WINPEC Working Paper Series No.E1616
June 2017

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June 19, 2017

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Abstract

This paper shows theoretically and empirically that the takeover market is an effective external force of discipline for corporate diversification. First, we derive a simple model that highlights the managers' incentives to overdiversify their firm. In the absence of a takeover threat, managers may structure their firm suboptimally in pursuit of private benefits. However, facing a threat of takeover, managers will de-diversify to maximize firms' value in fear of being acquired and replaced. We also discuss the discipline role of the takeover market under competitive and non-competitive environment, and other monitoring mechanisms. Second, we test three hypotheses generated from the model: (1) anti-takeover takeover laws increase corporate diversification; (2) the disciplinary effect is more pronounced in non-competitive industries; (3) the disciplinary effect is less when the firm is more intensively monitored. The empirical results are strongly consistent with these predictions, and robust to alternative measurements of takeover pressure and diversification, and censor and truncated data.

Keywords: Takeover pressure; Corporate diversification; Product market competition; Monitoring intensity.

JEL: G34.

1 Introduction

Literature over last three decades suggests that diversified firms are traded at discount compared to other non-diversified firms operated in the same line of business (e.g., Berger and Ofek, 1995; Laeven and Levine, 2007; Hoechle, Schmid, Walter, and Yermack, 2012). Announcements of diversifying acquisitions also significantly destroy the acquirer's value (Cornett, 2003; Hoechle et al., 2012; Malmendier and Tate, 2008; Morck, Shleifer, and Vishny, 1990), while restructuring activities such as divestitures increase the value of firms (Lang, Poulsen, and Stulz, 1995; Mulherin and Boone, 2000; Slovin, Sushka, and Polonchek, 2005). Researchers often attribute diversification discount to the agency problem in that the incumbent manager diversifies her firm to gain private benefits. A broad question is, then, "What discipline mechanism can ensure the firm's optimal diversification?".

In this paper, we examine the question from both theoretical and empirical perspectives and show that the takeover market can act as an effective external force of discipline for corporate diversification. We also discuss situations in which the influence of external takeover pressure is more pronounced, such as in non-competitive industries or when the monitoring intensity of the manager is weak.

First, we formalize the monitoring mechanism of the takeover market in a simple principal-agent model of corporate diversification. In the absence of a takeover market, our model shows that shareholders' limited ability in diversification enforcement (i.e. shareholders cannot extract monetary penalty from the firm's manager beyond a certain limit) leads to over-diversification. This is because the manager may choose to sacrifice the firm's value in pursuit of private benefits from diversification. However, with the discipline force of the takeover market, the incumbent manager will choose the optimal level of diversification and maximizing the firm's value for fear of being acquired and replaced.

Second, we empirically test the hypothesis that state anti-takeover laws as a proxy for external takeover pressure encourage firms to increase their level of diversification. We

collect a sample of 121150 firm-year observations during the period 1980-2010. The business count approach is then employ to measure corporate diversification as the firm's number of business segments. A binary variable indicating whether the firm has more than one segment is also use as a proxy for diversification. Empirical results confirm the positive relation between the anti-takeover index and corporate diversification. Specifically, the probability of being a diversified firm drops 2.5% when the state passes an anti-takeover law, *ceteris paribus*. In addition, the firm's number of segments increase 0.04 unit when the anti-takeover index increases by one. Robust checks that take into account the relative importance of each segment in measuring diversification also confirms the discipline forces of the external takeover market.

We introduce market competition to the model. We assume that the manager must at least meet the profit target that is set by the industry standard and it is higher in a more competitive industry. The model predicts that the level of corporate diversification decreases more in less competitive industries when facing takeover pressure. Using the Herfindahl-Hirschman index as a proxy for industry competition, we perform regressions in the first and last quartile. Empirical evidence confirms a large difference in the effect of anti-takeover index on corporate diversification, approximate 0.7% in the likelihood of being a diversified firm. The effect on the number of segments is 0.015 and 0.042 when the Herfindahl-Hirschman is in the first and last quartile, respectively.

Under the assumption that the manager's private benefit from diversification is decreasing with shareholders' monitoring intensity, the level of corporate diversification decreases more when facing takeover pressure if the firm is less intensively monitored. In other words, we expect a trade-off between the governance of the takeover market and the monitoring intensity of the incumbent. Using the percentage of stock ownership by blockholders and ESOP-related blockholders as proxies for monitoring intensity, we find a significant difference in the effect state anti-takeover index when the firm has weak and strong monitoring intensity. Specifically, the likelihood of being a diversified firm is 2.3% and 2.0% in regressions of the

first and last quartile of blockholders ownership, respectively. Similarly, the influence of state anti-takeover index drops from 2.1% to 0.4% when a proportion of the firm's is owned by ESOP-related shareholders.

We concern that time-invariant factors can explain the variation of diversification at both state and firm level. Evidence from fixed effects estimation confirms the positive effect of anti-takeover index on the probability of being a diversified firm. However, when the number of business segments is used as the dependent variable, the overall statistical significance decreases substantially. We conjecture that the state-anti takeover index changes in the cross section, but it does not vary much over time, especially during the period 1996-2010. We eliminate the problem of the firm effect using random effects estimation. We find that diversification dummy increases 1.3% the number of segments increases 0.018 unit when an anti-takeover law is passed, *ceteris paribus*.

According to Billett and Xue (2007) and Upadhyay and Zeng (2016), takeover threats can be used as a measurement for the firm's takeover pressure. While Hypothesis 1 suggests a positive relation between the state anti-takeover index and corporate diversification, it implies a negative relation between takeover threat and diversification. We confirm that a takeover threat has a negative and statistically effect on the firm's level of diversification. Specifically, firms are 4.7% less diversified when they face a takeover threats. In addition, the level of diversification drops 0.09 unit when the firm becomes a takeover target in one year.

Our paper contributes to the literature of market for corporate control in several aspects.

First, it fills the gap of internal corporate governance in explaining corporate diversification and diversification discount (Denis, Denis, and Sarin, 1997; Hoechle et al., 2012). On the theoretical front, we formalize the relation between private benefits of incumbent managers and the monitoring mechanism of the takeover market. Our result is consistent with the agency explanations of diversification discount (Cremers and Nair, 2005; Easterbrook and Fischel, 1996; Jensen, 1986, 1993; Jensen and Warner, 1988; Mitchell and Lehn, 1990).

Moreover, we highlight that when the takeover market is efficient, each firm will operate at its optimal level of diversification. We also provide empirical analysis to support our theoretical results.

Second, we compare the takeover market's external force of discipline between competitive and non-competitive environment. We support the view that self-motivated behaviors are mitigated by product market competition Scharfstein (1988); Machlup (1967); Giroud and Mueller (2010). Giroud and Mueller (2010) finds that corporate governance only matters in competitive industries. The firm's operating performance experiences no significant effect after the laws' passage. Our results, however, indicate that the disciplinary effect of takeover market does exist in both non-competitive and competitive environment, but it is more pronounced in non-competitive industries in comparison with competitive industries.

Third, we support the substitution effect between governance mechanisms (Agrawal and Knoeber, 1996; Guo, Lach, and Mobbs, 2015; Sapra, Subramanian, and Subramanian, 2014), by showing that external takeover pressure affects the firm's diversification more when the firm is less intensively monitored. The result also supports the view of Berger and Ofek (1996) that discounted firms are good takeover targets. Strategic managers, therefore, reduce the firm's level of diversification to increase firms' value to avoid takeover threats. Finally, we complement the literature on determinants of corporate diversification (Campa and Kedia, 2002; Aggarwal and Samwick, 2003; Villalonga, 2004), and the propensity to pursue diversifying acquisitions (Hornstein and Nguyen, 2014).

The remainder of the paper is organized as follows. Section 2 describes the model. Section 3 shows empirical methodology and sample selection. Section 4 provides empirical results. Section 5 concludes the paper.

2 The Model

2.1 Optimal Contract in a Frictionless Environment

We consider a simple model that highlights managers' incentives to over-diversify her firm due to private benefit of diversification, but refrain from doing so when being under a threat of takeover. The private benefits of diversification can be thought of as managers' empire-building ambition and/or others.

Empirically, researchers have tested the role of internal corporate governance mechanism with respect to the agency problem of diversification. Denis et al. (1997), Lins and Servaes (2002) and May (1995) find that managerial ownership has a negative correlation with the level of diversification. Besides CEOs' ownership, Aggarwal and Samwick (2003) measure the CEOs' incentives as pay-to-performance sensitivity, and show that it negatively affects firms' level of diversification. Hoechle et al. (2012) examine to what extent the effectiveness of board governance structure and show that they are important determinants of diversification discount; however, the discounted effect remains even after controlling for different sets of corporate governance factors.[1]

Building on the aforementioned literature, we choose to focus on the external force of discipline of diversification. Furthermore, the theory of market for corporate control suggests that competition for control rights may solve the principal-agent problem (Jensen, 1986; Mitchell and Lehn, 1990; Jensen and Warner, 1988). An incumbent manager who acts against the interest of shareholders is often replaced by a better alternative management team. Firms, which are traded at discount, often become good takeover targets (Berger and Ofek, 1996).

Following Aggarwal and Samwick (2003), we begin with a multi-task principal-agent setting, in which a well-established firm hires a manager who chooses a non-verifiable action

x (i.e. effort) and an amount of diversification n. The firm's value is given by:

$$\Pi = X(x)N(n).$$

Furthermore, we assume that:

- The firm's profit increase with the amount of effort the manager invests, but the marginal benefit of effort is decreasing: $X'(0) > 0$, $X' > 0$ and $X'' < 0$.
- Diversification has positive benefit (e.g. risk hedging and corporate synergy) for small n, i.e. $N'(0) > 0$.
- Marginal benefit of diversification is strictly decreasing, i.e. $N' < 0$. Furthermore, it decreases with an increasing speed, i.e. $N'' < 0$ and $N''' < 0$.
- Finally, let us denote $\bar{n}$ such that $N'(\bar{n}) = 0$.

The manager's compensation is linear in the firm's performance and diversification, which are verifiable:

$$w = w_0 + \gamma\Pi + \kappa n.$$

We can simply assume that w_0 is exogenously given by the industry standard, while γ and κ are contracted between the shareholders and the manager.

The manager's utility is given by:

$$\begin{aligned} U(x,n) &= w + \zeta \ln n - \frac{k}{2}x^2 \\ &= w_0 + \gamma X(x)N(n) + \kappa n + \zeta \ln n - \frac{k}{2}x^2 \end{aligned} \tag{1}$$

where the ζ component is her private benefit from diversification ($\zeta > 0$) that depends on the firm's total level of diversification, and the last component is her cost of exerting x.

Given γ and κ, the manager chooses x and n to maximize (1). The first order conditions

yield:

$$\frac{\partial}{\partial x}U(x,n) = \gamma X'(x)N(n) - kx = 0, \quad (2)$$

$$\frac{\partial}{\partial n}U(x,n) = \gamma X(x)N'(n) + \kappa + \zeta\frac{1}{n} = 0. \quad (3)$$

Let $\{x(\gamma,\kappa), n(\gamma,\kappa)\}$ denote the solution to (2) and (3) above.

Anticipating the manager's actions, shareholders pick $\{\gamma,\kappa\}$ to maximize the firm's value, excluding the manager's compensation:

$$\max_{\gamma,\kappa} \Pi - w = (1-\gamma)X(x(\gamma,\kappa))N(n(\gamma,\kappa)) - \kappa n(\gamma,\kappa)$$

We have the following proposition:

Proposition 1. *Shareholders impose a level of diversification $n < \bar{n}$ by punishing the manager for diversification, e.g. $\kappa < 0$.*

Proof. See Appendix A □

The proposition has a novel implication. The shareholders' preferred level of diversification is suboptimal from the perspective of the technology (the technology indicates $\bar{n}$). The shareholders are able to "force" the manager to implement a low level of diversification precisely because she has private benefit from diversification.

Note that the result holds in a frictionless environment, where negative punishment can be written into the contract. This is often not the case in reality.

In the next section, we introduce a friction in diversification enforcement to the existing environment. We then examine how external threats of takeover can act as an extra layer of diversification discipline.

2.2 Limited Diversification Enforcement

A. Without Takeover Threats.

Assume that diversification punishment is limited. Specifically, we assume that:

Assumption 1. $\kappa > 0$.

The assumption states that shareholders cannot impose a penalty on the manager with respect to diversification. This is to reflect a reality that while it is easy to include rewards in employment contracts, it is difficult, or even impossible, to include pecuniary penalty.

Thus, we have the following proposition:

Proposition 2. *Given Assumption 1, the manager will diversify the firm beyond* $\bar{n}$.

Proof. See Appendix B □

Due to limited diversification punishment, the manager now has strong incentive to diversify the firm further and capitalize on her private diversification benefits.

This proposition provides a stark contrast to the previous proposition. In Proposition 1, shareholders actively elect for under-diversification. In the current case, the fiction in contracting leads to the firm being over-diversified.

When overdiversification occurs, fortunately, an active takeover market can serve as a beneficial external discipline mechanism for the shareholders, as we will see next.

B. With Threats of Takeover.

Let us now assume that there is an active threat of takeover from an external firm. The takeover firm is aware of the available technology, and can also observe the level of diversification. After the manager of the original firm has chosen her effort and diversification, the takeover firm will decide whether to pursue a takeover.

If a takeover happens, we assume that the incumbent manager is replaced without any compensation.(Alternatively, we can assume that the incumbent is compensated with a lump sum payment. However, he becomes "unemployable" after being fired, and hence, would not want to be replaced.)

Let n_i and n_t denote the levels of diversification that the incumbent manager and the takeover firm, respectively, would implement.

The objective of the takeover is to earn a profit, occurring through diversification adjustment. Any adjustment comes at cost $c(\Delta n)$, where $\Delta n = n_t - n_i$. We assume that $c(0) = 0$, $c'(0) = 0$, and $c''(\Delta n) > 0$ for all Δn. In other words, the cost of diversification adjustment is increasing in the absolute amount of adjustment.

Note that we elect to not consider the adjustment in x. The reason is that effort, once exerted, is generally considered non-reversible. It can be thought of as the research and project preparation and installment that the manager has carried out. The level of effort, as we see in previous sections, is fully revealed and pinned down by the manager's first-order condition with respect to x, given γ. Any additional effort that external personnel carries out, presumably, comes at high costs and low marginal benefit.

Thus, given x^* and n_i, a takeover happens if and only if there exists Δn satisfying:

$$\begin{aligned} & X(x^*)N(n_t) - c(\Delta n) > X(x^*)N(n_i) \\ & \qquad \Leftrightarrow X(x^*)\Big(N(n_t) - N(n_i)\Big) \;\; > \;\; c(\Delta n_t). \end{aligned} \tag{4}$$

In other words, the takeover firm will pursue a takeover when the potential benefit from diversification adjustment exceeds the cost of doing so.

Given the setting, we have the following proposition:

Proposition 3. *Under a takeover threat, the incumbent manager will choose $n \equiv \bar{n}$.*

Proof. See Appendix C □

The intuition behind the proposition is clear. Takeover firms oftentimes look for undervalued targets that can be "restructured" to increase in value after a takeover. To avoid being acquired, managers of target firms must strive to run a business that is optimal with respect to their given technology—not their private incentives.

2.3 Hypothesis Development

Based on our model, we develop the following hypotheses that we will test in the next section.

First, Proposition 2 and Proposition 3 together give to rise to our main hypothesis, which we test and confirm in Section 4.1:

Hypothesis 1. *The level of corporate diversification decreases with the external takeover pressure.*

While Proposition 2 implies that managers tend to overdiversify, Proposition 3 indicates that managers will quickly reduce the level of diversification once they realize threats of takeover.

Second, we are interested in the impact market competition may have on diversification.

To introduce market competition to our model, we assume that the manager picks (x, n) to maximize her utility subject to shareholders' additional constraint on profit $\Pi(x, n) \geq \Pi_0$. In other words, the manager must at least meet the profit target, Π_0, which is set by the industry standard. If the manager fails to meet the profit target, she will be replaced.

We assume that the profit constraint, Π_0, is higher in more competitive industries, and thus, more likely to bind. It then follows that in more competitive industries, managers is bounded in their pursuit of private benefit of diversification. This is consistent with previous literature. Specifically, while research by Parrino (1997) and De Fond and Park (1999) has shown that CEO turnover is higher in competitive industries than in noncompetitive ones (more likely to be replaced), de Bettignies and Baggs (2007) show that more competitive industries provide stronger contractual incentives but lower pays to managers.

While Proposition 2 implies that firms have strong incentives to over-diversify, the profit constraint may limit diversification—at least more so in competitive industries than in non-competitive ones. Meanwhile, Proposition 3 indicates that an active takeover market can force the manager to pick the optimal level of diversification with respect to the firm's tech-

nology.

It follows that the takeover pressure is more pronounced in industries whose low competitiveness leads to weak diversification discipline.

Thus, we have the following hypothesis, which is tested and confirmed in Section 4.2:

Hypothesis 2. *The level of corporate diversification decreases more in less competitive industries when facing takeover pressure.*

Finally, we are interested in the impact monitoring intensity may have on corporate diversification.

Following Sapra et al. (2014), we assume that the manager's private benefit from diversification, ζ, is decreasing with shareholders' monitoring intensity.

It is then straightforward, using the manager's first-order condition with respect to n given by (3), to show that n is decreasing in ζ. In other words, when the monitoring intensity increases, the manager enjoys less private benefit from diversification, and hence, will diversify less. (The manager will continue to overdiversify, i.e. $n > \bar{n}$, as long as $\zeta > 0$.)

When a takeover pressure appears, the manager reverts to $\bar{n}$, as noted by Proposition 3. It follows that takeover pressure has smaller impact when monitoring intensity is higher.

Thus, we have the following hypothesis, which is tested and confirmed in Section 4.3:

Hypothesis 3. *The level of corporate diversification decreases more when facing takeover pressure if the firm is less intensively monitored.*

We shall continue with our empirical analysis to test the aforementioned hypothesis.

3 Empirical analysis

3.1 Methodology

We follow Campa and Kedia (2002) and model the firm's level of corporate diversification as a linear function of the external takeover pressure and other firm specific characteristics

as follows:

$$Corporate\ diversification_{i,t} = \alpha + \beta External\ takeover\ pressure_{i,t} + \theta z_{i,t} + \gamma_t + \eta_k + v_{i,t}, \quad (5)$$

where *external takeover pressure* can be the level of anti-takeover laws in the state that the firm is located, or a binary indicator equal one if the firm receives a takeover bid at time $t+1$ (the details of the measurements are discussed in the next section). According to hypothesis 1, β is predicted to be positive when the anti-takeover index is used as the proxy for the external takeover pressure, while it supposes to be negative when the proxy is takeover threat. The variables γ_t and η_k capture year and industry fixed effects respectively. $z_{i,t}$ is a set of firm characteristics which are known as determinants of corporate diversification (Lins and Servaes, 2002; Villalonga, 2004; Hoechle et al., 2012; Hornstein and Nguyen, 2014). $z_{i,t}$ includes firm size, leverage, liquidity, return on assets, sales growth rate, net property, plant and equipment, investment, advertising expense, and R&D expense.

3.2 Proxy for corporate diversification

Literature documents two approaches to measure corporate diversification, the business count or the strategic approach. The classification using the strategy approach relies heavily on the user's judgment (Martin and Sayrak, 2003). In addition, the survey for a large sample of firms are not publicly available. In our study, we use the business count approach to measure the level of corporate diversification.

We count the number of business segments of which 4-digit SIC code is not duplicated. Previous literature measures corporate diversification using a dummy indicator to distinguish between a single-segment and multiple-segment firm (Berger and Ofek, 1995; Campa and Kedia, 2002; Hoechle et al., 2012; Laeven and Levine, 2007). This indicator compares a diversified firm with the non-diversified firm, but it ignores the differences in the diversification levels of diversified firms. We, therefore, provide empirical analyses using both discrete

and binary measurements.

3.3 Proxy for takeover pressure

As discussed in Subsection 2.2, a takeover threat occurs whenever the potential benefit from diversification adjustment is higher than its costs. The speed of adjusting from $n_i > \bar{n}$ relies on the ease to announce a takeover bid, or the takeover exposure of each firm. We use two proxies to capture the takeover pressure.

We first follow Sapra et al. (2014) and Bebchuk and Cohen (2003) to use the number of state anti-takeover laws as a proxy for the external takeover pressure. The state-level anti-takeover index comes from five different laws call Control Share Acquisition, Fair-price, Business Combination, Poison Pill Endorsement, and Constituencies Statutes. Each passed law increases one unit in the anti-takeover index and the score varies between 0 and 5. Since Sapra et al. (2014) covers the index between 1980-1995, we update the state anti-takeover laws using the dataset of Bebchuk and Cohen (2003) which covers the period 1986-2001. We extend the coverage of the dataset to 2010 using a more detail table of state takeover laws which are passed in the last five decades and summarized by Cain, McKeon, and Solomon (2017). According to Giroud and Mueller (2010) and Sapra et al. (2014) the state-level anti-takeover index can be considered as an exogenous measurement for takeover pressure.

[Insert Table 1 here]

Table 1 shows the state-level anti-takeover index at the end of all calendar years that have a change in the index (which equals to the number of the anti-takeover laws that were passed). The table also presents the index of listed sates before the changes. We see that most variation or changes in the anti-takeover index happen between the period 1980-1995. After 1995, only a few of states have passed an anti-takeover law, such as Connecticut, Iowa, Maryland, Michigan, Mississippi, Texas, Vermont, Wyoming, and Maine.

Following Billett and Xue (2007) and Upadhyay and Zeng (2016), we also measure use

takeover threats as a proxy for the firm's takeover exposure. Although at time t the takeover exposure is unobservable, but the comprehensive coverage of takeover database allows use to observe whether a firm receives a takeover threat at time $t+1$. Analyzing the effect of receiving a takeover threat on corporate diversification provides support for the monitoring role of the takeover market. It is noted that β is expected to be negative when takeover threats are used as a proxy for external takeover pressure.

3.4 Data collection

The state anti-takeover index is obtained from Sapra et al. (2014) and Ang, Cole, and Lin (2000) Bebchuk and Cohen (2003) and revised with the database of Cain et al. (2017) to extend the data period to 2010. The information of takeover threats is obtained from SDC platinum database (We specifically discuss the sample selection in Subsection 4.5).

Following Hoechle et al. (2012), Campa and Kedia (2002) and Berger and Ofek (1995), we construct a sample of firms between 1980 and 2010. We start with a universal sample of all listed firms in Center for Research in Security Prices (CRSP) database between 1980 and 2010. We then merge it with Compustat database to get accounting information of firms and form a CRPS-Compustat matched sample. We drop all financial and utility firms from our sample, i.e., firms that have four-digit SIC code between 4900 and 4999, and 6000 and 6999 are excluded.

Next, we identify the number of industrial segments for each firm from Compustat Segments database by following procedures. First, we discard segments that have missing information of total assets and sales. Segments are required to have a standard 4-digit industrial classification (SIC) code. Only business or operating segments are considered to measure corporate diversification. Second, we drop segments which have the same SIC code. We measure a firm's level of diversification as the number of business segments of which 4-digit SIC code is not duplicated. We also construct a binary variable indicating a diversified firm which equals one if the firm has more than one business segment. The Compustat Seg-

ments sample is then merged with the CRSP-Compustat matched sample. After deleting all observations that have missing information to construct our necessary variables, we have completed sample of 121150 firm-year observations. In addition, all continuous variables are winsorized at the 1% and 99% percentiles to eliminate the effect of outliers. Definition of all variables are shown in Appendix D. Summary statistics

3.5 Descriptive statistics and univariate comparison

Table 2 presents summary descriptive statistics of all variables and univariate comparisons between diversified and non-diversified firm. Firms have an average number of 1.5 business segments and a standard deviation of 1.00. On average, the state anti-takeover index is 1.27 and a mean of 0, suggesting that a majority of firms are not covered by state anti-takeover laws. In addition, 4% of firms is going to receive a takeover threat within a year.

[Insert Table 2 here]

The leverage ratio is 24% on average and varies substantially across firms. The liquidity ratio is large at 17% while the first quartile shows the rate of holding liquid assets of less than 5%. Although more than 50% of firms have return on total assets greater than 6%, the average ratio for all firms is only 0%.The first quartile has a negative sales growth rate of -3%, but the last quartile has a ratio larger than 28%. Table 2 also shows that 29% of the firm's total assets is the net property, plan and equipment and 7% is the mean of capital expenditure. On average, firms spend 1% and 5% on advertising and R&D respectively.

In the last column of Table 2, we provide univariate analysis of the raw data. The state anti-takeover index is higher in the group of diversified firms than it it is in the group of non-diversified firms. Also, the unconditional probability of receiving a takeover threat within a year is lower when the firm is diversified. Our preliminary analyses support the negative relation between the external takeover pressure and the firm's level of diversification. Other comparisons suggest that diversified firms have a larger size, a higher leverage ratio, more

returns from their assets, and larger fixed assets than non-diversified firms. In contrast, they hold less liquid assets, grow slowly in sales, and spend less on advertising and R&D.

4 Empirical Results

4.1 Takeover pressure and corporate diversification

We estimate Equation 5 and present the regression results in Table 3. We predict that sate anti-takeover laws encourage firms to diversified and β is positive. We include various firm characteristics to ensure the independent effect of external takeover pressure. industry and year fixed effects are also controlled to account for inter-temporal variations that may affect the relation between external takeover pressure and corporate diversification.

In Model 1, we use a binary variable as an indicator of a diversified firm. Empirical evidence suggest that a firm is more likely to diversified from its core-business when the state anti-takeover index is higher. Specifically, the probability of being a diversified firm increases 2.5% when the state passes an anti-takeover law. In Model 2, we use the raw number of business segments as a proxy for corporate diversification. The coefficient of *anti-takeover index* is positive and statistically significant at 1% and implies that a firm increases the number of segment by 0.04 unit when the anti-takeover index increases by one. Overall, the findings suggest that the level of corporate diversification increases with the external takeover pressure.

[Insert Table 3 here]

The size of the firm's assets is positively relate to its level of diversification, consistent with previous literature (Rajan, Servaes, and Zingales, 2000; Anderson and Reeb, 2003; Colak, 2010). Rajan et al. (2000) argue that over-sized firms increase their level of diversification to improve the internal capital market efficiency. In addition, large-size firms will have greater resources to acquire or invest in businesses that are unrelated to their core business Anderson

and Reeb (2003). Leverage ratio is negative and only statistically significant in Model 2. Similar to Villalonga (2004), the effect of negative and statistically significant in both models, suggesting that diversified firms tend to use liquid assets to fund their diversified investment opportunities.

We also find that factors indicating the firm's performance are negatively related to the level of corporate diversification. Specifically return on assets and sales growth rate negatively affect the firm's diversification. This evidence is consistent with the view of Campa and Kedia (2002) in that firms increase their number of industry segments to search for lucrative opportunities when they perform poorly in their current operations.

Berger and Ofek (1995), Campa and Kedia (2002), and Villalonga (2004) suggest that firms that have a high level of investment in current operations tend to have a low level of diversification. Empirical results imply that the firm's level of capital expenditures negatively affects its level of diversification. In particular, 1% increase in investment leads to a decrease of -0.37% in the probability of being a diversified firm. We also document a negative relation between the firm's advertising as well as R&D expense and its level of diversification.

4.2 Takeover pressure and Industry competition

Proposition 2 suggests that the manager tends deviate from the firm's optimal level of diversification and gain private benefits. Such self-motivated behavior is mitigated by product market competition because inefficient firms are eliminated from the market (Scharfstein, 1988). Machlup (1967) shows that optimizing the firm's value and maximizing the manager's private income is the same goal when the industry is competitive. However, non-competitive industries often leave room for managerial slack (Giroud and Mueller, 2010), and it raises the importance of external takeover forces as a discipline mechanism.

We, therefore, introduce the industry competition into the model. Under the assumption that managers have to satisfy the profit target set by the industry standard, and the such requirement is stricter (higher) in more competitive industries. The model predicts that the

effect of anti-takeover laws on corporate diversification is more pronounced when the firm operates in non-competitive industries.

We use Herfindahl-Hirschman index as a benchmark for industry competitiveness which is well examined in industrial organization theory (Tirole, 1988; Curry and George, 1983). The index is measured as the total of squared market shares,

$$HHI_{kt} = \sum_{i=1}^{N_k} s_{ikt}^2 \tag{6}$$

where s_{ikt} is the market share of firm i in industry k in year t. s_{ikt} is measured as the firm's sales scaled by the total sales of all firms operated in the same industry defined by 4-digit SIC code. The higher Herfindahl-Hirschman index is the lower the competition. The 25th and 75th percentile are 0.11 and 0.3, respectively. We estimate Equation 5 using the observations in the first and last quartile.

[Insert Table 4 here]

Table 4 presents regression results. Empirical evidence in all models confirms that anti-takeover index positive affects the firm's level of diversification. Specifically, in the first and second column, a unit increase in anti-takeover index leads an increase of 1.7% and 2.4% in the probability of being a diversified firm. Similar positive effects are found when the number of business segments is the proxy for diversification. Strikingly, we confirm that the influence of external takeover pressure is higher when the Herfindahl-Hirschman index is higher, suggesting that the increase in corporate diversification is larger for firms in less competitive industries.

So far, we conclude that anti-takeover laws create incentives for the manger to over-diversified her firm and gain private benefits and the law passage has a significantly higher effect in non-competitive industries.

4.3 Takeover pressure and Monitoring

Besides the disciplinary force of the takeover market, other governance mechanism can also monitor managers. In section 2, we follow Sapra et al. (2014) and assume that the private benefit from diversification decreases with the shareholders' monitoring. As a result, the manager will diversify less and the takeover pressure has a smaller effect on the level of diversification.

We use (i) the percentage of shares own by blockholders and (ii) the percentage held by all ESOP-related blockholders as proxies for monitoring intensity. The data of blockholders ownership is obtained from WRDS blockholders between 1996 and 2001. Table 5 provides estimation results of Equation (5) for the first and last quartile of the blockholders' ownership. It also shows estimation results for the group that has ESOP-related blockholders ownership and the remaining group. Evidence confirms the positive effect of state anti-takeover laws on the firm's measurements of diversification, excluding firms that have zero ownership of ESOP-related blockholders. The effect of anti-takeover index reduces from 2.3% (Model 1) to 2% (Model 2). The overall statistical significant also decreases substantially. In Model 3, the likelihood of being a diversified firm drops 2.1% to 0.4% when the firm has some ownership of ESOP-related blockholders. The result is similar when the number of segments is used as a proxy for corporate diversification. Our evidence suggests that the influence of the state-anti takeover index is lower when the firm is more intensively monitored by blockholders.

[Insert Table 5 here]

4.4 Unobserved heterogeneity

It is reasonable to concern that time-invariant factors can explain the variation of corporate diversification at firm level. We consider the following unobserved effects model:

$$Corporate\ diversification_{i,t} = \alpha + \beta External\ takeover\ pressure_{i,t} + \theta z_{i,t} + \kappa_i + \gamma_t + v_{i,t}, \quad (7)$$

where κ_i is the firm fixed effect. Other variables are defined as in Equation 5. It is unlikely that a firm changes its state of incorporation or its core industry of operations, the latent effect, κ_i, also takes into account the unobserved effects at the state and industry levels. We estimate Equation 7 using both fixed effects and random effects.

[Insert Table 6 here]

Model 1 and 2 in Table 6 report results of the fixed effects estimation. The coefficient of anti-takeover index in Model 1 is positive and statistically significant at 1%, suggesting that passage of anti-takeover laws encourages corporate diversification. The economic significance of anti-takeover index, however, is small in comparison with 2.5% in the cross-section regression (Table 3). In Model 2, we observe a similar effect of anti-takeover index, but it is not statistically significant at 10% level.

We concern that the standard error of anti-takeover is large in Model 2 because our variable of interest varies in the cross section, but does not change much over time. As can be seen in Table 1, the number of anti-takeover laws only vary slightly in several states after 1995. Hence, it is reasonable to apply random effects estimation to consistently estimate β. As recommended by Wooldridge (2010), we include industry fixed effects to take into account systematic differences across industries. Estimation results in the last two columns are consistent with our main hypothesis that corporate diversification decreases with the external takeover pressure. Specifically, Model 3 shows an increase of 1.3% in the likelihood of being a diversified firm, while the number of segments reduces by 0.018 in Model 4 when

the state anti-takeover index increases by one unit. The results are similar when the standard errors are fully robust and clustered by states of incorporation.

4.5 Takeover threats and corporate diversification

We also follow Billett and Xue (2007) and Upadhyay and Zeng (2016) to measure use takeover threats as a proxy for the firm's takeover exposure. Billett and Xue (2007) study the pre-repurchase takeover pressure on the firm's decision to buy back shares. Upadhyay and Zeng (2016) shows that R&D firms increase cash holdings in anticipation of a takeover threat. Similarly, we analyze the impact of receiving a takeover threat at time $t+1$ on the firm's corporate diversification at time t. Our hypothesis suggests a negative relation between receiving takeover threat and corporate diversification. In contrast to the state-level anti-takeover index, our hypothesis suggests a negative relation between receiving a takeover bid and corporate diversification.

The information of takeover threats is obtained from SDC platinum database. Only domestic U.S. transactions are selected. Nonstandard deal types, including undisclosed value, spin-offs, recapitalizations, self-tenders, exchange offers, repurchases, acquisition of minority stake, acquisitions of remaining interest, and privatizations, are excluded from the sample. Only transactions with the value of equal or greater than $1 million are selected. In addition, we include only transactions in that the acquirer holds less than 50% of the target prior to the announcement date and seeks to acquire more than 50% after. Last, we require that targets are identified in CRSP database. We match the SDC data with our main data and construct a binary variable indicating whether the firm receives a takeover bid with one year.

[Insert Table 6 here]

Table 7 reports the estimation results of Equation 5 using takeover threats as a proxy for external takeover pressure. In all specifications, we find that takeover threat has a negative and statistically significant relation with the level of diversification. Specifically,

diversification dummy is statistically significant at 1% in Model 1, suggesting that a firm is 4.7% less likely to be diversified when it anticipates a takeover bid. The effect reduces to 1.7% when the model controls for fixed effects. In addition, Model 3 shows that a firm reduces its level of diversification by 0.09 unit when it perceives a takeover threat. The absolute effect of external takeover pressure drops to 0.03 when the firm becomes a takeover target in one year when fixed effects estimation is applied. Overall, the findings is consistent with the positive effect of anti-takeover laws on corporate diversification.

4.6 Robustness checks

4.6.1 Censored and truncated data. Compustat segment database captures a maximum number of ten business segments for each firm. In this case, ordinary least squares estimations do not provide consistent estimates of parameters since the censored data does not represent the population. Specifically, our dataset has a left-censoring limit of ten and a right-censoring limit of one. We, therefore, use generalized Tobit models to obtain a consistent estimate of state anti-takeover index when the number of segments is used as a proxy for corporate diversification.[2] Overall, the empirical results (untabulated) consistently support our main hypothesis that anti-takeover laws encourage managers to diversify.

4.6.2 Measurement of corporate diversification. Researchers argue that simple counting the number of SIC codes does not take into account the relative importance or distribution of the firm's sales or asset in each industry segment. Berry (1971) and McVey (1972) introduce a Herfindahl-based measurement of corporate diversification to resolve the problem of the discrete proxy. Jecquemin and Berry (1979) propose another continuous measurement which accounts for the degree of relatedness within industries (at 2-digit SIC code) while considering the relative importance of each industry segment(at 4-digit).

The first Herfindahl-based proxy is measured as follow

$$H = (1 - \sum_{i=1}^{n} P_i^2), \tag{8}$$

where P_i is the share of i^{th} industry based on sales or total assets of each segments. n is the firm's number of industry segments. The Entropy measurement weights each P_i by $log(1/P_i)$ instead of P_i as the Herfindahl-based method. The Entropy measure of total diversification at 4-digit SIC code is:

$$E_T = \sum_{i=1}^{n} P_i log(1/P_i) \tag{9}$$

Table 8 presents Pearson correlation coefficients between measurements of diversification. Both asset-based measurement are highly correlated with the number of business segments. However, when sales is used to calculate the weight of each segment, the correlation deviates substantially from the business count strategy. In addition, the coefficient of Entropy sales-based proxy is lower than the proxy calculated by Herfindahl sales-based method in column 2 and 3.

We re-estimate Equation 5 using a set of continuous measurement of diversification. Evidence in Table 9 confirms the positive relation between state anti-takeover index and diversification. In particular, when anti-takeover index increases one unit, the Entropy measurements increase 0.006, while Herfindahl-based diversification increases 0.011, *ceteris paribus*.

5 Conclusion

In this paper, we theoretically and empirically show that the takeover market can serve as an effective external monitoring mechanism, preventing managers from overdiversifying their firms in pursuit of private benefits.

On the theoretical front, we provide a simple principal-agent framework of diversification

and conceptualize the role of the takeover market in a formal setting. Consistent with corporate finance research over past decades, our model shows that firms can be overdiversified due to managerial private incentives, and thus, have suboptimal value. This is a direct result of weak internal governance, specifically due to shareholders' limited enforcement capacity. In this environment, the takeover market is a beneficial layer of discipline, forcing managers to maximize firms' value for fear of being acquired and replaced.

On the empirical front, we test three hypotheses generated from the model: (1) takeover laws reduce corporate diversification; (2) the disciplinary effect is more pronounced in non-competitive industries; (3) the disciplinary effect is less when the firm is more intensively monitored. We construct a sample of 121150 firm-year observations during the period 1980-2010. We employ the business count approach to measure corporate diversification and employ two proxies for takeover pressure, anti-takeover laws and takeover threats.

Empirical evidence shows that the anti-takeover index has a positive and statistically significant relation with the level of diversification. Specifically, the probability of being diversified drops 2.5% and the level of diversification reduces 0.04 unit when the anti-takeover index increases one. Also, the effect of takeover pressure is more pronounced in non-competitive and low monitoring environment. Regression shows a different of 0.7% in the probability of being a diversified firm when the Herfindahl-Hirschman index is in the first and last quarter. The level of diversification reduces 0.042 unit for the subsample in non-competitive industries, while it only decreases 0.015 in competitive industries. In addition, we use the proportion of stock ownership by blockholders and ESOP-related blockholders as proxies for monitoring intensity. We find a significant difference in the effect state anti-takeover index when the firm has weak and strong monitoring intensity. Specifically, the likelihood of being a diversified firm is 2.3% and 2.0% in regressions of the first and last quartile of blockholders ownership, respectively. Similarly, the influence of state anti-takeover index drops from 2.1% to 0.4% when a proportion of the firm's is owned by ESOP-related blockholders. The findings are similar when the number of business segments are used as a proxy for diversifi-

cation. The findings are robust to the censor and truncated data, continuous measurements of diversification, and an alternative proxy for takeover pressure (takeover threat).

Overall, our paper shed light on the broad question, "What discipline mechanism can ensure firms' optimal diversification?" According to our analysis, an active takeover market can be very effective in reigning in managers' private diversification incentives. We also examine and verify that production competition and other monitoring mechanisms are important in preventing overdiversification—consistent with standard views on corporate governance. Moreover, our analysis shows that the effect of takeover threat is more pronounced when the industry is not competitive and the monitoring intensity is weak, providing further support to the hypothesis that corporate governance mechanisms could be substituted. Our results withstand several tests for robustness, such as censored and truncated data, and measurement of diversification.

Appendix

A Proof of Proposition 1

Proof. The manager's first-order conditions (2) and (3) imply that:

$$\gamma = \frac{kx}{X'(x)N(n)}, \tag{10}$$

$$\kappa = -\zeta\frac{1}{n} - \frac{kx}{X'(x)N(n)}X(x)N'(n). \tag{11}$$

Thus, by the revelation principle, shareholders can choose (x, n) directly to maximize the value of the firm, excluding the manager's compensation:

$$\begin{aligned}\max_{x,n}\Pi - w &= \left(1 - \frac{kx}{X'(x)N(n)}\right)X(x)N(n) \\ &\quad + \left(\zeta\frac{1}{n} + \frac{kx}{X'(x)N(n)}X(x)N'(n)\right)n.\end{aligned}$$

Thus, the first-order condition with respect to n is:

$$\begin{aligned}\frac{\partial}{\partial\Delta n}(\Pi - w) &= \frac{kxX(x)}{X'(x)}N(n)N'(n) + X(x)N'(n) \\ &+ \frac{kxX(x)}{X'(x)}\frac{nN(n)N''(n) - nN'(n)^2}{N(n)^2} \\ &= 0.\end{aligned} \tag{12}$$

Furthermore, it is straightforward to verify that $\frac{\partial^2}{\partial n^2}(\Pi - w)$ is negative.

Recall that $N'(\bar{n}) = 0$. Hence,

$$\frac{\partial}{\partial n}(\Pi - w)\bigg|_{n=\bar{n}} = \frac{kxX(x)}{X'(x)}\frac{\bar{n}N(\bar{n})N''(\bar{n})}{N(\bar{n})^2}.$$

Since $N''(n) < 0$, it follows that $\frac{\partial}{\partial n}(\Pi - w)\Big|_{n=\bar{n}} < 0$.

Thus, for n that solves (12), it must be that $n < \bar{n}$.

Furthermore, for $n < \bar{n}$, it is straightforward from (11) that $\kappa < 0$. □

B Proof of Proposition 2

Proof. Evaluating $\frac{\partial}{\partial n}U(x,n)$ at $n = \bar{n}$, we have:

$$\begin{aligned}\frac{\partial}{\partial n}U(x,n)\Big|_{n=\bar{n}} &= \Big(X(x)N'(n) + \zeta\frac{1}{n} + \kappa\Big)\Big|_{n=\bar{n}} \\ &= \kappa + \zeta\frac{1}{\bar{n}}.\end{aligned}$$

It is straightforward to verify that $\frac{\partial^2}{\partial n^2}U(x,n) < 0$.

Given Assumption 1, $\frac{\partial}{\partial n}U(x,n)\Big|_{n=\bar{n}} > 0$.

Thus, for any n that solves the manager's first order condition (3), it must be the case that $n > \bar{n}$. □

C Proof of Proposition 3

Proof. Let $F(n_t) = X(x^*)\Big(N(n_t) - N(n_i)\Big) - c(n_t - n_i)$. It follows that $F(n_i) = 0$.

Then, we have:

$$F'(n_t) = X(x^*)N'(n_t) - c'(n_t - n_i)$$

Thus, $F'(n_i) = X(x^*)N'(n_i)$, which is positive for $n_i < \bar{n}$ and negative for $n_i > \bar{n}$.

In other words, if the incumbent manager chooses $n_i < \bar{n}$, the takeover firm will pursue a takeover and earn a profit through more diversification. Meanwhile, if the incumbent chooses $n_i > \bar{n}$, the takeover firm can earn a profit post-takeover through de-diversification.

Thus, to avoid having the firm taken over by an external company and being replaced, the incumbent must implement $n_i \equiv \bar{n}$. □

D Variable definitions

Variable name	Definition	Data source
Number of segments	is the number of business segments of which the 4-digit SIC of each segment is not duplicated.	Compustat segments
Diversification dummy	equals one if the number of business segments is greater than one, zero otherwise.	Compustat segments
Anti-takeover index	is the number of anti-takeover laws that were passed in each state.	Hand collected
Takeover threat	is a dummy indicator which equals one if the rm receives a takeover bid in year $t+1$.	SDC Platinum
Log(total assets)	is the natural logarithm of the firm's total assets.	Compustat
Leverage	is the ratio between the total debts and the total assets ((item #9 + item#34) / item #6)	Compustat
Liquidity	is the ratio of cash and short-term investments divided by the total assets (item #1/ item #6)	Compustat
Return on assets	is the earnings before interest and taxes scaled by the total assets (item #ebit/item #6)	Compustat
Sales growth rate	is the sales growth rate measured by the ratio between sales of year t and year $t-1$, minus one (item #12/lagged item #12−1).	Compustat
Nppe	is the net property, plant and equipment scaled by the rm's total assets (item #8/ item#6).	Compustat
Investment	is the total capital expenditure divided scaled by the total assets (item #128/item #6).	Compustat
Advertising expense	is the advertising expense scaled by the total asset. We set advertising expense equal zero if it is missing or has a negative value (item #45/item#6)	Compustat
R&D expense	is the research and development expense scaled by the total assets. We set R&D expense equal to 0 if it is missing or has a negative value (item #46/item#6).	Compustat

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State Name	Year	Index before	Change	Anti-takeover index
Arizona	1987	0	4	4
Colorado	1989	0	1	1
Connecticut	1984	0	1	1
Connecticut	1989	1	1	2
Connecticut	1997	2	1	3
Connecticut	2003	3	1	4
Delaware	1988	0	1	1
Florida	1987	0	2	2
Florida	1989	2	2	4
Georgia	1985	0	1	1
Georgia	1988	1	1	2
Georgia	1989	2	2	4
Iowa	1989	0	2	2
Iowa	1997	2	1	3
Illinois	1984	0	2	2
Illinois	1989	2	2	4
Indiana	1986	0	4	4
Indiana	1989	4	1	5
Kansas	1989	0	1	1
Massachusetts	1987	0	1	1
Massachusetts	1989	1	3	4
Maryland	1983	0	1	1
Maryland	1988	1	1	2
Maryland	1989	2	1	3
Maryland	1999	3	2	5
Michigan	1984	0	1	1
Michigan	1988	1	1	2
Michigan	1989	2	1	3
Michigan	2001	3	4	7
Minnesota	1984	0	1	1
Minnesota	1987	1	2	3
Minnesota	1991	3	1	4
Missouri	1984	0	1	1
Missouri	1986	1	3	4
Mississippi	1985	0	1	1
Mississippi	1990	1	1	2
Mississippi	1991	2	1	3
Mississippi	2005	3	1	4
North Carolina	1987	0	2	2
North Carolina	1990	2	1	3
Nebraska	1988	0	2	2

New jersey	1986	0	2	2
New jersey	1989	2	2	4
Nevada	1987	0	1	1
Nevada	1989	1	1	2
Nevada	1991	2	3	5
New York	1985	0	3	3
New York	1989	3	1	4
Ohio	1982	0	3	3
Ohio	1990	3	2	5
Oklahoma	1987	0	1	1
Oregon	1987	0	1	1
Oregon	1989	1	2	3
Oregon	1991	3	1	4
Pennsylvania	1988	0	1	1
Pennsylvania	1989	1	3	4
Pennsylvania	1993	4	1	5
Rhode island	1990	0	4	4
South Carolina	1988	0	3	3
Tennessee	1988	0	4	4
Tennessee	1989	4	1	5
Utah	1987	0	1	1
Utah	1989	1	1	2
Virginia	1985	0	1	1
Virginia	1988	1	2	3
Virginia	1992	3	1	4
Washington	1987	0	2	2
Washington	1998	2	1	3
Wisconsin	1984	0	2	2
Wisconsin	1987	2	3	5
Texas	1997	0	1	1
Texas	2006	1	2	3
Vermont	1998	0	1	1
Vermont	2008	1	1	2
Wyoming	1989	0	1	1
Wyoming	1990	1	2	3
Wyoming	2009	2	1	3
Maine	1988	1	1	2
Maine	2003	2	1	3
Idaho	1988	1	4	5
Kentucky	1988	1	2	3
Kentucky	1989	3	1	4
Louisiana	1987	1	1	2
Louisiana	1988	2	1	3
North Dakota	1993	0	1	1

New Mexico	1987	0	1	1
South Dakota	1990	0	5	5

Table 1. State anti-takeover laws:

		Full sample					Div. =0	Div.=1	(1)-(0)
Variable name	N	Mean	S.D.	0.25	0.5	0.75	Mean	Mean	Δ Mean
Number of segments	121150	1.51	0.98	1	1	2	-	-	-
Diversification dummy	121150	0.29	0.46	0	0	1	-	-	-
Anti-takeover index	121150	1.27	1.81	0.00	0.00	3.00	1.13	1.59	0.46***
Takeover threat	121150	0.04	0.19	0.00	0.00	0.00	0.04	0.03	-0.01***
Log(total assets)	121150	4.72	2.12	3.20	4.59	6.13	4.33	5.66	1.33***
Leverage	121150	0.24	0.22	0.04	0.20	0.36	0.22	0.27	0.05***
Liquidity	121150	0.17	0.21	0.02	0.08	0.24	0.20	0.10	-0.10***
Return on assets	121150	0.00	0.25	-0.03	0.06	0.12	-0.02	0.05	0.08***
Sales growth rate	121150	0.29	0.94	-0.03	0.10	0.28	0.33	0.18	-0.15***
Nppe	121150	0.29	0.23	0.11	0.23	0.42	0.28	0.32	0.04***
Investment	121150	0.07	0.08	0.02	0.05	0.09	0.07	0.06	-0.01***
Advertising expenses	121150	0.01	0.04	0.00	0.00	0.01	0.02	0.01	0.00***
R&D expenses	121150	0.05	0.10	0.00	0.00	0.05	0.06	0.02	-0.04***

Table 2. Descriptive statistics
This table provides summary statistics for a sample of CRSP listed firms between 1980-2010 which have segments' information on Compustat Segments database and accounting information on Compustat annual. Diversification dummy equals one if the number of business segment is greater than one, zero otherwise. Other variables are defined in Appendix D. The last column shows univariate comparisons of all variables' mean between diversified and non-diversified firms. ***, **, and * are statistically at 1%, 5%, 10%, respectively.

	Div. dummy	N. segments
	(1)	(2)
Anti-takeover index	0.025***	0.040***
	(0.002)	(0.005)
Log(total assets)	0.062***	0.181***
	(0.002)	(0.008)
Leverage	-0.010	-0.071**
	(0.015)	(0.032)
Liquidity	-0.255***	-0.452***
	(0.015)	(0.031)
Return on assets	-0.142***	-0.444***
	(0.011)	(0.026)
Sales growth rate	-0.005***	-0.011***
	(0.001)	(0.002)
Nppe	-0.034	-0.164***
	(0.023)	(0.053)
Investment	-0.366***	-0.695***
	(0.033)	(0.065)
Advertising expense	-0.362***	-0.738***
	(0.092)	(0.209)
R&D expense	-0.457***	-0.790***
	(0.028)	(0.061)
Constant	0.477***	2.138***
	(0.089)	(0.401)
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
No. of Obs.	112150	112150
R-Squared	0.19	0.22

Table 3.
Anti-takeover index and Corporate diversification
This table provides regression analysis of corporate diversification on takeover pressure. N. segments is the number of business segments of which the 4-digit SIC of each segment is not duplicated. Div. dummy equals one if the number of business segment is greater than one, zero otherwise. Anti-takeover index is the number of anti-takeover laws that were passed in each state. Other variables are defined in Appendix D. Robust standard errors that are clustered by firm are presented in parentheses. ***, **, and * are statistically at 1%, 5%, 10%, respectively.

	Div. dummy		N. segments	
	H<25%	H>75%	H<25%	H>75%
	(1)	(2)	(3)	(4)
Anti-takeover index	0.017***	0.024***	0.015*	0.042***
	(0.004)	(0.004)	(0.008)	(0.008)
Log(total assets)	0.049***	0.075***	0.130***	0.232***
	(0.004)	(0.004)	(0.012)	(0.014)
Leverage	-0.044*	0.018	-0.091*	-0.049
	(0.024)	(0.028)	(0.051)	(0.060)
Liquidity	-0.295***	-0.221***	-0.496***	-0.442***
	(0.024)	(0.028)	(0.048)	(0.069)
Return on assets	-0.101***	-0.168***	-0.260***	-0.574***
	(0.017)	(0.021)	(0.035)	(0.055)
Sales growth rate	-0.006***	-0.002	-0.015***	-0.003
	(0.002)	(0.003)	(0.004)	(0.006)
Nppe	-0.149***	0.040	-0.327***	-0.108
	(0.040)	(0.040)	(0.084)	(0.093)
Investment	-0.302***	-0.377***	-0.619***	-0.630***
	(0.048)	(0.066)	(0.092)	(0.128)
Advertising expense	-0.153	-0.623***	-0.133	-1.078***
	(0.168)	(0.160)	(0.374)	(0.403)
R&D expense	-0.332***	-0.559***	-0.448***	-0.960***
	(0.041)	(0.059)	(0.078)	(0.139)
Constant	0.344***	0.405***	1.583***	1.931***
	(0.048)	(0.093)	(0.090)	(0.386)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
No. of Obs.	30075	30417	30075	30417
R-Squared	0.19	0.22	0.22	0.28

Table 4.
Product market competition
This table provides regression analysis of corporate diversification on takeover pressure for competitive and non-competitive industry defined by Herfindahl-Hirschman index. N. segments is the number of business segments of which the 4-digit SIC of each segment is not duplicated. Div. dummy equals one if the number of business segment is greater than one, zero otherwise. Anti-takeover index is the number of anti-takeover laws that were passed in each state. Other variables are defined in Appendix D. Robust standard errors that are clustered by firm are presented in parentheses. ***, **, and * are statistically at 1%, 5%, 10%, respectively.

	Div. dummy				N. segments			
	sumblks <25%	*sumblks* >75%	*sumesop* =0%	*sumesop* >0%	*sumblks* <25%	*sumblks* >75%	*umesop* =0%	*sumesop* >0%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Anti-takeover index	0.023**	0.020*	0.021***	0.004	0.041	0.017	0.030**	0.02
	(0.010)	(0.010)	(0.006)	(0.022)	(0.029)	(0.020)	(0.014)	(0.048)
Log(total assets)	0.067***	0.079***	0.076***	0.116***	0.293***	0.180***	0.245***	0.512***
	0.015	0.018	0.009	0.031	(0.048)	(0.037)	(0.027)	(0.080)
Leverage	-0.139	-0.114	-0.018	-0.241	0.19	-0.409**	-0.049	-1.429**
	(0.130)	(0.106)	(0.067)	(0.237)	(0.355)	(0.181)	(0.145)	(0.577)
Liquidity	-0.799***	-0.448***	-0.469***	-0.595	-1.623***	-0.868***	-1.005***	0.643
	(0.125)	(0.136)	(0.080)	(0.485)	(0.378)	(0.249)	(0.171)	(1.111)
Return on assets	-0.295*	-0.422**	-0.404***	-0.343	-0.839*	-0.882***	-0.740***	-1.993
	(0.159)	(0.174)	(0.083)	(0.559)	(0.429)	(0.308)	(0.169)	(1.386)
Sales growth rate	-0.072**	-0.017	-0.032*	-0.129	-0.034	0.029	-0.034	0.203
	(0.035)	(0.036)	(0.019)	(0.099)	(0.111)	(0.083)	(0.048)	(0.308)
Nppe	-0.081	-0.373**	-0.211**	-0.332	-0.204	-0.522	-0.385*	-1.295*
	(0.166)	(0.150)	(0.093)	(0.286)	(0.385)	(0.325)	(0.204)	(0.684)
Investment	-0.641	0.042	-0.137	0.693	-1.088	-0.619	-0.687	1.591
	(0.439)	(0.310)	(0.202)	(0.703)	(0.857)	8	(0.442)	(1.658)
Advertising expense	0.051	-1.236**	-0.448	1.737	1.361	-2.863***	-0.312	-8.196*
	(0.587)	(0.593)	(0.325)	(1.492)	(2.175)	(0.990)	(0.929)	(4.849)
R&D expense	-0.989***	-1.588***	-1.290***	-2.48	-1.406*	-3.030***	-1.854***	-11.427***
	(0.288)	(0.451)	(0.204)	(1.955)	(0.795)	(0.892)	(0.464)	(3.911)
Constant	-0.342*	0.410	0.195	0.261	-0.949	1.988***	1.006	0.499
	(0.199)	(0.262)	(0.221)	(0.369)	(0.684)	(0.713)	(0.664)	(0.818)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	1269	1298	4581	449	1269	1298	4581	449
R-Squared	0.34	0.27	0.25	0.47	0.37	0.31	0.28	0.52

Table 5.
Monitoring intensity
This table provides regression analysis of corporate diversification on takeover pressure for different subsamples defined by stock ownership of blockholders. *sumblks* is the percentage held by all blockholders for that firm-year. *sumesop* is the proportion held by all ESOP-related blockholders. Other variables are defined in Appendix D. Robust standard errors that are clustered by firm are presented in parentheses. ***, **, and * are statistically at 1%, 5%, 10%, respectively.

	Div. Dummy	N. segments	Div. Dummy	N. segments
	(1)	(2)	(3)	(4)
Anti-takeover index	0.003***	0.003	0.013***	0.018***
	(0.001)	(0.002)	(0.001)	(0.002)
Log(total assets)	0.061***	0.151***	0.058***	0.151***
	(0.001)	(0.003)	(0.001)	(0.002)
Leverage	0.030***	0.030**	0.023***	0.011
	(0.006)	(0.013)	(0.006)	(0.012)
Liquidity	-0.133***	-0.254***	-0.165***	-0.294***
	(0.008)	(0.015)	(0.007)	(0.014)
Return on assets	-0.037***	-0.126***	-0.049***	-0.164***
	(0.006)	(0.012)	(0.006)	(0.011)
Sales growth rate	0.005***	0.008***	0.002***	0.005**
	(0.001)	(0.002)	(0.001)	(0.002)
Nppe	-0.024**	-0.124***	-0.021**	-0.111***
	(0.010)	(0.021)	(0.009)	(0.019)
Investment	-0.072***	-0.153***	-0.117***	-0.220***
	(0.016)	(0.032)	(0.016)	(0.031)
Advertising expense	0.109**	0.147*	-0.016	-0.052
	(0.045)	(0.090)	(0.040)	(0.080)
R&D expense	-0.003	0.061	-0.102***	-0.101***
	(0.019)	(0.038)	(0.017)	(0.034)
Constant	0.144***	1.289***	0.248***	1.528***
	(0.009)	(0.017)	(0.052)	(0.105)
Fixed effect	Yes	Yes	No	No
Random effect	No	No	Yes	Yes
Industry fixed effects	No	No	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
No. of Obs.	121150	121150	121150	121150

Table 6.
Unobserved heterogeneity
This table provides regressions of corporate diversification on takeover pressure which take into account time-invariable factors that can explain the variation of corporate diversification at firm level. Results from both fixed effect and random effect estimation are shown. N. segments is the number of business segments of which the 4-digit SIC of each segment is not duplicated. Div. dummy equals one if the number of business segment is greater than one, zero otherwise. Anti-takeover index is the number of anti-takeover laws that were passed in each state. Other variables are defined in Appendix D. ***, **, and * are statistically at 1%, 5%, 10%, respectively.

	Div. dummy		N. segments	
	(1)	(2)	(3)	(4)
Takeover threat	-0.047***	-0.017***	-0.091***	-0.030***
	(0.006)	(0.005)	(0.013)	(0.009)
Log(total assets)	0.064***	0.061***	0.184***	0.152***
	(0.002)	(0.004)	(0.008)	(0.009)
Leverage	-0.012	0.030**	-0.074**	0.031
	(0.015)	(0.012)	(0.032)	(0.026)
Liquidity	-0.280***	-0.134***	-0.493***	-0.255***
	(0.015)	(0.015)	(0.032)	(0.027)
Return on assets	-0.137***	-0.037***	-0.436***	-0.127***
	(0.011)	(0.009)	(0.026)	(0.017)
Sales growth rate	-0.008***	0.004***	-0.015***	0.008***
	(0.001)	(0.001)	(0.002)	(0.002)
Nppe	-0.036	-0.024	-0.168***	-0.124**
	(0.023)	(0.025)	(0.053)	(0.054)
Investment	-0.395***	-0.072***	-0.742***	-0.154***
	(0.033)	(0.022)	(0.065)	(0.043)
Advertising expense	-0.372***	0.110	-0.754***	0.148
	(0.092)	(0.087)	(0.209)	(0.165)
R&D expense	-0.483***	-0.003	-0.832***	0.062
	(0.028)	(0.027)	(0.062)	(0.049)
Constant	0.462***	0.140***	2.114***	1.284***
	(0.092)	(0.019)	(0.407)	(0.040)
Fixed effect	No	Yes	No	Yes
Industry fixed effects	Yes	No	Yes	No
Year fixed effects	Yes	Yes	Yes	Yes
No. of Obs.	121150	121150	121150	121150
R-Squared	0.18	0.05	0.22	0.05

Table 7.
Takeover threats and corporate diversification
This table provides regression analysis of corporate diversification on takeover threat. N. segments is the number of business segments of which the 4-digit SIC of each segment is not duplicated. Div. dummy equals one if the number of business segment is greater than one, zero otherwise. Takeover threat is a dummy indicator which equals one if the rm receives a takeover bid within a year. Other variables are defined in Appendix D. Robust standard errors that are clustered by firm are presented in parentheses. ***, **, and * are statistically at 1%, 5%, 10%, respectively.

	N	N. segments	Div. dummy	Entropy asset	Entropy sales	Herf asset	Herf sales
Number of segments	121,150	1					
Diversification dummy	121,150	0.81***	1				
Entropy asset-based	121,150	0.68***	0.78***	1			
Entropy sales-based	121,150	0.21***	0.24***	0.30***	1		
Herf asset-based	121,150	0.75***	0.77***	0.98***	0.30***	1	
Herf sales-based	121,150	0.42***	0.44***	0.55***	0.95***	0.56	1

Table 8. Pearson Correlation Coefficients of diversification measurements

	Entropy asset-based	Entropy sales-based	Herf asset-based	Herf sales-based
	(1)	(2)	(3)	(4)
Anti-takeover index	0.006***	0.006***	0.011***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)
Log(total assets)	0.020***	0.020***	0.042***	0.042***
	(0.001)	(0.001)	(0.001)	(0.001)
Leverage	-0.008*	-0.029	-0.019**	-0.035*
	(0.004)	(0.023)	(0.008)	(0.021)
Liquidity	-0.101***	-0.116***	-0.180***	-0.189***
	(0.005)	(0.018)	(0.008)	(0.017)
Return on assets	-0.043***	-0.040***	-0.090***	-0.085***
	(0.003)	(0.004)	(0.006)	(0.006)
Sales growth rate	-0.002***	-0.001	-0.004***	-0.003*
	(0.000)	(0.002)	(0.001)	(0.002)
Nppe	-0.030***	-0.026***	-0.062***	-0.054***
	(0.007)	(0.007)	(0.012)	(0.012)
Investment	-0.097***	-0.164**	-0.172***	-0.225***
	(0.009)	(0.069)	(0.016)	(0.059)
Advertising expense	-0.082***	-0.067**	-0.127**	-0.098*
	(0.028)	(0.028)	(0.051)	(0.051)
R&D expense	-0.146***	-0.138***	-0.257***	-0.246***
	(0.009)	(0.011)	(0.016)	(0.017)
Constant	0.138***	0.150***	0.236***	0.234***
	(0.028)	(0.032)	(0.057)	(0.055)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
No. of Obs.	121150	121150	121150	121150
R-Squared	0.21	0.02	0.23	0.08

Table 9.
Anti-takeover index and continuous measurements of diversification
This table provides regression analysis of corporate diversification on takeover pressure using continuous measurements of diversification as dependent variables. Anti-takeover index is the number of anti-takeover laws that were passed in each state. Other variables are defined in Appendix D. Robust standard errors that are clustered by firm are presented in parentheses. ***, **, and * are statistically at 1%, 5%, 10%, respectively.