, 1967; Libecap, 1989), equity ownership rights represent residual rights of control, which can give managers some bargaining power with respect to the distribution of rents (Grossman and Hart, 1986; Hart and Moore, 1990). With the increased ability to appropriate the returns from their investments in specialized skills, managers will be more convinced to invest in such skills (Castanias and Helfat, 1991, 2001). As a result, they are more likely to direct the firm toward accumulating a higher level of firm-specific knowledge assets.

Therefore, although an increase in takeover protection is expected to increase the likelihood of a firm's strategic shift toward accumulating more firm-specific (vis-à-vis general) knowledge, this tendency is influenced by the extent to which top managers' interests are aligned with those of shareholders. With an increase in management ownership, the increased takeover protection is better able to induce managers to acquire specialized skills and to change the firm's strategic orientation successfully.

Hypothesis 2: As top managers' stock ownership increases, the effect of takeover protection on a firm's level of firm-specific knowledge assets will become stronger.

The moderating role of organizational tenure of top managers

Job security provided by an increase in takeover protection may give a firm's top managers stronger incentive to invest in specialized skills. However, at a certain point in time, top managers may vary in

the level of firm-specific skills they already possess and the commitments to their firms. We argue below that for those top managers who for some other reasons already acquired a substantial amount of specialized skills, the motivating role of takeover protection may become weaker.

A key source of specialized skills acquisition is often considered to be associated with top managers' tenure in a firm (Henderson, Miller, and Hambrick, 2006; Kor and Mahoney, 2005; Simsek, 2007; Souder, Simsek, and Johnson, 2012). Managers with long tenure in a firm have rich experiences of the firm's unique organizational routines as well as tacit knowledge of existing firm-level resources and capabilities and their rent-generating potentials (Kor and Mahoney, 2005). Moreover, managers with long tenure in a firm are likely to have already built strong, or at least, mutually acceptable, relationships with the key employees, which provide necessary motivations for the employees to cooperate in implementing a new strategy, especially if the strategy is based on firm-specific knowledge. Thus, long-tenured managers would have already acquired much of the specialized skills necessary to form the base of a strategy toward developing firm-specific knowledge. In contrast, for top managers who have relatively short tenure in a firm, they lack the firm-specific experiences and tacit knowledge necessary to implement a strategy toward firm-specific knowledge accumulation (Lazear, 2009). Moreover, as relationships are often established and tested over time, such managers are also less likely to have close relationships with the key employees. As developing firm-specific skills and building relationships with employees will have to be done from anew, the cost of doing so for managers with short tenure would be much higher than that for long-tenured managers, who already have certain level of such skills and relationships. In order for short-tenured managers to acquire specialized managerial skills, they must find some additional incentives to justify the value of their investment in such skills.

Therefore, the job security provided by takeover protection should matter more to short-tenured managers than to long-tenured managers in that top managers with relatively long organizational tenure are already committed to their firms, and would be more willing implement such a strategy even in the absence of takeover protection. Thus, managerial tenure can to a certain extent be considered as a substitute for takeover protection in providing managerial incentives. Accordingly, we expect that, in contrast to managerial stock ownership, managerial tenure negatively moderate the effect of takeover protection on the level of firm-specific knowledge.

Hypothesis 3: As the organizational tenure of top managers increases, the effect of takeover protection on a firm's level of firm-specific knowledge assets will become weaker.

SAMPLE AND METHODS

Our theory highlights the role of takeover protection in mitigating top managers' concern over their personal risk if they direct the firm's strategy toward accumulating more firm-specific (vis-à-vis

general) knowledge assets. One way of testing this prediction would be to look at antitakeover provisions that firms typically adopt, including, for example, poison pills, staggered boards, and so on, and then examine the relationship between the extent to which firms adopt these provisions and the level of firm-specific knowledge. Previous studies have adopted such approaches to examine the relationship between antitakeover provisions and some firm-level variables such as managerial compensation (Agrawal and Knoeber, 1998; Davis, 1991), firm financial performance (Bebchuk *et al*., 2009; Gompers *et al*., 2003), CEO dismissal (Faleye, 2007), and R&D intensity (O'Connor and Rafferty, 2012). The drawback of such an approach is that the adoption of antitakeover provisions is likely to be endogenous. Specifically, the relationship between takeover protection and various firm characteristics is subject to the problem of reverse causality—the relationship may be significant not because antitakeover provisions affect firm characteristics, but because these firm characteristics affect the adoption of antitakeover provisions.

This endogeneity problem may, to a certain extent, be addressed by some econometric approaches such as firm fixed effects (when using panel data) and instrumental variables. However, such approaches have their own limitations,[2] which prompted us to use a natural experiment that can effectively mitigate endogeneity bias (Wooldridge, 2002). Specifically, the empirical setting of the present article is around the period of the "third-generation" antitakeover legislation in the United States in the mid-1990s.

Before the mid-1990s, Delaware's legal system had been relatively friendly to takeovers. However, several Delaware law cases in the mid-1990s, namely, *Carson Pirie Scott & Co. v. Younkers* (1994), *Unitrin Inc. v. American General Corp*. (1995), *Moore v. Wallace Computer* (1995), and *US Surgical v. Circon* (1996), led to a significant takeover regime shift.[3] Specifically, The Younkers, Wallace, and Circon (YWC) cases legitimized the use of poison pills in conjunction with a staggered board for firms incorporated in Delaware. Poison pills are a typically adopted takeover defense that dilute the share ownership of the acquirer by enabling the target firms' existing shareholders to purchase shares at a discount. A staggered board restricts the replacement of a firm's directors to a certain fraction in a year. This provision makes taking control of a firm difficult for a raider because the raider cannot immediately remove incumbent directors, who may, in the meantime, adopt policies that can harm the raider's wealth. The Unitrin ruling further expanded the circumstances under which a hostile bid was considered a threat and relaxed the judicial scrutiny in the proportionality review (Gilson, 2001). As a result, while the other three cases mainly apply to Delaware firms with staggered board, Delaware Supreme Court's ruling on Unitrin (decided in January 1995) more broadly affected all Delaware firms. As Subramanian (2004) noted, "at the same time that the YWC trilogy was solidifying Just Say No for the majority of public corporations that

[2] For example, firm fixed effects estimations eliminate firm-level heterogeneity, and it is not suitable when error terms are correlated; the effectiveness of an instrumental variable approach, on the other hand, is constrained by the quality of the instrumental variables chosen, which are notoriously difficult to find.
[3] Please refer to Subramanian (2004) for a more detailed discussion.

have staggered boards, Unitrin was strengthening the Just Say No defense for companies more generally."

Since antitakeover laws are typically supported by a small number of firms rather than by large coalitions (Romano, 1987), these legal changes should be regarded as exogenous events for most firms, and thus, can be used as natural experiments in which the corporate governance environment is exogenously altered for firms incorporated in the legislated states. Another benefit of our focus on Delaware's legal shift in takeover is the wide scope of its influence on the U.S. economy. Many U.S. firms (57% in our sample) are incorporated in Delaware, and all Delaware-incorporated firms are affected by the legal change regardless of their specific locations of operations.[4]

Data

We formed our sample from the intersection of (1) the Compustat annual industrial file and Execucomp database, (2) the NBER patents file (Hall, Jaffe, and Trajtenberg, 2001), (3) IRRC (now RiskMetric) database, and (4) Compact Disclosure database. The sample period is from 1992 to 1999. In keeping with prior studies (e.g., Kacperczyk, 2009), we treated 1996 as the first year following the legislation. We used an eight-year window to compare the effects. Thus, the sample period covers four years before and after the legislation event.

We began our sample selection from firms in manufacturing industries (four-digit Standard Industrial Classification [SIC] codes from 2000 to 3999) in Compustat. This selection enabled us to construct a sample of firms that share some common characteristics in terms of their knowledge accumulation processes, but provided sufficient variation in terms of the level of knowledge specificity. We then merged the data with the NBER patents file assembled by Hall *et al*. (2001). The file, which is based on the patents filed by U.S. firms with the U.S. Patent Office, contains rich information on patents and citations. Data on the historical state of incorporation were obtained from the IRRC database. Managerial ownership data were collected from Compact Disclosure, which contains extensive corporate governance data extracted from the annual reports, 10Ks, and proxy statements. Execucomp provides data on top managers' organizational tenure and stock options. After merging all the datasets, we obtained a base sample of an unbalanced panel containing 307 firms and 1,396 firm-year observations.

Measurements

Our measures of the *level of firm-specific knowledge* were constructed using patents and their citations. Patent citations provide direct evidence of the path of knowledge flow and spillovers

[4] Note that firms seldom change their states of incorporation. In fact, only one firm in our sample changed its Delaware incorporation. Therefore, there is not a concern for endogeneity regarding the state of incorporation in our study.

because each patent normally identifies several others as constituting the state-of-the-art technology on which it is built. The data enable the tabulation of both backward citation (the previous patents that a focal patent cites) and forward citation (the patents that subsequently cite a focal patent). Distinguishing whether the citations are made within the same firm vis-à-vis by other firms is also possible.

Previous research has used patent citations to address the questions on spatial diffusion (Jaffe, Trajtenberg, and Henderson, 1993), international knowledge flows (Jaffe and Trajtenberg, 1999), and spillovers from public research (Jaffe and Lerner, 2001). Firm-specific knowledge often results from searching and accumulating new knowledge on top of a firm's established knowledge base (Cohen and Levinthal, 1989; Teece, 1986).[5] If patents represent knowledge creation,[6] and patent citations represent knowledge flows, then the frequency with which a firm's existing patents cite its own previous patents indicates the degree to which the firm's new knowledge is built on its own knowledge base. The higher the level of internal accumulation is, the more likely that the firm's knowledge assets are firm specific. This logic supports the construction of a measure of firm-specific knowledge assets using patent citations. Accordingly, we build on previous studies (Hall *et al*., 2005; Wang and Chen, 2010; Wang *et al*., 2009) to generate two proxies for the level of firm-specific knowledge as follows:

Firm-specific Knowledge 1 = Share of backward self-citations (over total citations) made by the focal firm × the extent to which these self-cited patents are subsequently cited by the focal firm6

Firm-specific Knowledge 2 = Number of backward self-citations made (adjusted by the number of employees) × the extent to which these self-cited patents are subsequently cited by the focal firm

The two measures capture two dimensions of firm-specific knowledge. Whereas the first dimension is about the degree of firm specificity in a firm's knowledge assets, the second is about the absolute level of firm-specific knowledge in a firm. Specifically, the first measure is the share of self-citations made, calculated based on counting all citations made in a firm's new patents in a certain year that cited the firm's own previous patents then dividing this number by the total number of citations made in all of the firm's new patents in that year. The second proxy is a count measure, calculated as the number of prior self-citations made (adjusted by the number of employees). We further performed a logarithm transformation of the count measure, given its apparent skewness. Both measures are further adjusted

[5] Some recent research in corporate governance has also applied patent citation patterns to measure firm-specific investments. For example, Kale, Kedia, and Williams (2011) use citations by customers and suppliers to construct measures of relationship-specific investments between a firm and its major stakeholders. Bena and Li (2012) use patent cross-citations between bidders and acquirers to measure specific investment between merger partners.

[6] To facilitate presentation, in the empirical analyses, we further scale the share-based measure of firm-specific knowledge by multiplication of 100.

by a weight, the extent to which backward self-cited patents are subsequently cited by the focal firm, which is the fraction of the total forward citations of these self-cited patents that are generated by the focal firm (vs. by other firms). The weight is added to address the concern that, "even though a firm cites its own previous patents, if these previous patents are also widely cited by other firms (which makes the weight rather small), the degree of firm-specificity in knowledge as measured by the count of self-citations made should be discounted" (Wang *et al*., 2009: 929).

To elaborate these measures further, suppose a firm has 10 patents in the focal year and that these patents have made 50 backward citations, 15 of which are the firms' own patents (35 are external patents of other firms). Moreover, forward in time from the focal year, these 15 self-cited patents are cited by 80 patents, 20 of which belong to the focal firm (60 are external patents). Then, a simple share-based measure of firm-specific knowledge for that year would be 15/50 = 0.3, and the count-based measure would be 15. After the weight (20/80 = 0.25) is incorporated, the share-based measure becomes $0.3 \times 0.25 = 0.075$,[7] and the count-based measure becomes $15 \times 0.25 = 3.75$.

Public firms in the United States are required to disclose the stock ownership of all officers and directors (both in amount and in fraction of total common shares) in their proxy statements. Following prior studies (e.g., Anderson and Lee, 1997), we obtained this information from Compact Disclosure and used the fraction number (in percentage) of shareholding by all officers and directors to measure *managerial ownership*. Execucomp database documents the number of years for which a CEO has joined a firm, which was used to measure CEO's *organizational tenure*.

Control variables

In keeping with prior research, we controlled for the effects of other possible determinants of the firm's knowledge accumulation strategy, including firm *cash holdings, performance relative to aspirations, financial leverage, return on assets, market to book ratio, R&D intensity, firm age, firm size, and managerial options*. Firms may decide whether to make a strategic shift in their knowledge search based on the available level of slack or cash holdings (Cyert and March, 1963; Greve, 2007). Similarly, some firms' knowledge accumulation decision may be influenced by financial leverage or the extent to which they are exposed to financial distress (Ketchen and Palmer, 1999; March and Shapira, 1987). According to the behavioral theory of the firm, aspiration levels and firm performance in general may also influence firms' knowledge search and accumulation strategy (Cyert and March, 1963; Greve, 2007; Levinthal and March, 1981). In addition, managerial options holding may influence top managers' risk preferences (e.g., Wiseman and Gomez-Mejia, 1998), and thus, incentives to adopt a strategy toward firm-specific knowledge accumulation.

[7] With multiplication of 100, the unweighted share-based measure becomes 30 and weighted measure becomes 7.5.

Firm *cash holdings* was measured by cash and short-term investments divided by total assets. *Financial leverage* was the book value of debt divided by total assets. We used *return on assets* (earnings before interest and taxes over total assets) to measure firm profitability. *Financial performance* was measured by *market to book ratio,* or the market value of equity plus total assets minus the book value of equity all divided by total assets. *R&D intensity* was measured by the R&D expenditure divided by total assets. We extracted *firm age* data from Compustat. *Firm size* was proxied by the natural logarithm of a firm's total assets. We followed Levinthal and March (1981) and Lant (1992) to model aspiration as a function of the exponentially weighted moving average of a firm's past performance. In particular, a firm's current aspiration level (at time t) was calculated as the weighted average of the firm's performance and its aspiration level in the previous period (at t – 1). And *performance relative to aspiration* is then the difference between the performance at this period and the current aspiration level. Following Fenn and Liang (2001), we calculate *managerial options* as the sum of the number of unexercisable options and the number of exercisable options held at the year end by all executives listed at Execucomp database divided by the number of common shares outstanding (multiplied by 100). In addition, we also included firm and year dummy variables in all models.

Empirical analysis

We tested the hypotheses using a differences-in-differences (DD) methodology, which is commonly used in labor economics.[8] The DD approach compares the effect of a policy (antitakeover legislation in the present study) on a group that is affected by the policy (Delaware-incorporated firms) with that on a group that is unaffected (non-Delaware-incorporated firms). Suppose we want to estimate the effect of a policy on the treatment group (denoted by *T*). To find the effect of the policy on the outcome variable *y*, we can subtract the average outcome value before the policy taking effect from that after the event for the treatment group, that is, $\bar{y}_{T,After} - \bar{y}_{T,Before}$

This difference gives the change in the average outcome variable during the event window. However, other variables that affect the outcome variable, such as macroeconomic conditions, may also change during the event window. Therefore, we need a control group (denoted by *C*) to account for these other common shocks that affect *y*. Thus, we subtract the average outcome before the event from that after the event for the control group. This difference gives us the counterfactual: Without the treatment, how would the treated firms' outcomes change during the event window? The policy effect can then be calculated by subtracting the difference for the control group from that for the treatment group, that is,

[8] See Meyer (1995) or Imbens and Wooldridge (2009) for a more detailed exposition of the DD methodology.

$$(\bar{y}_{T,After} - \bar{y}_{T,Before}) - (\bar{y}_{C,After} - \bar{y}_{C,Before})$$

The double differences enable us to control for the common shocks that can affect both groups. Thus, differencing in this manner eliminates biases on the treatment group that may arise from any common shock affecting both groups during the event window.

Following Bertrand, Duflo, and Mullainathan (2004), our DD estimation equation for firm-specific knowledge assets (FS) is as follows:

$$FS_{it} = \alpha_t + \alpha_i + \beta Takeover\_protection_{it} + \gamma X_{it} + \varepsilon_{it,}$$

where *i* indexes firm and *t* indexes year. FS_{it}, the dependent variable of interest, is the level of firm-specific knowledge assets. *Takeover_protection* is a dummy variable equal to 1 if (1) the year is greater than or equal to 1996 and (2) the company is incorporated in Delaware; and 0 if otherwise. X_{it} is a vector of control variables. α_i and α_t are firm and year fixed effects, respectively. The coefficient β is the DD estimator, measuring the effect of an increase in takeover protection. In the extended model, we added to the above equation the interaction term between managerial ownership and takeover protection, and that between managerial tenure and takeover protection, respectively, in order to test Hypotheses 2 and 3.

Following prior studies (e.g., Low, 2009), we winsorized all continuous variables at one percent for both tails to mitigate the influence of outliers. Also consistent with prior studies (e.g., Bertrand *et al*., 2004), we adjusted our standard errors by clustering the observations at the state of incorporation level to accounts for arbitrary correlation across firms incorporated in the same state, as well as serial correlation within the same firm.

Following Bertrand *et al*. (2004), all models were estimated by OLS with firm fixed effects. We used firm fixed effects instead of random effects models for two reasons. First, fixed effects models, which require weaker distribution assumptions, are considered to provide more robust estimations (e.g., Cameron and PK. Trivedi, 2005). In fact, most studies employing the DD method used the fixed effects models (e.g., Bertrand and Mullainathan, 2003; Low, 2009; Yun, 2009). Second, we conducted a Hausman test, and it showed that the fixed effects models were more appropriate than random effects models for our setting.

RESULTS

Table 1 shows the descriptive statistics of the key variables for our sample. The mean value of firm-specific knowledge based on the share measure is 3.55, and that based on the count measure is 0.93. As expected, the two measures of firm-specific knowledge resource are highly correlated with a

coefficient of 0.52. Moreover, both measures are significantly and positively correlated with takeover protection, cash holdings, market to book ratio, and managerial options. On the other hand, they are negatively correlated with return on assets.

Table 1. Descriptive statistics and correlation matrix

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Firm-specific knowledge (share-based measure)	3.55	4.15													
2 Firm-specific knowledge (count-based measure)	0.93	1.00	0.52												
3 Takeover protection	0.27	0.44	0.07	0.20											
4 Cash holdings	0.13	0.16	0.08	0.35	0.09										
5 Performance relative to aspiration	0.00	0.06	−0.05	−0.02	−0.05	−0.07									
6 Financial leverage	0.20	0.13	0.01	−0.16	0.10	−0.42	−0.01								
7 Return on assets	0.16	0.10	−0.07	−0.13	−0.07	−0.25	0.31	−0.09							
8 Market to book ratio	2.38	1.63	0.08	0.28	0.10	0.42	0.04	−0.30	0.22						
9 R&D intensity	0.06	0.07	0.01	0.35	0.07	0.63	−0.11	−0.33	−0.36	0.37					
10 Firm age	29.68	15.55	0.01	−0.24	−0.08	−0.53	0.06	0.31	0.14	−0.18	−0.42				
11 Firm size	7.48	1.53	−0.04	−0.20	0.00	−0.44	0.05	0.29	0.28	−0.10	−0.38	0.63			
12 Managerial ownership (%)	6.52	8.63	0.03	0.05	−0.01	0.06	−0.04	−0.14	−0.06	0.05	0.03	−0.34	−0.39		
13 Managerial options	2.18	2.34	0.07	0.23	0.16	0.35	−0.12	−0.08	−0.34	0.08	0.39	−0.38	−0.53	0.15	
14 Managerial tenure	19.41	12.37	0.04	−0.15	−0.01	−0.35	0.03	0.14	0.13	−0.12	−0.36	0.44	0.39	−0.02	−0.27

n = 1,396.
Correlations larger than 0.05 are significant at the level of $p < 0.05$ and those larger than 0.07 are significant at the level of $p < 0.01$.

Table 2 presents the empirical results of the models using the degree (or share-based) measure of firm-specific knowledge assets. The standard errors were clustered at the state of incorporation level. The coefficients for the takeover protection dummy variable indicate the effect of the Delaware takeover regime shift on firm-specific knowledge accumulation, which is one of the main interests of the current study.

In Model 1, we included the control variables only. We found that firm aspiration is negatively and significantly associated with the share-based measure of firm-specific knowledge. The estimated coefficients on the control variables also indicates that more profitable firms, older firms, and firms whose CEOs had longer managerial tenure have higher firm-specific knowledge. The effects of some other variables, including financial leverage, firm size, and R&D intensity, are statistically insignificant.[9]

[9] This is not too surprising because it is generally more difficult to find significant results with firm-fixed effects estimations, as such models explore only within firm variation but exclude cross-sectional variation.

Table 2. Takeover protection and firm knowledge accumulation strategy (DV: firm-specific knowledge using share-based measure)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Cash holdings	1.231		1.363	1.788*	1.438	1.855*
	(1.057)		(1.073)	(1.021)	(1.040)	(0.994)
Performance relative to aspiration	−3.543**		−3.428**	−3.511***	−3.360***	−3.447**
	(1.130)		(1.198)	(1.254)	(1.191)	(1.249)
Financial leverage	1.768		1.681	1.795	1.677	1.791
	(1.855)		(1.855)	(1.859)	(1.858)	(1.861)
Return on assets	2.658**		2.647**	3.178**	2.576**	3.109**
	(1.120)		(1.167)	(1.286)	(1.154)	(1.275)
Market to book ratio	0.146*		0.144*	0.162*	0.146*	0.164*
	(0.083)		(0.082)	(0.089)	(0.083)	(0.089)
R&D intensity	0.207		0.347	0.651	0.429	0.725
	(1.577)		(1.550)	(1.555)	(1.538)	(1.540)
Firm age	0.158***		0.121**	0.125**	0.125**	0.129**
	(0.033)		(0.052)	(0.050)	(0.051)	(0.049)
Firm size	0.019		−0.017	−0.039	−0.052	−0.071
	(0.179)		(0.167)	(0.170)	(0.174)	(0.177)
Managerial ownership	0.017		0.017	−0.004	0.018	−0.003
	(0.015)		(0.015)	(0.013)	(0.015)	(0.013)
Managerial options	0.018		0.010	−0.012	0.002	−0.020
	(0.080)		(0.082)	(0.075)	(0.080)	(0.073)
Managerial tenure	0.023**		0.023**	0.019*	0.030**	0.026**
	(0.010)		(0.011)	(0.011)	(0.012)	(0.012)
Takeover protection		0.588**	0.542**	−0.097	1.000***	0.335
		(0.233)	(0.227)	(0.237)	(0.235)	(0.239)
Takeover protection × managerial ownership				0.104***		0.103***
				(0.004)		(0.005)
Takeover protection × managerial tenure					−0.021***	−0.020***
					(0.005)	(0.005)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,396	1,396	1,396	1,396	1,396	1,396
R-squared	0.751	0.748	0.751	0.756	0.752	0.756

Clustered standard errors are shown in parentheses.
Significant at the *p < 0.10; **p < 0.05; ***p < 0.01 level.

Following Bertrand and Mullainathan (2003), in Model 2, we included only the takeover protection variable. We found its coefficient to be positive and significant. In Model 3, we included takeover protection and other control variables, and again found the coefficient of the takeover protection to be positive and significant ($p = 0.025$). Regarding its economic significance, a coefficient of 0.542 represents a 15.3 percent increase in the mean degree of firm-specific knowledge assets in response to the change in takeover protection. The findings strongly support Hypothesis 1.

We further investigated the moderating effect of managerial ownership in Model 4. Consistent with Hypothesis 2, the interaction term is significant and positive, indicating that the firms with higher managerial ownership are more likely to increase their levels of firm-specific knowledge as a result of stronger takeover protection. To understand the practical implication of this significant interaction, we computed the high and low values of managerial ownership by adding and subtracting half standard

deviation[10] from its mean, which are 10.84 and 2.21, respectively. At the high value of managerial ownership (10.84), the effect of takeover protection was 1.03 (= –0.097 + 10.84 × 0.104), representing a 29.0 percent increase in the mean degree of firm-specific knowledge assets in response to change in takeover protection. This effect became 0.13 at low value of managerial ownership (2.21), representing only a 3.7 percent increase in firm-specific knowledge assets.

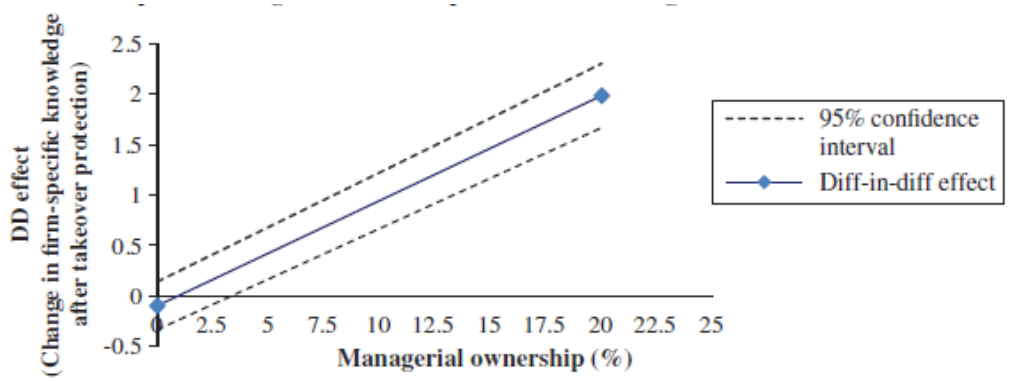
In Model 5, the interaction term between managerial tenure and takeover protection was entered. As expected, the term is significant and negative, suggesting that the firms with CEOs having a longer tenure are less likely to increase their levels of firm-specific knowledge with stronger takeover protection. This is consistent with Hypothesis 3. Again, we computed the high and low values of the managerial tenure by adding and subtracting half standard deviation from its mean. At the high value of managerial tenure (25.60), the effect of takeover protection was 0.46 (= *1 + 25.60 × (–0.021)*), representing a 13.0 percent increase in the mean degree of firm-specific knowledge assets in response to change in takeover protection. The effect became 0.72 at low value of managerial tenure (13.23), representing a 20.3 percent increase in firm-specific knowledge. Finally, we included all variables in Model 5 and found results consistent with those in partial estimations.

Figure 1 shows the moderating effects of managerial ownership and CEO organizational tenure. Please note that due to our use of differences-in-differences (DD) methodology, the figure is different from typical two-way interaction graphs (Younge, Tong, and Fleming, 2015).[11] In particular, the horizontal axis in Figure 1 is the moderating variable (managerial ownership and organizational tenure of top managers, respectively), while the vertical axis is the *DD effect*, or *change in dependent variable before and after takeover law shifts*. The magnitude of the DD effect and the confidence-intervals are calculated using the estimated coefficients and standard errors. Consistent with Hypothesis 2, which states that managerial ownership strengthens the effect of takeover protection on firm-specific knowledge, Graph 1 in Figure 1 reveals that the DD effect, or the change in firm-specific knowledge assets after takeover protection, becomes greater with an increase in managerial ownership. Also consistent with Hypothesis 3, Graph 2 indicates that the DD effect, or the effect of takeover protection on firm-specific knowledge, is weaker for firms with longer managerial tenures.

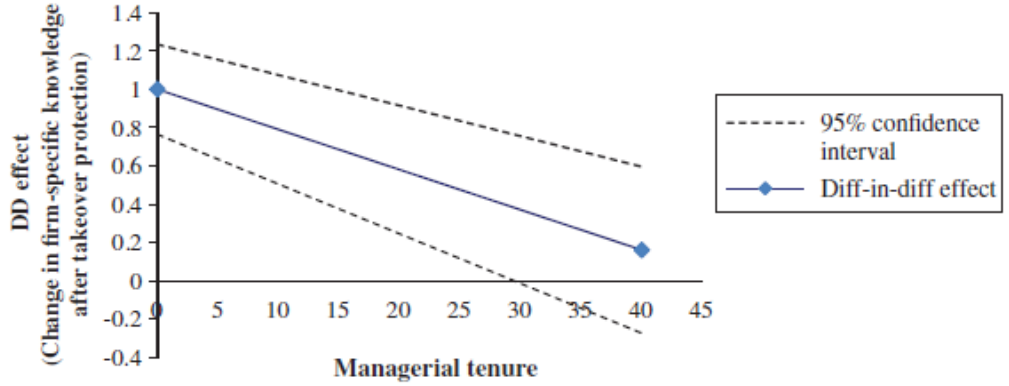
[10] Since the standard deviation for managerial ownership is high, subtracting 1 standard deviation from the mean would make the low value negative. Therefore, we use 0.5 standard deviation to calculate the high and low values.

[11] Please see Younge et al. (2015) for a similar graph also based on DD approach.

Figure 1: Moderating roles of managerial ownership and tenure in the effect of takeover protection on firm-specific knowledge (share-based measure[a]). [a]Similar patterns of graphs (not shown here) are observed for count-based measure of firm-specific knowledge



Graph 2: Managerial tenure as the moderating variable



We repeated the analyses in Table 3 using the absolute-level (or count-based) measure of firm-specific knowledge and obtained similar results. Specifically, Models 2 and 3 show that there is a statistically and economically significant increase in the level of firm-specific knowledge following an increase in takeover protection. The coefficient of 0.232 represents a 25.0 percent increase in the mean level of firm-specific knowledge assets in response to the increase in takeover protection. In Models 4–6, the interaction term between takeover protection and managerial ownership and that between takeover protection and managerial tenure are significant with the expected signs, indicating that the increase in firm-specific knowledge with takeover protection is more pronounced for firms with higher managerial ownership but lower managerial tenure. These results again provide support for all the three hypotheses.

Table 3. Takeover protection and firm knowledge accumulation strategy (DV: firm-specific knowledge using count-based measure)

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Cash holdings	0.191		0.247	0.292*	0.281	0.323*
	(0.171)		(0.163)	(0.168)	(0.184)	(0.189)
Performance relative to aspiration	−0.219		−0.170	−0.179	−0.140	−0.149
	(0.185)		(0.183)	(0.183)	(0.182)	(0.182)
Financial leverage	0.133		0.096	0.108	0.094	0.105
	(0.308)		(0.309)	(0.310)	(0.310)	(0.310)
Return on assets	0.249		0.244	0.300	0.213	0.267
	(0.441)		(0.433)	(0.414)	(0.443)	(0.425)
Market to book ratio	0.043*		0.042*	0.044*	0.043*	0.045*
	(0.022)		(0.021)	(0.021)	(0.021)	(0.022)
R&D intensity	−0.392		−0.332	−0.300	−0.295	−0.265
	(0.792)		(0.872)	(0.861)	(0.878)	(0.868)
Firm age	0.066***		0.050***	0.051***	0.052***	0.053***
	(0.016)		(0.010)	(0.010)	(0.011)	(0.011)
Firm size	−0.045		−0.061	−0.063	−0.076	−0.078
	(0.062)		(0.062)	(0.062)	(0.068)	(0.068)
Managerial ownership	0.001		0.001	−0.001	0.001	−0.001
	(0.004)		(0.004)	(0.004)	(0.004)	(0.004)
Managerial options	−0.005		−0.008	−0.011	−0.012	−0.014
	(0.015)		(0.016)	(0.016)	(0.015)	(0.014)
Managerial tenure	0.004		0.004	0.004	0.007	0.007
	(0.005)		(0.006)	(0.005)	(0.009)	(0.008)
Takeover protection		0.225***	0.232***	0.165**	0.436***	0.368***
		(0.042)	(0.048)	(0.049)	(0.066)	(0.068)
Takeover protection × managerial ownership				0.011***		0.011***
				(0.001)		(0.001)
Takeover protection × managerial tenure					−0.009***	−0.009***
					(0.003)	(0.003)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,396	1,396	1,396	1,396	1,396	1,396
R-squared	0.849	0.850	0.851	0.852	0.853	0.854

Clustered standard errors are shown in parentheses.
Significant at the *p < 0.10; **p < 0.05; ***p < 0.01 level.

Robustness tests

We conducted a number of other tests to ensure the robustness of the empirical findings. First, while in the main analyses we use share- and count-based measures to proxy for firm-specific knowledge assets, we ran additional tests using *unweighted* measures of firm-specific knowledge assets (e.g., Wang and Chen, 2010). In addition, as the count-based measure of firm-specific knowledge is skewed, we conducted sensitivity tests by taking the logarithm transformation of this measure. Our results are not sensitive to either exclusion of the weight or logarithm transformation of the count-based measure.

In another robustness test, we replace *managerial ownership* and *executive option variable* with an index variable capturing both components, that is, *CEO pay for performance sensitivity (PPS).* *PPS* captures incentives induced by both stock and option holdings of the CEO. It is defined as the dollar change in CEO stock and option portfolio for a $1,000 change in firm value, and is calculated

as the executive's fractional equity ownership ([number of shares held + number of options held × average option delta]/[number of shares outstanding]) multiplied by 1,000. We again find our main results remain robust with this measure.

We also found similar key results when we lagged the independent and control variables in the models by one year. In the main analyses, although we defined all Delaware-incorporated firms in our sample as the treatment group (e.g., Low, 2009; Yun, 2009), Delaware-incorporated firms with staggered boards were mostly affected by the legislation. Thus, in an alternative specification, following Kacperczyk (2009), we defined Delaware-incorporated firms with staggered boards as the treatment group. Specifically, the takeover protection variable is defined as a dummy variable equal to 1 if (1) the year is 1996 or later, (2) the company was incorporated in Delaware, and (3) the company has a staggered board; otherwise, it is 0. We repeated the analyses using this new definition of takeover protection and obtained consistent results.[12]

While we have tried our best to show that the observed relationships are channeled through changes in managerial incentives, we are also aware of the existence of alternative explanations. For example, it may be argued that an increase in takeover protection affects product market competition, which, in turn, affects firms' knowledge accumulation patterns. To specifically address this concern, we have examined whether there is a significant change in product market competition (based on several measures, including four-firm concentration ratio, sales-based, and asset-based Herfindahl-indexes) as a result of changes in takeover protection. We compared these measures before and after 1996 (also with the control group). However, we found no significant changes in these measures.

In some other tests, we have included additional control variables. For example, some other firm-level or top manager-related factors could also affect a firm's change in their knowledge structure. These factors may include firm age, CEO compensation level, board related variables such as board size and board independence, to name a few. In addition, in comparing Delaware and non-Delaware firms in our sample, we found that Delaware firms are more leveraged and have lower returns on assets (ROA) than non-Delaware firms. In the robustness tests, we controlled for firm leverage and ROA in our regressions. In alternative specifications, we also controlled for variables that could conceivably affect the decision of a firm to incorporate in Delaware, such as firm age and Tobin's Q (Daines, 2001; Subramanian, 2004). We found that the inclusion of these variables in the regressions did not change our key results. Therefore, we do not think endogeneity of incorporation is a major concern in our study.

We also added employee-level control variables in some additional robustness tests. It might be argued that in addition to top managers, key knowledge employees and their incentives also play important roles in a firm's process of accumulating firm-specific knowledge. To acknowledge the role

[12] Detailed results of these robustness tests are available from the authors upon request.

of employees in the process, we added two employee-level control variables that are thought to affect employee incentives to accumulate firm-specific knowledge: employee equity ownership and firm-employee relationship. Employee stock ownership is considered particularly relevant to inducing employee effort to acquire firm-specific knowledge, since equity ownership provides key employees greater power to bargain *ex post* over the economic rents generated from the deployment of firm-specific knowledge assets (Wang *et al*., 2009).[13] Since employees' concerns about holdup by the firm may be based on perceptions that the firm is in a position to unfairly expropriate their investments in firm-specific human capital, the firm's efforts to build trust may help reduce the threat of such perceptions. We thus expect that firm-employee relationships, as a proxy for the trust between a firm and its employees, may also affect employee incentives to accumulate firm-specific knowledge Firm-employee relationship information is obtained from the KLD data.[14] After controlling for the effects of these employee-level variables, we still found significant support for our hypotheses, while both of the coefficients on the two employee variables are insignificant.

We conducted alternative analyses to ensure that our main results are robust. First, we examined different post-legislation windows. Since a time lag may exist between firms' strategic shift toward firm-specific knowledge accumulation and patent application, we also used the second year (1997) and third year (1998) after the legislation as the starting year for the post-legislation window. In other words, the four years before legislation were taken from the period of 1992 to 1995, and the four years after legislation were from 1997 to 2000 and from 1998 to 2001, respectively. Second, we conducted additional tests by applying a matching approach. In particular, we match Delaware incorporated firms with other firms using the coarsened exact matching (CEM) approach, based on firm size and market to book ratio, as these covariates have been shown in previous studies as the main factors that affect the firm's decision to incorporate in Delaware (Subramanian, 2002). We then run regressions using the matched sample. Our results remained robust across these different approaches.

Finally, while our current clustering is done at the state level, we applied alternative clustering approaches. In particular, we have clustered the standard errors at the firm level to account for serial correlation within the same firm and found that the main results remain significant. In addition, we have conducted a two-way cluster (both at the firm and at the year level) (Cameron and Miller, 2013) and have again found robust results.

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[13] Employee ownership is measured in terms of the percentage of beneficial ownership of the firm's common stock held by employees as a collective. Information on employee stock ownership was collected from the SEC data. The SEC requires every registered firm to file a definitive proxy statement (DEF14-A) annually, which discloses the beneficial ownership of common stock holdings in excess of five percent. Note that for firms in which employees' collective shareholdings are below five percent, this information is not reported and was thus coded as 0.

[14] The data have been used to compile profiles and social ratings evaluating each company's strengths and concerns in several , including community, diversity, firm-employee relations, environment, products, and so forth. We obtained our firm-employee relationship measure from the “employee relations” dimension of the KLD data.

CONCLUSION AND DISCUSSION

In this study, we argue that with an exogenous increase in takeover protection, top managers are more willing to acquire specialized managerial skills, and accordingly, adopt a firm strategy of accumulating a higher level of firm-specific knowledge assets. Our empirical analyses strongly support this argument. Following an increase in takeover protection, there is an increase in firm specific knowledge in terms of both the degree of firm-specificity in a firm's knowledge and the absolute level of firm-specific knowledge asset stock. Moreover, managerial ownership positively moderates this relationship. That is, firms with higher levels of managerial ownership are found to have a bigger increase in firm-specific knowledge resources following an increase in takeover protection. In contrast, firms with top managers having longer organizational tenure are less likely to be influenced in their firm-specific knowledge assets following an increase in takeover protection.

The present study contributes to the corporate governance literature in general and the takeover literature in particular. First, it echoes Shleifer and Summers (1988) and Hanley (1992) to suggest that takeover threats increase managerial concern about job security and about the loss of firm-specific managerial human capital. As a result, the presence of takeover threats reduces mangers' incentives to adopt a strategy toward accumulating and deploying a higher level of firm-specific knowledge. Second, the present study builds on Jensen and colleagues (e.g., Jensen, 1986; Jensen and Ruback, 1983) to address the other side of the story, that is, takeover protection also eliminates the disciplinary role of the takeover threat. In particular, although takeover protection lessens managerial concerns for acquiring firm-specific skills, it may also lead to other forms of misbehavior and reduced managerial efforts in general. Thus, a complementary internal incentive mechanism such as managerial ownership should be implemented jointly with takeover protection to best direct managers toward strategies that can help maximize firm value. By inference, this study suggests a contingent approach to understanding the role of takeovers by highlighting the conditioning effects of a firm's knowledge resource composition and managerial ownership. We hope that this study can help reconcile some of the controversies over whether and to what extent the market for corporate control functions as an effective governance mechanism (see Dalton *et al*. (2007) for a recent review).

The present study also makes several contributions to the resource-based theory of the firm. It extends the theory by highlight how external factors may affect managerial incentives to fully realize firm resources' rent-generating potential. Although the resource-based theory emphasizes the role of firm-specific resources in enabling a firm to achieve superior financial performance (Barney, 1991; Peteraf, 1993), relatively little attention[15] has been given to managers' willingness and the governance

[15] Exceptions are Gottschalg and Zollo (2007), Makadok (2003), and Wang *et al*. (2009), who maintain that accurately predicting firm performance requires resource-based research not to overlook governance mechanisms.

mechanisms that may influence the accumulation of firm-specific resources. We argue that the features of firm-specific (knowledge) resources that constitute *potential* performance advantages are simultaneously likely to give rise to concerns in managers' incentives to invest in specialized managerial skills. Without incorporating these managerial incentives issues into the resource-based analysis, we may not have a complete understanding of the origin of firm-specific resources and their real potential for performance advantage.

Our theoretical focus on the role of managerial incentives in firm knowledge accumulation and deployment also adds two important understandings with regard to firm resources. First, previous studies on managerial resources (Castanias and Helfat, 1991, 2001; Wulf and Singh, 2011) generally viewed managerial firm-specific skills per se, as a potential rent-generating resource of firms. Yet we view those skills as a complementary resource that needs to be combined with firms' specific knowledge to generate rents or superior performance for the firm. This is why managerial incentives become critical for the generation of resource-based advantages. Viewed this way, top managers' firm-specific skills will be determined not only by managers' age and tenure (Murphy and Zabojnik, 2007), but also by the firm's knowledge asset structure (e.g., its firm-specificity). Second, while previous studies typically view a firm's stock of firm-specific knowledge as a given, we consider it as the result of firm knowledge accumulation strategy, and discuss how managerial incentives affect the accumulation of firm-specific knowledge in the first place. Therefore, our study is in keeping with the proposal that resource-based research needs to tap into the origin and antecedents of critical firm resources and capabilities (Dierickx and Cool, 1989; Helfat and Peteraf, 2003; Lacetera, Cockburn, and Henderson, 2004). To our best knowledge, this is one of the first studies examining such an issue in empirical contexts.

Another contribution of the current study is in terms of methodology. We are able to apply the DD methodology to compare the effects of antitakeover legislation on different groups of firms using the Delaware antitakeover legislation as a natural experiment. This approach has several advantages over a typical cross-sectional approach. First, the adoption of the law is exogenous to our variables of interest.[16] Hence, there is little concern about selection biases. Second, we were able to control for other contemporaneous factors and trends in the outcomes (Meyer, 1995) by using the firms incorporated in the states that do not increase takeover protection as the control group. The double differences enabled us to control for common shocks that could affect both groups. Thus, examining the differences in this manner eliminates biases on the treatment group that may arise from any other common changes during the event window.

Despite these potential contributions, the study also has some limitations that provide opportunities for future research. First, to formulate our theoretical predictions, we focused mainly on the incentives

[16] For further discussion of the endogeneity issue of antitakeover laws, see Bertrand and Mullainathan (2003) and Rauh (2006).

of top managers. Although top managers are structurally influential in both adopting and implementing strategies related to firm-specific knowledge assets, the role of critical employees such as key knowledge workers is also important for a firm to achieve resource-based advantages. Therefore, other employees' motivation and governance also deserve a systematic examination. Given their lack of bargaining power, the concerns of employees in making specific investments are likely to be even stronger than those of the top managers. And, the governance of key technical employees in firms operating in high-tech, knowledge-intensive environments may be particularly important (Wang *et al*., 2009). Further, investigating the conditions under which executive-level incentives and nonexecutive-level employee incentives may interact to influence firm strategy and resource-based performance advantages would also be promising for future research.

Second, the current study mainly examines the role of takeover protection in influencing top managers' decisions toward accumulating firm-specific knowledge and considers the interactive effect between takeover protection and managerial ownership. However, some other corporate governance factors may also affect top managers' motivations to acquire specialized managerial skills. Although we are unable to directly incorporate these alternative mechanisms in this study, future research can take into consideration a broader range of governance or motivating mechanisms.

Other limitations come from data- and measurement-related issues. First, although patent data provide rich information about the path of knowledge creation and flow, they only encompass one type of organizational knowledge. This condition leads to some inherent limitations that may question the validity of our measurement of firm-specific knowledge and constrain the interpretation of our regression results. Future research may consider using survey or other field data to explore organizational knowledge and its degree of firm specificity more broadly by including other nonpatented knowledge assets.

In this article, through the lens of firm knowledge strategy, we integrate the corporate governance and resource-based theory of the firm literatures to show how they jointly provide a better understanding of the effects of market for corporate control. In particular, we examine how an increase in takeover protection affects a firm's strategic shift toward the accumulation of a higher level of firm-specific knowledge assets. More generally, this study highlights the importance of human factors in generating competitive advantage from firm-specific resources, which is in accordance with some other recent efforts examining the roles that managers and employees play in obtaining and developing firm resources (e.g., He and Wang, 2009; Wang *et al*., 2009) and dynamic capabilities (Helfat and Peteraf, 2003; Teece, Pisano, and Shuen, 1997). Our study also shares the vision of a line of research that emphasizes the role of resource orchestration in realizing a resource-based competitive advantage (e.g., Sirmon and Hitt, 2009; Sirmon, Hitt, and Ireland, 2007). It can be considered complementary to this line of research to provide a better understanding of the origin of firm resources, capabilities, and resource-based competitive advantages.

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