Will Deregulation Affect the Structure of Corporate Governance? Evidence from the Deregulation of U.S. Trucking and Telecommunication Industries

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Abstract

We investigate whether and how governance structure changes in response to the dynamics of business environment after deregulation. Deregulation, on one hand, shifts the responsibility of agency problem from the regulatory parties to firm's shareholders. On the other hand, deregulation may affect the extent of market competition. The change in product market competition may serve as a substitute or complement to the governance structure (Alchian, 1950; Stigler, 1958; Winston, 1995; Holmstrom, 1982; Hart, 1983; Nalebuff and Stiglitz, 1983; Schmidt, 1997). We develop our research hypotheses and specifically focus on the deregulation events for two US industries – trucking and telecommunication industries- after 1990s. We show that deregulation does not increase market competition of trucking industry. The overall governance structure does not improve after deregulation although there is significant change in some governance features for both industries. Our empirical results from telecommunication industry generally support the complement hypothesis regarding product market competition and governance structure.

Keywords: Deregulation, Product Market Competition, Corporate Governance

Research highlights:

- Government deregulation affects the structure of corporate governance.
- Government deregulation does not necessarily increase market competition.
- Deregulation of telecommunication industry increases the market competition, leading their governance structure to closely control owner-manager agency conflict.

1. Introduction

Literature shows that deregulation tends to affect governance structure that inclines to align the managerial interests with shareholders' (Hambrick and Finkelstein, 1987; Kole and Lehn, 1997; Lehn, 2002; Kim and Prescott, 2005; Ovtchinnikon, 2010). Previous wisdom suggests that one of changing forces to governance structure is increased market competition post deregulation (Alchian, 1950; Stigler, 1958; Fama, 1980; Winston, 1998). Firms are disciplined by competition from other firms, which will induce managerial incentives to well perform and ensure firm's survival in the industry. Using the evidence from utility industry deregulation, Rennie (2006) provides the supporting evidence that increased product market competition leads utilities firms to adopt governance structures that more closely control agency problems after deregulation.

Although previous studies are fruitful, they do not consider two issues surrounding government deregulation. First, deregulation tends to be accompanied by changes in entry and exit corresponding with the change in business environment. Substantial mergers activity would generally occur during the period of the deregulation (Winston, 1998). Firms with cost advantages will experience competitive benefits and are more likely to expand their operation boundary as firms adjust to deregulation (Winston et al., 1990; Morrison and Winston, 1989). When firms are in competitive environments, poorly governed or managed firms are easily forced out of the market. Their urgency to adjust any suboptimal governance structure is strongest in the most competitive industries. As a result, it is argued that firms in highly competitive industries use relative less takeover defenses (Fama and Jensen, 1983; Shleifer and Vishny, 1997; Gompers, Ishii, and Metrick, 2003; Bebchuk, Cohen, and Ferrell, 2009; Cremers and Nair, 2005). However, it is also possible that

shareholders employee stronger anti-takeover provisions to protect stakeholders benefits, such as customers, in highly competitive markets (Cremers, Nair, and Peyer, 2008). Therefore, how the change in firm's anti-takeover provisions associated with governance structure changes post deregulation is one of main purposes investigated in this study.

Second, the effect of deregulation to one industry may not apply to other industry due to industries *themselves* are different (Winston, 1998; Kim and Prescott, 2005). Industries have different technologies, entry requirements, market structures and so on. Even worse, the magnitude of deregulation process in different industries is quietly different (Kim and Prescott, 2005). Investigating the effect of deregulation in one single industry is not enough to comprehensively understand the association between the governance structure changes and the effect of deregulation. The second purpose of our study is to examine whether the results from previous studies can be applied to different industries.

We investigate the deregulation of two industries in 1990s: Trucking industry and regulatory reform act in 1994 and Telecommunication Act in 1996. There are two reasons to investigate these two industries. First, the economic deregulation in the trucking industry was quick and relatively complete, so it can be characterized substantial deregulation (Kim and Prescott, 2005). On the other hand, the deregulation of telecommunication industry is slow and quite narrow.[1] According to prior literature, the impact of deregulation to the corporate governance change depends on its magnitude of deregulation and its associated market competition (Kim and Prescott, 2005). These two types of business deregulation are largely different

[1] As Kim and Presoctt (2005) discussed, Federal Communication Commission (FCC) start allow limited competition for interstate business connections in the 1970s. In 1984 long-distance services were partially deregulated. In 1996 local services were partially deregulated through Telecommunication Act.

and provide us a good experiment for examining how governance adapts to structure changes in cope with product market competition and possible changes of takeover pressure. Second, because most governance data is not available from research database before 1996, we need to hand collect all governance data to test our hypotheses. To ensure we have enough sample size and validated data, we limit our research on the industry deregulation after the 1990s.

Our univariate analyses show that the individual governance characteristics change for both industries after deregulation. However, factor score analyses suggest that both industries do not adopt governance structures that better control owner-manager agency conflicts after deregulation. In addition, deregulation does not necessarily increase market competition for trucking industry, which is contrary to the traditional thought (Winston, 1988; Rennie, 2006). Changes in individual governance characteristics of trucking industry during the sample period are not significantly related to changes in product market competition, but rather are associated with the change in economic environment after deregulation. Overall, this study suggests that deregulation does not necessarily lead firms to adopt governance structures that better control owner-manager agency conflict, nor lead to competition increases which help closer alignment of manager-owner incentives. The effect of product market competition to governance structure changes after deregulation is also associated with the status of market competition prior deregulation and change in market competition after deregulation. We also investigate the operating performance of these two industries after deregulation. We find that operating performance for both deregulated industries become worse post deregulation, but the matched-firms-adjusted levels of operating performance for telecommunication firms is insignificantly different from the one of matched firms,

indicating that telecommunication firms do not perform worse than matched firms that do not experience changes in regulatory environment.

Our study makes three contributions to the literature. First, the results of this study add contributions to the governance literature by addressing how corporate governance adapts to the external shock such as deregulations. Although a few studies have explored this issue, they do not consider how takeover defenses and internal governance mechanisms react to the change product market competition in details. Our study could fill this gap. Kole and Lehn (1997, 1999) address that the deregulation provides an important opportunity for deregulated firms to adapt more nimble governance structures for firms' survivals. No consideration of market competitions in Kole and Lehn (1997, 1999) motivates Rennie's (2006) study in which he further considers the effect of product market competition to the associated governance structure changes after the deregulation of U.S. electric utility. However, Rennie's (2006) work does not consider the impact of market competition to different industries and interaction effects among market competitions, internal governance structures, and takeover defenses. In addition, Rennie's study (2006) draws his conclusion from the empirical evidence in electric utility in which deregulation process has been thought to be slow with limited impact on firm's competitive settings as well as owner's monitoring work (Peltzman and Winston, 2000). Therefore, it is incomplete to the understanding of the dynamics of governance structures post deregulation without testing the differential effect in terms of market competition or deregulation effects between industries.

Second, our study helps to clarify the role of product market competitions in the design of governance mechanisms. Previous studies have not obtained a consensus on the role of product market competition to corporate governance structures. One

stream of studies views product market competition as a substitute of governance structures (Holmstrom, 1982; Hart, 1983; Nalebuff and Stiglitz, 1983; Schmidt, 1997). However, some other studies indicate product market competition may complement to governance structures (Delmas and Tokat, 2005; Kim and Prescott, 2005; Rennie, 2006; Karuna, 2008). Our study by investigating the deregulation effect to telecommunication industry suggest that market competition serves as complements to governance structure, which is consistent with the finding of Rennie (2006) but inconsistent with the arguments of Holmstrom (1982), Hart (1983), Nalebuff and Stiglitz (1983) and Schmidt (1997). However, the above implication does not apply to tucking industry.

Finally, our study also contributes to governance literature by documenting the dynamic relationship between governance structures and changes in business environment. Previous studies on corporate governance usually investigate comparative static predictions linking the firm performance to various governance dimensions, including board characteristics (Fama and Jensen, 1983; Monks and Minow, 1995; Brickley, Coles, and Jarrell, 1997), ownership structures (Morck, Shleifer, and Vishny, 1988; McConnell and Servaes,1990; Hermalin and Weisbach, 1988; Hubbard, and Palia, 1999; Demsetz and Lehn,1985), and CEO compensation (Fama and Miller, 1972; Jensen and Murphy, 1990; Bizjak, Brickley, and Coles, 1993; Datta, Iskandar-Datta, and Raman, 2001). Little is known about how firms adapt to external shock by dynamically adjust their governance systems. This study complements to the related literature by documenting that the effect of product market competition to governance structure changes after deregulation is also associated with the status of market competition prior deregulation and change in market competition after deregulation.

The remainder of the study proceeds as follows. Section 2 reviews prior literature and develops the main hypotheses. Section 3 describes the data source, variables, and methodology. Sections 4 and 5 provide the empirical results. Finally we discuss and conclude in Section 6.

2. Literature Review and Hypotheses Development

2.1. The Spirit of Regulation

Regulation usually has two forms: social and economic (OECD, 1999). Industry can benefit from economic regulations by receiving subsidies, restriction of market entry/exit or price controls (Stigler, 1971; Peltzman, 1976; Vietor, 1989, 1994; Viscusi, Vernon, and Harrington, 1995). Through the intervention of government agencies, regulation plays its role as an intermediary in principal-agent relationship from an agency theory perspective (Kim and Prescott, 2005). When firms are in regulated industry, their operations should be monitored or supervised by government agencies. In words, the regulated industry's major uncertainty arises from regulators, who may influence everything from pricing to the distribution strategy to the market. Because many aspects of external environments are controlled or influenced by regulators, regulated industries face quite stable environment in which managers have no discretion on firm' competition strategies. Therefore, some scholars argue that regulatory agencies serve as an external disciplining tool for firm operation (Kim and Prescott, 2005; Becher and Frye, 2011).

Because managers have limited discretion on firm operations, there are three main drawbacks for a regulated industry. First, decision control among the firms in the industry moves from the corporate owners to government or outside stakeholders once a certain industry is regulated (Stigler, 1971). This change of control distribution

shifts the locus of decision making away from managers to regulatory agents (Smith and Watts, 1992), so it deviates managerial profit-maximization decision to the concern of public or certain group's benefits. Second, a regulated industry is likely to deter entry from new comer so limits market competition in some sense (Stigler, 1971; Peltzman, 1976; Ovtchinnikov, 2010). Managers in low market-competition industry are less likely to involve in innovative strategies and to provide service with best quality (Winston, 1998; Kole and Lehn, 1999; Kim and Prescott, 2005). Lastly, managers in regulated industries have less incentive to pursue high NPV projects and hence reduce firm's investment opportunity set (Gaver and Gaver, 1995; Ovtchinnikov, 2010). Hubbard and Weiner (1986) provide an example of managerial no incentive in investing new reserves in natural gas industry. Similar case happens in railroad industry in late l970s. Willig and Baumol (1987) find that firms in railroads postpone investment on track maintenance before the passage of Staggers Rail Act of 1980, however their investment increases following the passage of the Act. Taken together, managerial function is negligible and shareholders of a firm in a regulated industry have less incentive to monitor firm's operation because regulation provides certain competitive advantage for incumbents and government agencies partially replace the role of shareholders in terms of monitoring and supervisory.

2.2. Deregulation and Change in Governance Structure

As regulation relaxes, the intermediary role of government between shareholders and owners become vanish (Kim and Prescott, 2005). Prior to deregulation, managerial actions are usually subject to intense monitoring by regulatory agents (Hubbard and Palia, 1995; Smith and Grimm, 1987; Rennie, 2006). By removing the restrictions imposed on the regulated industry, government remove /step down its role of monitoring and disciplining the management. Deregulation affects the

governance structure at least in three ways. First, deregulation provides managers more discretion in firms and increases the importance of managerial function in the firm (Hambrick and Finkelstein, 1987; Kim and Prescott, 2005; Ovtchinnikov, 2010). Prior deregulation, managers have less incentives to develop low-cost or high-profitability methods of production under price and entry regulation. Post deregulation, managers have more authority to establish prices and enter new market, so firm performance can be more sensitive to managerial decision quality. Meanwhile, deregulation creates uncertainty of environment which increases the costs of monitoring managerial performance (Kole and Lehn, 1997; Lehn, 2002). Regulation transfers owner-manager agency costs to taxpayers or ratepayers. Under regulation, all costs, including agency costs, are passed on to the consumers, and the owner-manager agency problem disappears (Kole and Lehn, 1999; Rennie, 2006). By removing the protective cover of regulation, deregulation infuses uncertainty and instability to the business environment. Firms start to consider the effect of different price schedules, capital investment in technologies or production process, or asset redeployment. The airline industry in the U.S. has been observed to face the severe change of business environment after deregulation (Kole and Lehn, 1997, 1999). Amidst this instability, shareholders face the challenge to distinguish the effects of management decision on firm performance from the effects of other factors which cannot be controlled by managers after deregulation. Shareholders need to undertake the owner-manager agency costs by themselves. Thirdly, deregulation is expected to enhance product market competition (Rennie, 2006; Ovtchinnikov, 2010). Regulation primarily limits competition among firms, and this lack of competition is one of major sources of managerial slack (Winston, 1998). When an industry is deregulated, the increase in competition among incumbent firms and from new

entrants forces the firms to minimize the cost production and enhance their production efficiency (Nickell, 1996). We leave the discussion about the effect of market competition to the change of governance structure to next sections.

To cope with competitive environment after deregulation, it becomes more important that shareholders implement its decision-making and monitoring functions in more efficient and rapid way (Fama, 1980; Fama and Jensen, 1983). Corporate governance, a set of integrated mechanisms designed to align managerial interest with shareholders', can be classified into many forms, such as board of directors, managerial incentives, ownership structures, and market for corporate control. Agency theory suggests that the use of managerial incentives and vigilant monitoring by board of directors are two primary mechanisms to minimize the difference between managerial and shareholder interests (Jensen and Mechkling, 1976; Smith and Watts, 1992; Jensen and Murphy, 1990; Fama and Jensen, 1983; Weisbach, 1988; Hermalin and Weisbach, 1991; Jensen, 1993; Yermack, 1996). The potential structural arrangements of board can ensure adequate and better monitoring functions- for example, a smaller board (Jensen, 1993), a higher proportion of outside directors (Zahra and Pearce, 1989), CEO nonduality (Fama and Jensen, 1983), and lower percentage of board busyness (Ferris, Jagannathan, and Pritchard, 2003).

Similarly, a better arrangement of executive compensation can reduce owner-manager agency conflict such as greater proportion of CEO stock options grants to total CEO pay (Fama and Miller, 1972; Jensen and Murphy, 1990) and higher CEO ownership (Jensen and Meckling, 1976; Agrawal and Mandelker, 1987). The level of executive rewards and proportion of CEO stock options to total pay are expected to more closely align CEO and shareholder interests (Kole and Lehn, 1997; Rennie, 2006). In order to effectively monitor the management by shareholders, it is

expected that the structure of equity ownership becomes more concentrated after deregulation (Kole and Lehn, 1997).

Shareholders with more available information regarding the firm performance can exert pressures for the adoption of governance structures to better control owner-manager agency problem (Rennie, 2006). However, ownership structure is composed by different owners with interests, such as managerial ownership, blockholder ownership, or institutional ownership. Different groups of shareholders have various incentives for monitoring (Cremers and Nair 2005). Prior studies did not investigate how and whether different components of ownership structure change surrounding deregulation period. This study investigates whether there is a significant effect between deregulation and change of ownership structure.

Takeover activity is the major source of external pressure on managers (Fama, 1980; Jensen, 1988; Jensen and Ruback, 1983; and Scharfstein, 1988). Prior deregulation, there is demand for managers skilled in managing the regulatory process, while after deregulation there is greater demand for talented and skilled managers in managing in competitive business environment. As the needs for managerial skills changes, the principal-agent relation between shareholders and managers might also affect the shareholders' right after deregulations (Cremers, Nair, Peyer, 2008). Overall, above discussions imply that deregulation shift the responsibility of agency problems from the regulatory parties to the firm's shareholders and result in the need for governance structure changes to control for owner-manager agency conflict. Hence we propose the first hypothesis as follows.

Hypothesis 1a. Deregulation is usually accompanied by changes in firm's governance structures with greater control of owner-manager agency conflict.

It is argued that the magnitude of governance change in response to market

competition depends on the scope and pace of deregulation (Kim and Prescott, 2005).[2] A narrow scope of deregulation limits managerial investment discretions and market-based competition (Hambrick and Finkelstein, 1987; Peltzman and Winston, 2000). Delayed or slow implementation in the deregulatory process offers early warnings to the industry so managers could anticipate possible changes to reduce uncertainty and take gradual adjustments to strategy (Spulber, 1989; Cook et al.,1983; Reger et al., 1992; Kim and Prescott, 2005). Thus, managers have sufficient time to anticipate possible outcomes and take gradual adjustments to their operating strategies (Spulber, 1989; Cook et al., 1983; Reger et al., 1992). Therefore, new entrants have marginal advantage to the industry. In this case, incremental implementation of regulatory changes slowly introduces market competitions and results in a more predictable environment which can be characterized by managers. Those firms in that industry have less incentive to quickly adapt new governance mechanisms.

On the other hand, if breadth and depth of deregulation are high, incumbents and new entrants of that industry are given discretion over strategic decisions, such as market entry/exit, pricing, product innovation, and investment alternatives. Under this circumstance, past norms or operation models no longer apply to new business environment and increase in firm's investment opportunities set introduce more product market competition (Gaver and Gaver, 1995; Smith and Watts, 1992; Hubbard and Palia, 1995). The substantial changes of business environment after deregulation largely shift the agency issues from the government to the owners and makes owner's monitoring become very difficult. Hence, the extent of adjustments of governance structure is expected to be associated with the magnitude of government deregulation.

[2] According to Kim and Prescott (2005), the scope of regulation means the degree to which regulations are removed from an industry. The pace of deregulation indicates the rate at which an industry is deregulated over time.

Hypothesis 1b. The changes in governance mechanisms depend on the extent of market competition after deregulation.

2.3. Deregulation, Market Competition, and Change in Governance Structure

Many studies suggest that deregulation is likely to increase the product market competition, which reduce agency problems between owners and managers (Alchian, 1950; Stigler, 1958; Winston, 1998; Winston, 1998; Ovtchinnikov, 2010). As Fama (1980) indicates that a firm is disciplined by competition from other firms, product market competition induces managerial incentives to well perform and ensures firm's survival in the industry. An increase in competition may have distinct impacts on a firm (Karuna, 2008). First, managers need to engage in more complex forward-looking activities, either cost reduction or quality improvement, to obtain a successful position in the competitive market (Kole and Lehn, 1997, 1999; Raith, 2003, 2005). Second, as managers involve in more complex decision making process, the outcome of managerial performance becomes less observable and more difficult to assess (Kole and Lehn, 1997, 1999). Finally, the increase in competition requires managers with greater expertise or skills to perform the more complex decisions in a timely manner (Hubbard and Palia, 1995; Christie, Joye, and Watts, 2003). Therefore, deregulation is expected to increase the product market competition and change the nature and the severity of potential agency problems in firms by simultaneously increasing the sensitivity of firm performance to managerial decisions (Kole and Lehn, 1999; Karuna, 2008).

2.3.1 A Substitute Relation between Market Competition and Governance Structure

Several studies indicate that market competition may act as the managerial incentive scheme to the firm performance (Holmstrom, 1982; Hart, 1983; Nalebuff and Stiglitz, 1983; Schmidt, 1997). Holmstrom (1982) and Nalebuff and Stiglitz

(1983) address that the increase in market competition generates valuable information from peer performance of managers across all firms, and which is useful to mitigate moral hazard problem. In addition, aggregate supply in product markets rise or decrease in product prices compresses profit margin and leads to the difficulty of fulfilling the profit target of the firm, so the managers can take less slack (Hart, 1983). Especially a firm with high bankruptcy cost or high possibility of liquidation, managers tend to work harder to keep their jobs and avoid the disutility of liquidation when an increase in market competition (Schmidt, 1997). Hence, market competition itself acts as a sort of managerial incentive scheme and provides shareholders with more information to evaluate managers' performance (Hart, 1983; Holmstrom, 1982; Nalebuff and Stiglitz, 1983).

After deregulation, managers will respond to increased market competition by making decisions that maximize shareholders' values to ensure firm survival and secure their job. Therefore, market competition after deregulation reduces the need for costly governance structures to control owner-manager agency conflict (Rennie, 2006). Hence, we propose the following hypothesis.

Hypothesis 2a. An increase in market competition aligns the managerial incentive with shareholders', therefore we will not observe significant changes in internal governance structure after deregulation.

As the industries are de-regulated, new entrants may enter the market and compete with incumbents. Due to the difference in their competitive advantage in business operation, the competition among incumbents or between incumbents and new entrants become intense (Winston, 1998). The change in entry and exit is a major driving source of pressure to bind managerial behavior, compared to internal governance mechanisms (Jensen, 1986). Once market competition increases after deregulation, managers need to take much effort to maintain the profit margin (Hart,

1983) or keep their jobs safely (Schmidt, 1997). Shareholders thus obtain more information about the managerial efforts and reduce the level of monitoring costs (Holmstrom, 1982; Nalebuff and Stiglitz, 1983; Hart, 1983). Since the managerial agency cost is lower under the market with high competition, it is expected to observe no significant changes in anti-takeover provisions of sample firms after deregulations. Hence, we propose the following hypothesis:

Hypothesis 2b. There is no significant change in anti-takeover provisions for firms after deregulations.

2.3.2 A Complement Relation between Market Competition and Governance Structure

Although an increase in market competition may serve as a substitute of managerial incentive and mitigate agency problem associated with owner and managers, the overall effect of competition to managerial incentive may be negative due to several reasons. First, more competition reduce firm profits, so it may affect the value of cost reduction and the benefits of inducing a higher level of managerial efforts (Schmidt, 1997). If the value of a cost reduction decreases with market competition, then managerial incentive may decrease and the owner of the firm is likely to involve in sets of governance mechanisms to induce managerial effort. Second, managerial incentive varies from managerial utility or objective function. By imposing different assumptions on managerial utility function, we can obtain contrary results for the relationship between managerial slack and market competition. [3] Since the market competition may exacerbate the potential owner-manager agency problem after deregulation, firms may adopt new governance

[3] There are at least two studies investigating the relationship between product market competition and managerial slack. Hart (1983) assumes that manager is infinitely risk averse and that income above a subsistence level has no value for the manger. In words, manager care more about reaching a given profit target than his income. Under this framework, product market competition unambiguously reduces managerial slack. On the other hand, Scharfstein (1988) poses the assumption about managerial utility function to be positively related to income level and find that competition increases managerial slack.

structures to adapt to regulatory and market changes (Kole and Lehn, 1997, 1999; Delmas and Tokat, 2005; Kim and Prescott, 2005; Rennie, 2006).

Based on the above argument, we can predict that market competition and internal governance structure move together and in the same direction. In words, market competition serves as complement to governance mechanism. Especially, when the extent of deregulation impact is substantial, it is expected to observe a quick adaption of governance mechanisms of the deregulated firms.

Hypothesis 3a. An increase in market competition leads to improve the internal governance structure after deregulation. Especially, largely increase in market competition will have more significant impact on changes in internal governance structure.

However, an increase in competition after deregulation may induce higher takeover defenses. Shareholders may impose higher takeover defenses in competitive market especially as industries with significant switching costs on customers or stakeholders (Titman, 1984; Klemperer, 1987; Chevalier and Scharfstein, 1996; Cremers et al., 2008). The study of Cremers et al. (2008) finds that firms in more competitive industries have more takeover defenses. They explain their findings that firms could rather use more anti-takeover provisions to decrease the disruption caused by takeovers because a long-term customers' relationship is vital for that industry. In accordance with this logic, we propose the alternative hypothesis between changes in market competition and anti-takeover provision that there is a positive relation between the changes in market competition and changes in anti-takeover provisions of sample firms. Therefore, we have following hypothesis:

Hypothesis 3b. The increase in market competition after deregulation may correspond with the increase in anti-takeover provisions.

[Table 1 is inserted about here]

3. Methodology

3.1. Sample Selection

Table 1 summarizes hypotheses statements. Our study primarily focuses on the deregulation of two industries in 1990s: Trucking Industry and Regulatory Reform Act in 1994 and Telecommunication Act in 1996. The sample on trucking industry consists of 63 publicly traded U.S. firms listed in Compustat under Standard Industrial Classification (SIC) codes 4210 (trucking and courier services, no air) to 4213 (trucking, no local). The sample on telecommunication industry consists of 447 publicly traded U.S. firms listed in Compustat under Standard Industrial Classification (SIC) codes 4812 (radiotelephone communications), 4813 (telephone communications), 4822 (telegraph and other message communications), 4832 (radio broadcasting stations), 4833 (television broadcasting stations), 4841(cable and other pay television services), and 4899 (communications service).

The test periods covers from 1989 to 1992, from 1991 to 1994 (the pre-deregulation period) and from 1996 to 1999, from 1998 to 2001 (the post-deregulation period) for trucking industry and telecommunication industries, respectively. These years correspond to five and two years before, and two and five years after passage of these two Acts, respectively. Figure 1 shows the time structure of test periods surrounding deregulations.

[Figure 1 is inserted about here]

To implement our test, a group of matched sample is generated in this study. We exclude financial firms, and regulated firms from industries other than trucking and telecommunications, by focusing on industrial firms. The matched sample

consists of a set of publicly traded U.S. industrial firms listed in Compustat under SIC codes 2000-3999. Similar to Rennie's (2006) approach, individual industrial firms are matched to our sample firms on size (90%-110% of prior year market value of assets), prior performance (closest prior five year average return on assets), and age (the firms must have been publicly traded at least since December 31, 1981).

We collect the corporate governance data from the Compact D/SEC database, SEC proxy statement, Risk Metrics (formerly Investors Responsibility Research Center, IRRC), Governance and Directors datasets, Thomson Reuters, Executive Compensation, and Corporate Library database. Four categories of corporate governance variables are collected: board characteristics, ownership structures, CEO compensation, and market for corporate control. We clarify the board characteristics from the Risk Metrics Directors and Corporate Library database. We hand collect the data on board characteristics from proxy statements before 1996. Data on ownership structure is collected from the Compact D/SEC database, Thomson Reuters, Corporate Library, and proxy statements, depending on the data availability. CEO equity-based pay and CEO ownership data is collected from the COMPUSTAT Executive Compensation and proxy statements. The index developed by Gompers et al. (2003) measures the numbers of anti-takeover provisions in a firm's charter and in the legal code of the state in which the firm is incorporated. The index is assembled and reported about approximately every two or three years (1990, 1993, 1995, 1998, and 2000) by the Risk Metrics. For the years without the index, we use the data from the closest previous year (Gompers et al., 2003; Cremers and Nair, 2005). To be included in the sample, accounting data on operating performance must be available on the COMPUSTAT annual industrial database. Because governance data draws from several sources, we do not require complete data availability for all

variables to maximize the sample size.

3.2. Variables

To test the effect of deregulation to our sample firms, we use two dummy variable of deregulation and de-regulated industry, denoted as *Dumde* and *Truck(Telecom)*, which is equal to one if the observation is post-deregulation and in a deregulated industry (trucking or telecommunication) respectively, and zero otherwise. We calculate the industry concentration, measured by Herfindahl-Hirschman index (*HHI*), as the proxy of product market competition for each sample industry, following previous studies (Cremers et al., 2008; Rennie, 2006; Schmidt, 1997). *HHI* is calculated as the sum of the squares of market shares of all Compustat firms in the industry and with valid data on sales for each sample year, where industries are defined by three-digit SICs.

Ten governance variables are investigated in this study. Board size is measured by the number of directors serving on the board. Board independence is calculated as the fraction of the outside directors in the board, where we define outside directors as directors who do not have an executive position in the firm, have not had such a position in the past, or are not related to an executive. Leadership structure is defined as a dummy variable that equals one when the chairman of the board serves as CEO, and zero otherwise. Busyness of board is calculated as the fraction of busy directors serving on the board for the sample firms. A busy director is defined as having directorships on the boards of three or more firms.

Managerial ownership is the fraction of outstanding shares held by the officers and directors. Blockholder ownership is the fraction of the outstanding shares owned by blockholders. Institutional ownership is defined as the percentage of equity ownership held by the institution investors. CEO equity-based pay is the

percentage of equity-based compensation (stock option and restricted stock grants) in CEO's total compensation and CEO ownership is the percentage of equity held by the CEO. G-index developed by Gompers et al. (2003) is used as the proxy for antitakeover provisions.

Several financial variables of firms are examined in this study. Firm size (*Size*) is measured as the market value of total assets. Leverage (*Debt*) is total debt to total market value of assets. Growth opportunities (*MB*) are measured as the market to book ratio, with the numerator total assets less book value of equity plus the product of year end stock price and the number of shares outstanding, and the denominator book value of assets. Free cash flow ratio (*FCF*) is operating income before depreciation minus interest expense, taxes, and preferred dividends divided by total asset. Profitability ratio (*ROA*) is operating income before depreciation divided by total book asset. Table 2 presents the variable definitions used in this study.

[Table 2 is inserted about here]

3.3. Data Descriptions

Figure 2 shows the distribution of sales revenues and Herfindahl-Hirschman index (*HHI*, market competition) for trucking and telecommunication industries from 1976 to 2008. It is observed that product market competitions of these two industries are quite different. The *HHI* for trucking industry in 1994 is approximately 32.0% which is higher than the industry average reported in Rennie (2006). In words, this industry is relatively less competitive compared with other industries. The average 4-year *HHI* for trucking industry prior deregulation (year -5 to -2) is around 22.3%, while 29.0% is the average number post deregulation (year +2 to +5). This indicates that trucking industry become less competitive/more

concentrated post de-regulation. The change in trucking industry concentration is inconsistent with the literature discussion that deregulation is expected to increase in product market competition for overall industries (Ovtchinnikov, 2010).

[Figure 2 is inserted about here]

On the other hand, the market competition of telecommunication industry prior deregulation is highly intense. The *HHI* for telecommunication industry in 1996 is around 3.9% which is significantly below the industry average. The market competition becomes much fiercer post 1996, 4-year average *HHI* decreasing from 6.0% (prior deregulation, year -5 to -2) to 3.3% (post deregulation, year +2 to +5). It is observed that there is a different pattern of change in market competition associated with de-regulations between these two industries.

The analyses on sample statistics and univariate tests are further conducted for trucking and telecommunication industries and are reported in Tables 3 and 4, respectively[4]. In each table, we report three panels of variables statistics: industry concentration, corporate governance, and financial characteristics. Industrial concentration measures shown in panel A of Table 3 suggest that trucking industry concentration increases (competition decreases) post-deregulation, which is opposite to the previous studies about the effect of deregulation (Rennie, 2006). The mean (median) *HHI* for trucking firms increases from 24% (22%) to 29% (29%). The industry concentration of trucking industry is quite concentrated prior deregulation, and become more concentrated than industrial matched firms post deregulation. The results for telecommunication industry shown in panel A of Table 4 indicate

[4] We remove the firms which do not have at least two-year observations of governance date both preceding and following the deregulation.

telecommunication firms industry concentration decreases (competition increases) post-deregulation, and industry concentration is significantly lower than the industrial matched firms. The mean (median) *HHI* for telecommunication firms decreases from 12% (10%) to 9% (9%).

[Table 3 is inserted about here]

The comparison of product market competition between these two industries pre- and post-deregulation brings an interesting result that deregulation does not necessarily increase market competition, which is inconsistent with the traditional thought (Winston, 1998). Therefore, it is insufficient to examine how governance changes correspond to market completion after deregulation by looking at one specific industry. Investigating how governance structure changes post deregulation in different industries helps better understand the association between governance structures and market competitions.

[Table 4 is inserted about here]

Governance features of sample firms shown in Panel B of Tables 3 and 4 suggest that governance structures change for sample firms and industrial matched firms after deregulation, but in different ways. The board structure of trucking industry does not significantly change after deregulation. The changes in mean (median) value of board size, board independence, leadership structure, or busyness of board between pre- and post-deregulation are not at significant level. Comparing with industrial matched firms, trucking firms are relatively smaller board size but

lower board independence either pre- or post-deregulation. The deregulated trucking firms also have a higher ratio of busy directors of the board post deregulation.

The ownership structure of trucking companies significantly changes after deregulation. Mean (median) proportion of blockholder ownership significantly increases from 32.94% (27.33%) to 52.55% (51.02%). Mean (median) proportion of institutional ownership also significantly increases from 31.11% (31.30%) to 34.85% (34.97%). Mean (median) proportion of CEO ownership increases from 9.15% (3.80%) to 11.84% (8.25%). Meanwhile, corporate anti-takeover provision (*G-index*) does not significantly change. Taken together, we find that the ownership structure of trucking industry after deregulation is increased through CEO, blockholder, and institutional ownership concentration.

For telecommunication industry, mean (median) proportion of independent directors significantly decreases from 66.00% (66.67%) to 58.85% (66.37%). CEOs are more likely to serve as the board chairman after deregulation. Mean (median) proportion of managerial ownership also significantly decreases from 18.67% (10.17%) to 15.37% (5.97%). Mean (median) proportion of CEO compensation paid in options significantly increases from 29.39% (29.09%) to 35.73% (36.09%), but no significantly changes in CEO ownership surrounding deregulation. Mean (median) corporate anti-takeover provision (*G-index*) significantly decreases from 8.61 (9.00) to 8.35 (8.00). The overall change in governance structure of telecommunication industry indicates that firms align the interests of CEOs with those of shareholders by granting higher proportion of CEO compensation paid in options, combining CEO and chairman positions in CEOs. Although it is possible that greater CEO bargaining power through higher compensation or leadership may increase the possibility to extract private benefit from shareholders (Ahn and Walker, 2007), we

also observe that the decrease in *G-index* following deregulation of telecommunication industry indicates the shareholder's protection also enhances to prevent CEO from deprivation of private benefits which will destroy the firm value.

The univariate comparison in the governance features of trucking and telecommunication industries indicates that governance structures change in both industries after deregulation. The governance changes in trucking industry suggest that governance structure better controls owner-manager agency conflict by improving ownership concentration. However, the governance structure changes in telecommunication industry reflect that firms try to align the interests of CEOs with those of shareholders through increasing the proportion of CEO compensation paid by stock options or releasing the imposition of anti-takeover provisions in a firm's charter, but also accompany with decreasing in board independence and managerial ownership.

Financial characteristics shown in panel C of Tables 3 and 4 report that sample firms, both trucking and telecommunication firms, and industrial matched firms are similar in size prior deregulation. Mean (median) leverage is higher for trucking than for industrial matched firms, but mean (median) leverage is lower for telecommunication than for industrial matched firms. Mean (median) free cash flow ratio of trucking companies is significantly higher than that of industrial matched firms prior deregulation, however, mean (median) free cash flow ratio becomes insignificantly different from industrial matched firms post deregulation. Mean (median) profit ratio of trucking firms become significantly lower than that of industrial matched firms post deregulation, while there is no significant difference in profit ratio for trucking firms and matched firms prior deregulation. Nevertheless, we find that mean (median) profit ratio of telecommunication firms significantly

outperform their matched firms either prior or post deregulation.

3.4. Methodology

We adopt the method used by Rennie (2006) and conduct the multivariate tests in the following ways. First, we use a traditional pre- versus post-deregulation indicators to indentify governance characteristics of sample firms that exhibit change or trend-adjusted change. Regressions applied to deregulated industries are of the forms:

$$Gov_{it} = \beta_{0it} + \beta_1 Dumde_{it} + \beta_2 Size_{it} + \beta_3 Debt_{it} + \beta_4 MB_{it} + \varepsilon_{it} \quad (1),$$

where Gov_{it} is one of ten individual governance characteristics tested, $Dumde_{it}$ is a deregulation dummy equal to one if the year is in post-deregulation period and zero otherwise. $Size_{it}$, $Debt_{it}$, and MB_{it} are firm size, leverage, and growth opportunities for firm *i* at year *t*, respectively. The $Dumde_{it}$ coefficient captures changes among deregulated firms in Gov_{it} between the pre- and post- deregulation periods, after controls.

We also consider the potential adjustments across all industries, so industrial matched firms are used to control this effect. Regressions applied to the full sample are of the forms:

$$Gov_{it} = \delta_{0it} + \delta_1 Dumde_{it} * Truck_{it} (/ Telecom_{it}) + \delta_2 Size_{it} + \delta_3 Debt_{it} + \delta_4 MB_{it} + \varepsilon_{it} \quad (2)$$

where $Truck_{it} / Telecom_{it}$ is a trucking/telecommunication industry dummy variable equal to one if the firm is in the trucking/telecommunication industry, and zero otherwise. The $Dumde_{it} * Truck_{it}$ / $Dumde_{it} * Telecom_{it}$ coefficient captures trend-adjusted changes among deregulated industries relative to industrial matched firms after deregulation. Fixed effects include firm and time dummy variables.

Under hypothesis 1a, we expect that both $Dumde_{it} * Truck_{it}$ and $Dumde_{it} * Telecom_{it}$ coefficients (δ_1) are significant.

To test hypothesis 1b, we consider the effect of product market competition and modify the regression specification (1) into the following regression specification.

$$Gov_{it} = \theta_{0it} + \theta_1 HHI_{it} + \theta_2 Size_{it} + \theta_3 Debt_{it} + \theta_4 MB_{it} + \varepsilon_{it} \quad (3),$$

where HHI_{jt} is the Herfindahl-Hirschman index for industry *j* at year *t*.

Then we investigate whether product market competition explains changes in governance structures of deregulated industries following deregulation. Similar to Rennie's study (2006), regressions applied to trucking / telecommunication industries, and then to the full sample, are of the forms:

$$Gov_{it} = \gamma_{0it} + \gamma_1 Dumde_{it} + \gamma_2 HHI_{jt} + \gamma_3 Size_{it} + \gamma_4 Debt_{it} + \gamma_5 MB_{it} + \varepsilon_{it} \quad (4)$$

(for deregulated industries)

$$Gov_{it} = \upsilon_{0it} + \upsilon_1 Dumde_{it} * Truck_{it}(/Telecom_{it}) + \upsilon_2 HHI_{jt} + \upsilon_3 Size_{it} + \upsilon_4 Debt_{it} + \upsilon_5 MB_{it} + \varepsilon_{it} \quad (5)$$

(for the sample firms and corresponding industrial matched firms)

Under hypotheses 2a and 2b, we expect that HHI_{jt} coefficient γ_2 in equation (4), or HHI_{jt} coefficient υ_2 in equation (5) are insignificantly different from zero. Under hypotheses 3a and 3b, we expect that HHI_{jt} coefficients γ_2 in equation (4), or HHI_{jt} coefficient υ_2 in equation (5) are significantly different from zero.

Because each governance variable is likely to include a governance component as well as idiosyncratic, non-governance-related components, individual governance characteristic is not able to catch the overall ability of governance structures to control owner-manager agency conflict (Baker and Wurgler, 2006; Boone et al., 2007; Chen

and Chen, 2012). It is important to consider how deregulation affects the overall governance structure of deregulated industries. Therefore, the factor analysis is used to extract the overall governance effect from individual governance variables and get the factor scores by multiplying factor weights by firm-year data (Rennie, 2006). Then the factor scores are used as dependent variables to repeat the above empirical designs and investigate the effects of deregulation on change in the overall governance structure.

4. Deregulation and Changes in Governance Structure for Both Industries

We investigate how these two deregulated industries adopt governance structures to cope with environmental change after deregulation in this section. We find that the governance structures of both deregulated industries change after deregulation, but the ways they adjust governance structures in response to the dynamics of business environment after deregulation are different.

4.1. Will Governance Structures Change after Deregulation?

We provide the evidence that government deregulation will change governance mechanisms in some perspectives, but the changes in governance structure for both industries are different. Specifically, we find that the overall governance structure of telecommunication firms does not improve after deregulation. The results are inconsistent with the previous studies that deregulations works as an intermediary to better control agency problem between managers and shareholders.

Table 5 and Table 6 report the changes in individual governance characteristics of trucking and telecommunication firms associated with deregulation, respectively. Each table reports two panels, panel A shows the results only for sample firms and

panel B reports the results after trend-adjusted changes among samples firms and industrial matched firms. We first discuss the results for trucking industry. The results in panel A of Table 5 show that board size and board independence of trucking firms significantly decrease at least the 10% level or better after deregulation. Blockholder ownership, institutional ownership, and CEO ownership of trucking firms tend to increase by 0.193, 0.037, and 0.041 of total equity outstanding, respectively. Trend-adjusted effect reported in panel B of Table 5 suggests that trucking firms significantly decrease in board size, board independence, CEO compensation paid by options, and *G-index*, but significantly increase in ownership concentration. Specifically, managerial ownership increases 0.061 of total equity outstanding higher for trucking firms than for industrial matched firms. Blockholder ownership and CEO ownership respectively increase 0.193 and 0.066 of total equity outstanding higher for trucking firms than for industrial matched firms. Results reported in Table 5 suggest that governance structure of trucking firms significantly changes in some perspectives after deregulation. The findings of increase in ownership concentration post deregulation are consistent with Kole and Lehn (1999), but are inconsistent with Rennie (2006).

[Table 5 is inserted about here]

We then discuss the results for telecommunication industry. The results in panel A of Table 6 show that board size and board independence of telecommunication firms significantly decrease at least the 10% level or better after deregulation. CEO compensation based on options of telecommunication firms significantly increases by 0.047 of total compensation. Managerial ownership

significantly decreases by 0.019 of total equity outstanding. *G-index* tends to decrease by 0.601 after deregulation. We also find stronger trend-adjusted governance changes for telecommunication firms. Trend-adjusted effect reported in panel B of Table 6 suggests that telecommunication firms significantly decrease in board size, board independence, leadership structure, busyness of board, and *G-index*. Not only improvement of shareholder's protection as shown changes in *G-index* after deregulation, the changes in board structure suggest telecommunication firms adopt new governance system to cope with the market competition after deregulation.

Different from the results found in Table 5, we do not find significant change in ownership structure of telecommunication industry after deregulation, except managerial ownership. The results from Table 5 and 6, together with the findings from Table 3 and 4, suggest that firms adjust their governance structures to cope with the environmental change after deregulation; however the ways they adopt are quite different. We observe a significant improvement in ownership concentration in trucking industry, while telecommunication firms emphasize the interest alignment between shareholders and CEO by adjusting the level of CEO compensation paid on options and releasing anti-takeover provisions in a firm's charter. Therefore, the adjustment of governance structure to the dynamic of business environment after deregulation not only is attributed to relieve of government regulation, but also depend on industrial characteristics such as the level of market competition (Kim and Prescott, 2005), which is measured by *HHI* and will be discussed in later section.

[Table 6 is inserted about here]

We also perform the factor analysis to individual governance features that change

to capture the overall ability of governance structures to control owner-manager agency problem. The factor analysis is first applied to each deregulated industry, trucking and telecommunication, respectively, and then to industrial matched firms. We generate the governance factor score for trucking industry by applying factor analysis to the governance characteristics shown in panel A of Table 5, including board size, board independence, blockholder ownership, institutional ownership, and CEO ownership. We also generate the full sample governance factor score by applying factor analysis to governance characteristics shown in panel B of Table 5 to have exhibited tread-adjusted change, including board independence, managerial ownership, blockholder ownership, CEO equity-based pay, CEO ownership, and *G-index*. We use the similar method to generate the governance factor score for telecommunication industry by applying the same technique to governance variables shown in Table 6.

The empirical results regarding the association between overall governance structure and the effect of deregulation (Model 1 in Panel A and B of Table 7) show that trucking firms do not significantly improve their governance structures after deregulation, although the ownership structure is more concentrated as discussed in Table 3. The coefficient of deregulation dummy (*Dumde*) (Model 1 in Panel A) is insignificantly different from zero. This suggests that trucking industry does not adopt governance structures that better control agency problem after deregulation. The interaction term (*Trend-Adjusted Dummy*) coefficient in the full-sample governance factor score regression (Model 1 of Panel B) is also insignificant different from zero. This implies that there is no much difference between trucking firms adopt governance structures to address agency problem and industrial matched firms do post deregulation.

[Table 7 is inserted about here]

The results for telecommunication industry shown in Panel C and Panel D of Table 7 report that the deregulation dummy coefficient (*DumDe*) (Model 1 of Panel C) is negative and statically significantly different from zero at the 1% level, indicating overall governance structure of telecommunication firms does not improve after deregulation. In addition, the interaction term (*Trend-Adjusted Dummy*) coefficient (Model 1 of Panel D) is also negative and significantly different from zero, indicating that telecommunication firms do not adopt governance structures to control owner-manager agency problem as much as industrial matched firms do after deregulation. To thoroughly explore the relationship among the overall governance structure (measured by factor score), market competition (*HHI*), and deregulation, we also present the association between the market competition and the overall governance structure, as shown in Models 2 and 3 in each Panel of Table 7. The detailed discussion will be presented in the later section.

4.2. Will Product Market Competition Cause the Changes in Governance Structure?

This section investigates the effect of product market competition to the adaption of governance structure. The empirical results in this section show that product market competition in telecommunication industry significantly affects the governance structure post deregulation and the general governance structure improves as increases in product market competitions. However, no sufficient evidence is found that product market competition improve general governance structure of

trucking firms post deregulation.

[Table 8 is inserted about here]

Evidence on the association between product market competition and changes in governance structure is shown in Tables 8 and 9. Table 8 reports the results for trucking industry and Table 9 discloses the results for telecommunication industry. Results reported in panels A and B of Table 8 indicate changes in individual governance characteristics of trucking industry during the sample period are not significantly related to changes in product market competition. The Herfindahl-Hirschman index (*HHI*) coefficients in all governance regressions are not significantly different from zero (Panel A), but *HHI* are significantly different from zero for the deregulated firms and industrial matched firms (Panel B). From the results of Table 8, we can conclude that changes in product market competitions in trucking industry do not significantly affect the changes in governance structures of trucking firms.

Results reported in panels A and B of Table 9 suggest changes in individual governance characteristics of telecommunication industry during the sample period are significantly related to changes in product market competition. The Herfindahl-Hirschman index (*HHI*) coefficients in many governance regressions are significantly different from zero. Overall governance score analysis reported in model 2 of Panels C and D in Table 7 show consistent results with Table 9 and indicates that the change in product market competition of telecommunication industry significantly affect the governance structure of telecommunication firms.

[Table 9 is inserted about here]

4.3 Test the Relationship among Deregulation, Market Competition, and Changes in Governance Structure

In this section we test the hypotheses 2 and 3. If market competition serves as a substitute of governance mechanism, we would observe no significant change in governance structure under the case that managers respond to increased market competition by acting in shareholder interests to ensure firm and thus managerial survival. On the other hand, if market competition serves as a complement of governance mechanism, it is expected to significant changes in governance structure after deregulation because deregulation works as a catalyst for increased market competition that pressures deregulated firms to adopt governance structures that better control agency problems. Our empirical analyses in Tables 10 and 11suggest that product market competition complements governance structures to minimize agency problems in telecommunication industry after controlling the deregulation effect. However, above implication could not be applied to trucking industry.

Results in panels A and B of Table 10 suggest that changes in individual governance characteristics of trucking firms, if exists, are associated with the change of business environment after deregulation, instead of changes in product market competition. In panel A of table 10, the coefficients on *Dumde* in the board size, board independence, and blockholders of deregulated firms are significant at the 10% level or better, but the coefficients on *HHI* in all models are insignificant. As compared with the full sample (including deregulated firms and industrial matched firms) in Panel B, it is inferred that market competition in trucking industry hardly affects the change in their governance structures. But rather, the deregulation *itself*, not product market competition in trucking industry, does change governance characteristics in some sense.

[Table 10 is inserted about here]

Results in panels A and B of Table 11 suggest that changes in individual governance characteristics of telecommunication firms are also associated with the change in economic environment after deregulation. The coefficients of *Dumde* in the board size, board independence, blockholder ownership, CEO equity-based pay, and *G-index* regressions are significant at the 1% level. Empirical results shown in the panel B of Table 11 also suggest that trend-adjusted changes in governance structure characteristics of telecommunication firms are also explained by change in product market competition. We observe that the coefficient signs of *HHI* of all regressions are almost significant, suggesting that product market competition serves as a complement to governance structures that mitigate agency problem after deregulation in telecommunication industry. Overall evidence reported in Table 11 suggests that changes in government regulatory environment do affect the governance structures of telecommunication firms and the magnitude of changes in governance structures may offset by the changes in product market competition in the industry.

We also use the governance factor scores discussed in previous section as dependent variables and perform additional test based on equation (4). The results are reported in model 3 of table 7. In Model 3 in Panel A of Table 7, the Herfindahl-Hirschman index (*HHI*) coefficient is 0.229, insignificantly different from zero, and the *Dumde* coefficient is -0.054, is also insignificant different from zero. This suggests that general governance structure of trucking firms does not significantly change after deregulation and market competition do not affect the governance structure of this industry. The full sample governance score regression

results are reported in panel B of Table 7, and indicate that market competition still does not affect the governance structure of industrial matched firms after deregulation of trucking industry.

[Table 11 is inserted about here]

The regression results for factor score of telecommunication industry are reported in model 3 of panel C and panel D of Table 7. The *Dumde* coefficient is -0.251, statistically significant at the 1% level, indicating that general governance structure of telecommunication firms become worse after deregulation. The Herfindahl-Hirschman index coefficient is -2.391, statistically significant at the 1% level, indicating that increase in product market competition attributes to the improvement of general governance structure of telecommunication firms after controlling the deregulation effect. The full sample governance score regression results reported in panel D of Table 7 also indicate that market competition works to complement the governance structure of industrial matched firms and telecommunication firms. Generally, we conclude that product market competition complements the governance structure that better control the agency conflicts of telecommunication firms.

5. Operating Performance of the Sample Firms Surrounding the Deregulation

To see whether sample firms experience any changes in their long-term operating performance post deregulation, we examine their operating performance over a seven-year period. This includes the two years preceding deregulation (year -2) and the four-year period post deregulation (years +2 to +5). For each of the four years

post deregulation, we also examine changes in performance relative to year -2. Table 12 reports the average level and changes in operating performance for the sample firm. Panel A shows the results for trucking industry and Panel B reports the results for telecommunication industry. In each panel, we compute operating return on asset and matched-firms-adjusted operating return on assets as the proxies for operating performance. Operating return on asset is defined as operating income before depreciation divided by total book asset. [5] Matched-firms-adjusted-performance is firm's operating return on asset minus the median operating return on asset for the portfolio of matching firms.

Relative to year -2, operating performance worsens in years +2, +3, +4, and +5 for trucking industry. The mean (median) changes for these periods are -0.029 (-0.011), -0.022 (-0.016), -0.021 (-0.015), and -0.032 (-0.022), all significant at the 1% level. The results from match-firm-adjusted levels of operating performance also indicate that the mean (median) changes in performance from year -2 to +2 and year -2 to +3 are significant at the 1% level. Operating performance significantly decreases in at least three years post deregulation, implying that the trucking firms do not perform as well as firms that did not experience changes in regulatory environments.

Results from panel B of Table 12 also indicate that operating performance worsens in years +2, +3, +4 and +5 for telecommunication industry relative to year -2. The mean (median) changes for these periods are -0.019 (-0.000), -0.019 (-0.002), -0.029 (-0.005), and -0.022 (-0.004), all significant at the 1% level, except the median change from year -2 to +2. It is also observed that the magnitude of change in

[5] The results remain similar if we define operating performance as the ratio of net income divided by the book value of asset.

operating performance for telecommunication industry is relatively smaller than the one in trucking industry. The matched-firm-adjusted levels of operating performance for telecommunication firms is insignificantly different from the one of matched firms, indicating that telecommunication firms do not perform worse than matched firms that do not experience changes in regulatory environment.

[Table 12 is inserted about here]

6. Discussion and Conclusion

Although the study of Rennie (2006) shows that the increase in market competition stemming from deregulation is a driving force to governance structure change after deregulation, his study does not consider the magnitude of deregulation and its impact on market competition in association with adaption of the governance structure (Kim and Prescott, 2005). Our study by focusing on the deregulation of different industries, which are believed to be different in the magnitude of deregulation and the level of market competitions, examines how governance structure adapts to changes in business environment in cope with product market competitions post deregulation.

The empirical analysis shows that deregulation does not necessarily increase market competition, which is contrary to the traditional thought (Winston, 1998). The trucking industry is significantly concentrated prior deregulation, and become more concentrated than industrial matched firms post deregulation. On the other hand, the concentration of telecommunication industry decreases (competition increases) post-deregulation, and industry concentration is significantly lower than the industrial matched firms.

It is also found that governance structure changes for both industries post

deregulation, but the ways they adjust governance structures are different. The ownership structure of trucking industry post deregulation is improved through greater CEO, blockholder, and institutional ownership concentration. The governance structure changes in telecommunication industry post deregulation reflect that firms try to align the interests of CEOs with those of shareholders through increasing the proportion of CEO compensation paid by stock options and releasing the imposition of anti-takeover provisions in a firm's charter, but also accompany with decreasing in board independence and managerial ownership. The results from factor analysis suggest that the overall governance score of trucking firms does not significantly change after deregulation whereas the overall governance structure of telecommunication firms even becomes worse post deregulation.

In addition, the empirical evidence also indicates that product market competition in telecommunication industry significantly affects the governance structure and the general governance structure improves as increases in product market competitions. However, no sufficient evidence shows that product market competition improve general governance structure of trucking firms during the sample period.

We finally investigate the association among market competition, governance structure, and deregulation. The results demonstrate that changes in individual governance characteristics of trucking industry during the sample period are not significantly related to changes in product market competition, but rather are associated with the change in economic environment after deregulation. The evidence suggests that deregulation *itself*, not product market competition in trucking industry, does change the governance characteristics in some sense. On the other hand, empirical results on telecommunication industry show that product market

competition serves as a complement to governance structure that mitigates agency problem after deregulation in telecommunication industry. The changes in government regulatory environment do affect the governance structures of telecommunication firms and the magnitude of changes in governance structures may offset by changes in product market competition of the industry.

Taken together, our study suggests that deregulation in some industries does not necessarily lead firms to adopt governance structures that better control owner-manager agency conflict, nor lead to competition increases which help closer alignment of manager-owner incentives. The effect of product market competition to governance structure changes after deregulation is also associated with the status of market competition prior deregulation and the change in market competition after deregulation.

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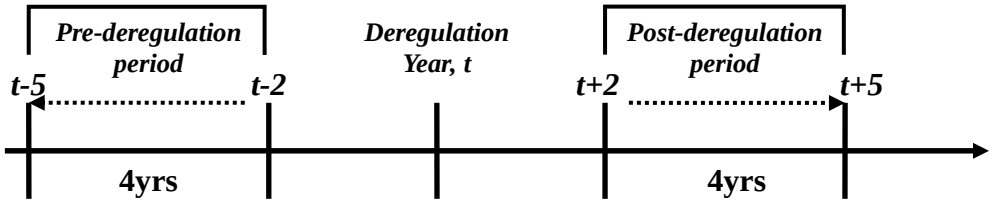

Figure 1. The Illustration of Test Period

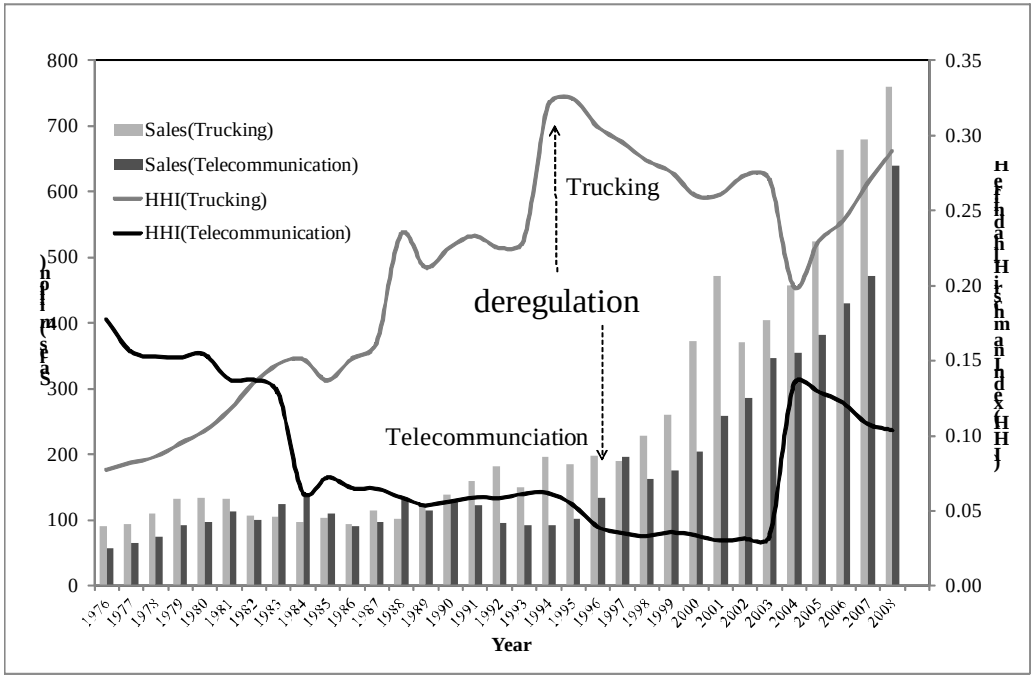

Figure 2. The Distribution of Sales Revenues and Herfindahl-Hirschman Index (*HHI*) of Trucking and Telecommunication Industries from 1976 to 2008.

Table 1. The Hypotheses proposed in this study

We propose three hypotheses in this study. The first hypothesis states that deregulation is expected to be accompanied by changes in firm's governance structures with greater control of owner-manager agency conflict. The second and third hypotheses propose argument regarding the association among deregulation, product market competition, and the dynamics of corporate governance. Two industries are investigated in this study—trucking and telecommunication industries. We calculate the industry concentration, measured by Herfindahl-Hirschman index (HHI), as the proxy for product market competition of each sample industry. We test the market competition to be substitutes or complements of the corporate governance (including governance and takeover defenses) after deregulation, respectively. The trucking and telecommunication industries from 1976 to 2008 and corresponding matching sample are used to test these hypotheses.

Hypothesis	The ***interaction*** of deregulation with market competition (*HHI*)	The ***correlation*** of deregulation with market competition (*HHI*)	The effect of deregulation on the corporate governance structures
H1a	No	--	Deregulation causes the adjustment of corporate governance structure.
H1b	Yes	Positive	Depends on the extent of market competition after deregulation.
H2a	Yes	Substitutes	No significant changes in ***internal governance*** after deregulation.
H2b	Yes	Substitutes	No significant changes in ***anti-takeover provisions*** after deregulation.
H3a	Yes	Complements	Significant changes in ***internal governance*** after deregulation.
H3b	Yes	Complements	Significant changes in ***takeover defenses*** after deregulation.

Table 2. Definitions of variables used in this study

Financial information on the firms is obtained from the Compustat database; data on board variables from the RiskMetrics Directors database (formerly the Investors Responsibility Research Center (IRRC) Directors database); data on ownership structure from Compact Disclosure, RiskMetrics, Corporate Library, Thomson Reuters, and proxy statements; detailed descriptions of CEO compensation from the Compustat Executive Compensation database; the two measures of audit quality from RiskMetrics, Corporate Library, and proxy statements; and the *G-index* from the RiskMetrics database.

Variables	Definitions
Panel A: Market Competition Characteristics	
Herfindahl-Hirschman Index (*HHI*)	Sum of the squared fraction of industry sales by all firms in the three-digit SIC industry.
Panel B: Governance Characteristics	
Board size	Number of directors serving on the board.
Board independence	Fraction of outside directors on the board, where outside directors are directors who do not have an executive position in the firm, have not had such a position in the past, or are not related to an executive.
Leadership structure	Dummy variable that equals one when the chairman of the board also serves as CEO, and zero otherwise..
Busyness of board	Fraction of directors who serve on the boards of three or more firms.
Managerial ownership	Fraction of outstanding shares held by officers and directors.
Blockholder ownership	Fraction of outstanding shares owned by blockholders, where blockholders is defined as shareholders who hold more than 5% of the outstanding shares.
Institutional ownership	Fraction of outstanding shares held by the 18 largest public pension funds (as in Cremers and Nair, 2005).
CEO equity-based pay	Percentage of equity-based compensation (stock options and restricted stock grants) in a CEO's total compensation.
CEO ownership	Fraction of outstanding shares held by the CEO.
G-index	An index developed by Gompers et al. (2003) and used as a proxy for external governance.
Panel C: Financial Characteristics	
Firm size (*Size*)	Market value of total assets.
Leverage (*Debt*)	Ratio of the book value of total debt to the book value of total assets.
Growth opportunities (*MB*)	Ratio of the market to book value of the firm's assets, where the market value of assets equals the book value of assets minus the book value of common equity plus the market value of common equity.
Free cash flow/book assets (*FCF*)	Free cash flow is defined as operating income before depreciation minus interest expense, taxes, and preferred dividends.
Operating income/asset (*ROA*)	Ratio of operating income before depreciation to total book asset.

Table 3. Market Competition, Corporate Governance, and Financial Characteristics for Deregulated Trucking Firms

This table presents mean and median changes in industry concentration, corporate governance, and financial characteristics for deregulated trucking firms between the four years preceding the deregulation (years -2 to -5) and four years following the deregulation (years +2 to +5). To implement our test, a group of matched sample is generated. The matched sample consists of a set of publicly traded U.S. industrial firms listed in Compustat under SIC codes 2000-3999. Similar to Rennie's (2006) approach, individual industrial firms are matched to our sample firms on size (90% -110% of prior year market value of assets), prior performance (closest prior five year average return on assets), and age (the firm must have been publicly traded at least since December 31, 1981). All variables are as defined in Table 2 and winsorized at the 5th and 95th percentiles. Differences in mean and median are assessed using a t-test and a Wilcoxon rank-sum test. The number of observations varies because of data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

	Deregulated Sample Firms				Industrial Matched Firms				Differences within Samples				Differences between Samples			
	Pre-Deregulation		Post-Deregulation		Pre-Deregulation		Post-Deregulation		Sample Firms (Pre- vs. Post-Deregulation)		Matched Firms (Pre- vs. Post-Deregulation)		Pre-Deregulation (Matched vs. Sample Firms)		Post-Deregulation (Matched vs. Sample Firms)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Industry Concentration Characteristics																
HHI (sales)(%)	24	22	29	29	20	12	12	10	5***	7***	-7***	-2***	4***	11***	16***	2***
Panel B: Corporate Governance Characteristics																
Board size	6.49	6.50	6.48	6.00	7.82	8.00	7.58	7.25	0.00	-0.50	-0.24	-0.75	-1.33***	-1.50***	-1.10***	-1.25***
Board independence (%)	57.67	62.50	56.41	60.00	72.80	75.00	69.71	71.43	-1.26	-2.50	-3.09*	-3.57	-15.12***	-12.50***	-13.29***	-11.43***
Leadership structure	0.51	0.50	0.58	1.00	0.64	1.00	0.61	1.00	0.08	0.50	-0.02	0.00	-0.13***	-0.50***	-0.03	0.00
Busyness of board (%)	19.86	18.33	21.77	20.00	20.28	18.71	17.53	14.29	1.91	1.67	-2.76	-4.42**	-0.43	-0.37	4.25**	5.71**
Managerial ownership (%)	25.99	21.61	25.14	20.31	19.50	14.27	11.31	6.41	-0.85	-1.30	-8.19***	-7.86***	6.48***	7.34**	13.83***	13.9***
Blockholder ownership (%)	32.94	27.33	52.55	51.02	25.32	17.53	37.66	34.18	19.61***	23.69***	12.35***	16.66***	7.62***	9.80**	14.89***	16.84***
Institutional ownership (%)	31.11	31.30	34.85	34.97	36.03	36.93	45.72	52.37	3.74**	3.67**	9.70***	15.44***	-4.92**	-5.63**	-10.88***	-17.40***
CEO equity-based pay (%)	7.47	0.00	11.64	0.00	35.57	40.38	38.05	42.62	4.17*	0.00	2.49	2.24	-28.10***	-40.38***	-26.41***	-42.62***
CEO ownership (%)	9.15	3.80	11.84	8.25	4.91	1.33	4.15	0.98	2.69**	4.45*	-0.76	-0.35	4.24***	2.47***	7.69***	7.26***
G-index	7.31	6.50	7.05	6.00	9.56	10.00	9.54	10.00	-0.27	-0.50	-0.02	0.00	-2.24***	-3.50***	-2.49***	-4.00***
Panel C: Financial Characteristics																
Size(asset, $millions)	182.31	92.50	305.81	183.98	201.28	84.02	309.14	154.06	123.5***	91.48***	107.86***	70.04***	-18.97	8.47	-3.33	29.92
Debt (%)	39.47	32.79	37.35	28.52	33.91	29.90	26.94	24.34	-2.12	-4.27	-6.97***	-5.56***	5.56***	2.89**	10.41***	4.18***
MB	1.22	1.07	1.09	0.94	1.34	1.23	1.54	1.41	-0.13**	-0.13**	0.20**	0.19*	-0.12*	-0.16**	-0.45***	-0.47***
FCF (%)	11.75	12.14	11.32	11.68	8.95	9.04	10.33	10.62	-0.44	-0.45	1.39**	1.58***	2.80***	3.10***	0.98*	1.06
ROA (%)	13.22	11.86	11.73	11.18	12.16	12.22	13.71	13.18	-1.49**	-0.68*	1.55**	0.96***	1.06	-0.37	-1.98***	-2.00***

Table 4. Market Competition, Corporate Governance, and Financial Characteristics for Deregulated Telecommunication Firms

This table presents mean and median changes in industry concentration, corporate governance, and financial characteristics for deregulated telecommunication firms between the four years preceding the deregulation (years -2 to -5) and four years following the deregulation (years +2 to +5). The selection of the matched sample is explained in Table 3. All variables are as defined in Table 2 and winsorized at the 5th and 95th percentiles. Differences in mean and median are assessed using a t-test and a Wilcoxon rank-sum test. The number of observations varies because of data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

	Deregulated Sample Firms				Industrial Matched Firms				Differences within Samples				Differences between Samples			
	Pre-Deregulation		Post-Deregulation		Pre-Deregulation		Post-Deregulation		Sample Firms (Pre- vs. Post-Deregulation)		Matched Firms (Pre- vs. Post-Deregulation)		Pre-Deregulation (Matched vs. Sample Firms)		Post-Deregulation (Matched vs. Sample Firms)	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Industry Concentration Characteristics																
HHI (sales) (%)	12	10	9	9	18	16	16	13	-2***	-1***	-2***	-3***	-7***	-6***	-7***	-4***
Panel B: Corporate Governance Characteristics																
Board size	8.08	7.00	8.22	8.00	8.45	8.00	8.28	8.00	0.14	1.00	-0.17	0.00	-0.37***	-1.00***	-0.06	0.00
Board independence (%)	66.00	66.67	58.85	66.37	71.10	75.00	67.53	71.43	-7.15***	-0.30***	-3.56***	-3.57***	-5.10***	-8.33***	-8.68***	-4.76***
Leadership structure	0.43	0.00	0.48	0.00	0.69	1.00	0.67	1.00	0.05**	0.00**	-0.03	0.00	-0.27***	-1.00***	-0.19***	-1.00***
Busyness of board (%)	21.81	15.63	22.89	20.00	24.91	22.79	20.29	16.67	1.08	4.37	-4.62***	-6.12***	-3.10***	-7.16***	2.59***	3.33*
Managerial ownership (%)	18.67	10.17	15.37	5.97	17.12	8.62	14.66	5.72	-3.30***	-4.20***	-2.46***	-2.90***	1.55*	1.56	0.72	0.26*
Blockholder ownership (%)	35.04	25.54	37.69	29.40	23.49	15.33	31.36	27.19	2.65*	3.86	7.87***	11.86***	11.55***	10.21***	6.32***	2.21*
Institutional ownership (%)	27.94	26.36	28.06	26.01	34.53	33.73	37.85	40.58	0.13	-0.35*	3.32***	6.85**	-6.59***	-7.37***	-9.79***	-14.57***
CEO equity-based pay (%)	29.39	29.09	35.73	36.09	31.50	31.17	39.26	38.83	6.34***	7.00***	7.76***	7.66***	-2.12	-2.07*	-3.54**	-2.74**
CEO ownership (%)	4.47	0.74	4.18	0.82	3.40	0.46	3.28	0.46	-0.29	0.08	-0.12	0.00	1.07***	0.28***	0.90***	0.36***
G-index	8.61	9.00	8.35	8.00	8.87	9.00	9.15	9.00	-0.26*	-1.00**	0.27*	0.00**	-0.26*	0.00	-0.80***	-1.00***
Panel C: Financial Characteristics																
Size(asset, $millions)	2139.79	211.70	4250.59	578.63	2250.53	235.99	3597.94	322.35	2110.80***	366.94***	1347.41***	86.36***	-110.74	-24.3	652.65**	256.28***
Debt (%)	28.46	25.37	29.42	25.16	34.91	30.05	38.55	30.65	0.96	-0.22	3.64***	0.60	-6.45***	-4.68***	-9.13***	-5.50***
MB	1.65	1.31	1.60	1.28	1.64	1.28	1.71	1.30	-0.05	-0.03***	0.07	0.02	0.01	0.03***	-0.11**	-0.02
FCF (%)	2.71	4.70	-0.05	4.38	2.61	5.37	0.37	5.47	-2.75***	-0.32***	-2.24***	0.10	0.09	-0.67	-0.42	-1.09***
ROA (%)	13.75	16.67	12.12	16.61	5.44	9.22	4.51	9.45	-1.63	-0.06	-0.93	0.23	8.31***	7.45***	7.61***	7.16***

Table 5. Individual Governance Characteristics of Deregulated Trucking Firms and Deregulation Change

This table presents regression analyses of individual governance characteristics of deregulated trucking firms. The individual governance characteristics of the trucking firms and full samples (including the trucking firms and industrial matched firms) are respectively regressed on a deregulation dummy (*Dumde*, in Panel A) or a deregulation dummy with trucking dummy variable (*Trend-adjusted Dummy*, in Panel B). *Dumde* is the dummy variable that equals one when the observation is in the period after deregulation for the deregulated firms (trucking), and zero otherwise. *Trend-adjusted Dummy* is the product of the *Dumde* and *Truck*, where *Truck* is the dummy variable that equals one when the observation is in the trucking industry, and zero otherwise. The other variables are as defined in Table 2 and winsorized at the 5th and 95th percentiles. We compute *t*-values (in parentheses) with heteroskedasticity-consistent standard errors if tests reject homoskedasticity at the 10% significance level (White, 1980). The number of observations varies due to data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

Panel A: Deregulation Change

Model	*Dependent Variables*	*Intercept*	*Dumde*	*Size*	*Debt*	*MB*	*N*	R^2
1	*Board size*	6.332 (20.92)***	-0.387 (-2.17)**	0.003 (9.09)***	-0.009 (-2.13)**	-0.015 (-0.10)	384	0.22
2	*Board independence*	0.488 (13.6)***	-0.040 (-1.88)*	0.001 (5.89)***	0.002 (4.37)***	-0.034 (-1.91)*	384	0.105
3	*Leadership structure*	0.651 (7.54)***	0.060 (1.18)	0.001 (0.71)	-0.003 (-2.60)***	-0.026 (-0.62)	384	0.021
4	*Busyness of board*	0.214 (6.85)***	0.005 (0.29)	0.001 (1.80)*	0.002 (4.27)***	-0.084 (-5.44)***	384	0.112
5	*Managerial ownership*	0.361 (9.31)***	0.018 (0.83)	-0.001 (-4.79)***	-0.002 (-3.84)***	0.028 (1.47)	384	0.072
6	*Blockholder ownership*	0.498 (9.84)***	0.193 (6.45)***	-0.001 (-1.78)*	-0.001 (-0.08)	-0.122 (-4.91)***	384	0.149
7	*Institutional ownership*	0.270 (8.55)***	0.037 (2.00)**	0.001 (9.53)***	-0.002 (-5.16)***	0.043 (2.73)***	384	0.333
8	*CEO equity-based pay*	0.090 (2.69)***	-0.001 (-0.05)	0.001 (5.94)***	-0.001 (-1.20)	-0.026 (-1.70)*	288	0.151
9	*CEO ownership*	0.145 (7.82)***	0.041 (3.63)***	-0.001 (-5.79)***	-0.002 (-5.73)***	0.023 (2.62)***	336	0.162
10	*G-index*	4.012 (4.57)***	0.421 (0.96)	-0.002 (-2.18)**	0.106 (6.31)***	0.432 (1.40)	128	0.259

Panel B: Trend-Adjusted Deregulation Change

Model	*Dependent Variables*	*Intercept*	*Trend-adjusted Dummy*	*Size*	*Debt*	*MB*	*N*	R^2
1	*Board size*	6.303 (30.92)***	-0.949 (-5.77)***	0.003 (15.87)***	-0.007 (-1.94)*	0. 326 (3.33)***	768	0.283
2	*Board independence*	0.689 (33.17)***	-0.119 (-7.08)***	0.001 (2.68)***	0.001 (1.03)	-0.035 (-3.50)***	768	0.067
3	*Leadership structure*	0.755 (14.86)***	-0.015 (-0.36)	0.001 (2.98)***	-0.004 (-4.17)***	-0.059 (-2.40)**	768	0.042
4	*Busyness of board*	0.197 (10.73)***	0.010 (0.70)	0.001 (1.88)*	0.001 (2.80)***	-0.032 (-3.67)***	768	0.027
5	*Managerial ownership*	0.260 (12.19)***	0.061 (3.52)***	-0.001 (-7.20)***	-0.001 (-0.83)	-0.008 (-0.78)	768	0.069
6	*Blockholder ownership*	0.410 (13.99)***	0.193 (8.14)***	-0.001 (-2.49)**	0.001 (0.78)	-0.063 (-4.50)***	768	0.119
7	*Institutional ownership*	0.287 (13.61)***	-0.014 (-0.81)	0.001 (12.82)***	-0.003 (-7.63)***	0.087 (8.61)***	768	0.298
8	*CEO equity-based pay*	0.312 (11.80)***	-0.155 (-7.44)***	0.001 (0.49)	-0.002 (-3.74)***	0.014 (1.24)	576	0.118
9	*CEO ownership*	0.105 (9.79)***	0.066 (7.76)***	-0.001 (-5.04)***	-0.001 (-4.37)***	-0.004 (-0.90)	672	0.118
10	*G-index*	8.091 (12.43)***	-2.002 (-4.87)***	-0.001 (-1.25)	0.048 (3.42)***	-0.054 (-0.25)	256	0.128

Table 6. Individual Governance Characteristics of Deregulated Telecommunication Firms and Deregulation Change

This table presents regression analyses of individual governance characteristics of deregulated Telecommunication firms. The individual governance characteristics of the Telecommunication firms and full samples (include the Telecommunication firms and industrial matched firms) are respectively regressed on a deregulation dummy (*Dumde*, in Panel A) or a deregulation dummy with Telecommunication dummy variable (*Trend-adjusted Dummy*, in Panel B). *Dumde* is the dummy variable that equals one when the observation is in the period after deregulation for the deregulated firms (Telecommunication), and zero otherwise. *Trend-adjusted Dummy* is the product of the *Dumde* and *Telecom*, where *Telecom* is the dummy variable that equals one when the observation is in the telecommunication industry, and zero otherwise. The other variables are as defined in Table 2 and winsorized at the 5th and 95th percentiles. We compute *t*-values (in parentheses) with heteroskedasticity-consistent standard errors if tests reject homoskedasticity at the 10% significance level (White, 1980). The number of observations varies due to data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

Panel A: Deregulation Change

Model	*Dependent Variables*	*Intercept*	*Dumde*	*Size*	*Debt*	*MB*	*N*	R^2
1	*Board size*	7.940 (56.02)***	-0.216 (-1.73)*	0.001 (18.92)***	-0.023 (-8.02)***	0.248 (3.89)***	2232	0.163
2	*Board independence*	0.648 (68.94)***	-0.043 (-5.26)***	0.001 (6.10)***	0.001 (2.80)***	-0.007 (-1.71)*	2232	0.026
3	*Leadership structure*	0.439 (18.54)***	0.032 (1.52)	0.001 (5.20)***	-0.001 (-0.59)	-0.013 (-1.27)	2232	0.015
4	*Busyness of board*	0.226 (22.02)***	-0.010 (-1.15)	0.001 (14.85)***	-0.001 (-4.42)***	-0.003 (-0.55)	2232	0.104
5	*Managerial ownership*	0.172 (17.30)***	-0.019 (-2.14)**	-0.001 (-10.21)***	0.001 (3.43)***	0.006 (1.29)	2232	0.061
6	*Blockholder ownership*	0.385 (23.28)***	-0.008 (-0.56)	-0.001 (-11.9)***	0.001 (2.23)**	0.002 (0.29)	2232	0.066
7	*Institutional ownership*	0.337 (28.61)***	-0.005 (-0.46)	0.001 (5.01)***	-0.002 (-10.35)***	0.003 (0.53)	2232	0.063
8	*CEO equity-based pay*	0.299 (17.22)***	0.047 (2.99)***	0.001 (5.53)***	-0.002 (-5.63)***	0.020 (2.62)***	1336	0.055
9	*CEO ownership*	0.044 (11.96)***	-0.001 (-0.05)	-0.001 (-4.91)***	0.001 (2.72)***	-0.002 (-1.05)	1824	0.016
10	*G-index*	7.921 (48.48)***	-0.601 (-4.13)***	0.001 (9.49)***	0.012 (3.28)***	0.069 (0.98)	1088	0.088

Panel B: Trend-Adjusted Deregulation Change

Model	*Dependent Variables*	*Intercept*	*Trend-adjusted Dummy*	*Size*	*Debt*	*MB*	*N*	R^2
1	*Board size*	8.374 (92.85)***	-0.467 (-4.92)***	0.001 (32.45)***	-0.018 (-10.12)***	-0.032 (-0.85)	4464	0.213
2	*Board independence*	0.679 (110.05)***	-0.064 (-9.88)***	0.001 (10.71)***	0.001 (0.51)	-0.007 (-2.75)***	4464	0.042
3	*Leadership structure*	0.604 (37.78)***	-0.141 (-8.41)***	0.001 (9.67)***	-0.001 (-2.84)***	-0.004 (-0.67)	4464	0.034
4	*Busyness of board*	0.238 (35.79)***	-0.013 (-1.88)*	0.001 (20.55)***	-0.001 (-3.86)***	-0.014 (-5.01)***	4464	0.097
5	*Managerial ownership*	0.155 (23.78)***	0.001 (0.15)	-0.001 (-16.58)***	0.001 (4.77)***	0.008 (2.98)***	4464	0.068
6	*Blockholder ownership*	0.343 (33.88)***	0.016 (1.52)	-0.001 (-16.11)***	0.001 (2.26)**	-0.004 (-0.98)	4464	0.057
7	*Institutional ownership*	0.401 (49.52)***	-0.018 (-1.17)	0.001 (12.82)***	-0.003 (-17.99)***	0.006 (1.85)*	4464	0.112
8	*CEO equity-based pay*	0.313 (30.02)***	-0.004 (-0.38)	0.001 (10.92)***	-0.001 (-3.82)***	0.019 (4.20)***	2672	0.053
9	*CEO ownership*	0.040 (17.22)***	0.010 (3.95)***	-0.001 (-9.32)***	-0.001 (-0.81)	0.001 (0.30)	3648	0.024
10	*G-index*	8.694 (76.48)***	-0.692 (-5.92)***	0.001 (4.10)***	0.002 (0.64)	0.075 (1.61)	2176	0.021

Table 7. Overall Governance Structures of Deregulated Firms, Herfindahl-Hirschman Index, and Deregulation Change

This table presents regression analyses of overall governance factor score of deregulated trucking firms with Herfindahl-Hirschman Index (HHI). All variables are as defined in Table 2 and winsorized at the 5th and 95th percentiles. We compute *t*-values (in parentheses) with heteroskedasticity-consistent standard errors if tests reject homoskedasticity at the 10% significance level (White, 1980). The number of observations varies due to data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

Panel A: Deregulated Trucking Firms

Model		*Intercept*	*HHI*	*Dumde*	*Size*	*Debt*	*MB*	*N*	R^2
1	*Effect of Deregulation*	-0.099 (-0.56)		-0.155 (-1.46)	0.001 (5.51)***	0.002 (0.61)	-0.130 (-1.57)	256	0.089
2	*Effect of Market Competition*	-0.086 (-0.19)	-0.329 (-0.22)		0.001 (5.26)***	0.002 (0.59)	-0.122 (-1.46)	256	0.084
3	*Overall Effects*	-0.211 (-0.38)	0.229 (0.11)	-0.054 (-0.38)	0.001 (5.26)***	0.002 (0.63)	-0.123 (-1.48)	256	0.081

Panel B: Deregulated Trucking Firms and Industrial Matched Firms

Model		*Intercept*	*HHI*	*Trend-Adjusted Dummy*	*Size*	*Debt*	*MB*	*N*	R^2
1	*Effect of Deregulation*	0.169 (1.21)		-0.100 (-1.07)	0.001 (4.09)***	0.001 (0.03)	-0.212 (-3.72)***	512	0.053
2	*Effect of Market Competition*	0.337 (1.92)*	-0.942 (-1.86)*		0.001 (4.43)***	0.001 (0.17)	-0.217 (-3.87)***	512	0.057
3	*Overall Effects*	0.338 (1.92)*	-0.859 (-1.57)	-0.041 (-0.41)	0.001 (4.37)***	0.001 (0.17)	-0.222 (-3.87)***	512	0.055

Panel C: Deregulated Telecommunication Firms

Model		*Intercept*	*HHI*	*Dumde*	*Size*	*Debt*	*MB*	*N*	R^2
1	*Effect of Deregulation*	-0.192 (-2.94)***		-0.202 (-3.48)***	0.001 (13.83)***	0.002 (1.15)	-0.004 (-0.12)	1056	0.154
2	*Effect of Market Competition*	-0.082 (-1.16)	-2.138 (-5.27)***		0.001 (12.22)***	0.002 (1.57)	0.007 (0.23)	1056	0.166
3	*Overall Effects*	0.050 (0.65)	-2.391 (-5.88)***	-0.251 (-4.34)***	0.001 (12.98)***	0.002 (1.6)	0.007 (0.24)	1056	0.180

Panel D: Deregulated Telecommunication Firms and Industrial Matched Firms

Model		*Intercept*	*HHI*	*Trend-Adjusted Dummy*	*Size*	*Debt*	*MB*	*N*	R^2
1	*Effect of Deregulation*	-0.183 (-4.14)***		-0.146 (-3.13)***	0.001 (19.6)***	0.002 (2.2)**	-0.052 (-2.94)***	2112	0.145
2	*Effect of Market Competition*	-0.145 (-2.85)***	-0.524 (-2.64)***		0.001 (18.7)***	0.003 (3.06)***	-0.06 (-3.34)***	2112	0.144
3	*Overall Effects*	-0.065 (-1.18)	-0.741 (-3.62)***	-0.193 (-3.98)***	0.001 (19.13)***	0.003 (2.81)***	-0.063 (-3.53)***	2112	0.150

Table 8. Individual Governance Characteristics of Deregulated Trucking Firms with Herfindahl-Hirschman Index

This table presents regression analyses of individual governance characteristics of deregulated trucking firms with Herfindahl-Hirschman Index (*HHI*). All variables are as defined in Table 2 and winsorized at the 5th and 95th percentiles. We compute *t*-values (in parentheses) with heteroskedasticity-consistent standard errors if tests reject homoskedasticity at the 10% significance level (White, 1980). The number of observations varies due to data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

Model	*Dependent Variables*	*Intercept*	*HHI*	*Size*	*Debt*	*MB*	*N*	R^2
			Panel A: Deregulation Trucking Firms					
1	*Board size*	7.061 (9.63)***	-3.341 (-1.36)	0.003 (8.90)***	-0.010 (-2.28)**	-0.004 (-0.03)	384	0.214
2	*Board independence*	0.488 (5.60)***	-0.068 (-0.23)	0.001 (5.60)***	0.002 (4.28)***	-0.031 (-1.77)*	384	0.097
3	*Leadership structure*	0.574 (2.75)***	0.387 (0.55)	0.001 (0.88)	-0.003 (-2.51)**	-0.028 (-0.67)	384	0.019
4	*Busyness of board*	0.132 (1.73)*	0.307 (1.22)	0.001 (1.84)*	0.002 (4.40)***	-0.084 (-5.46)***	384	0.115
5	*Managerial ownership*	0.463 (4.99)***	-0.336 (-1.08)	-0.001 (-4.56)***	-0.002 (-3.98)***	0.025 (1.35)	384	0.073
6	*Blockholder ownership*	0.620 (5.03)***	-0.112 (-0.27)	-0.001 (-0.49)	-0.001 (-0.02)	-0.135 (-5.16)***	384	0.056
7	*Institutional ownership*	0.350 (4.54)***	-0.233 (-0.9)	0.001 (10.46)***	-0.002 (-5.17)***	0.040 (2.56)**	384	0.327
8	*CEO equity-based pay*	0.013 (0.15)	0.292 (0.99)	0.001 (5.82)***	-0.001 (-1.13)	-0.025 (-1.67)*	288	0.154
9	*CEO ownership*	0.179 (3.59)***	-0.051 (-0.3)	-0.001 (-4.91)***	-0.002 (-5.67)***	0.020 (2.29)**	336	0.129
10	*G-index*	2.844 (1.61)	5.535 (0.88)	-0.002 (-2.16)**	0.105 (6.27)***	0.397 (1.29)	128	0.258
Model	*Dependent Variables*	*Intercept*	*HHI*	*Size*	*Debt*	*MB*	*N*	R^2
			Panel B: Deregulation Trucking Firms and Industrial Matched Firms					
1	*Board size*	6.224 (24.97)***	-0.822 (-1.17)	0.003 (14.95)***	-0.009 (-2.40)**	0.410 (4.14)***	768	0.253
2	*Board independence*	0.711 (27.94)***	-0.261 (-3.64)***	0.001 (2.53)**	0.001 (0.64)	-0.027 (-2.62)***	768	0.023
3	*Leadership structure*	0.776 (12.76)***	-0.122 (-0.71)	0.001 (3.04)***	-0.004 (-4.14)***	-0.059 (-2.43)**	768	0.042
4	*Busyness of board*	0.167 (7.60)***	0.162 (2.62)***	0.001 (1.43)	0.001 (2.62)***	-0.031 (-3.59)***	768	0.035
5	*Managerial ownership*	0.205 (8.07)***	0.347 (4.86)***	-0.001 (-7.71)***	-0.001 (-0.96)	-0.009 (-0.93)	768	0.083
6	*Blockholder ownership*	0.406 (11.14)***	0.264 (2.57)**	-0.001 (-2.00)**	0.001 (1.34)	-0.079 (-5.47)***	768	0.05
7	*Institutional ownership*	0.324 (12.87)***	-0.196 (-2.77)***	0.001 (13.16)***	-0.003 (-7.46)***	0.086 (8.61)***	768	0.304
8	*CEO equity-based pay*	0.404 (12.40)***	-0.621 (-6.95)***	0.001 (0.81)	-0.002 (-3.48)***	0.017 (1.47)	576	0.108
9	*CEO ownership*	0.050 (3.86)***	0.346 (9.57)***	-0.001 (-6.23)***	-0.001 (-4.76)***	-0.005 (-1.12)	672	0.155
10	*G-index*	7.997 (11.39)***	-5.442 (-2.82)***	-0.001 (-0.27)	0.054 (3.73)***	0.195 (0.88)	256	0.075

Table 9. Individual Governance Characteristics of Deregulated Telecommunication Firms with Herfindahl-Hirschman Index

This table presents regression analyses of individual governance characteristics of deregulated telecommunication firms with Herfindahl-Hirschman Index (*HHI*). All variables are as defined in Table 2 and winsorized at the 5th and 95th percentiles. We compute *t*-values (in parentheses) with heteroskedasticity-consistent standard errors if tests reject homoskedasticity at the 10% significance level (White, 1980). The number of observations varies due to data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

Model	*Dependent Variables*	*Intercept*	*HHI*	*Size*	*Debt*	*MB*	*N*	R^2
			Panel A: Deregulation Telecommunication Firms					
1	*Board size*	8.406 (51.95)***	-5.390 (-5.79)***	0.001 (17.54)***	-0.023 (-7.92)***	0.257 (4.07)***	2232	0.174
2	*Board independence*	0.637 (58.64)***	-0.083 (-1.33)	0.001 (4.92)***	0.001 (2.63)***	-0.007 (-1.58)	2232	0.015
3	*Leadership structure*	0.439 (16.12)***	0.136 (0.87)	0.001 (5.58)***	-0.001 (-0.57)	-0.014 (-1.31)	2232	0.014
4	*Busyness of board*	0.210 (17.75)***	0.115 (1.7)*	0.001 (14.91)***	-0.001 (-4.53)***	-0.003 (-0.57)	2232	0.105
5	*Managerial ownership*	0.114 (10.1)***	0.474 (7.28)***	-0.001 (-9.21)***	0.001 (3.12)***	0.005 (1.19)	2232	0.081
6	*Blockholder ownership*	0.320 (17.04)***	0.585 (5.41)***	-0.001 (-10.94)***	0.001 (2.04)**	0.002 (0.21)	2232	0.078
7	*Institutional ownership*	0.304 (22.52)***	0.297 (3.83)***	0.001 (5.66)***	-0.003 (-10.55)***	0.002 (0.46)	2232	0.069
8	*CEO equity-based pay*	0.328 (16.81)***	-0.080 (-0.73)	0.001 (6.04)***	-0.002 (-5.46)***	0.020 (2.58)**	1336	0.049
9	*CEO ownership*	0.042 (9.98)***	0.022 (0.92)	-0.001 (-4.76)***	0.001 (2.68)***	-0.002 (-1.1)	1824	0.017
10	*G-index*	7.990 (44.8)***	-3.530 (-3.46)***	0.001 (8.03)***	0.013 (3.6)***	0.081 (1.15)	1088	0.083
Model	*Dependent Variables*	*Intercept*	*HHI*	*Size*	*Debt*	*MB*	*N*	R^2
			Panel B: Deregulation Telecommunication Firms and Industrial Matched Firms					
1	*Board size*	8.070 (73.43)***	1.147 (2.58)***	0.001 (32.15)***	-0.018 (-9.98)***	-0.014 (-0.36)	4464	0.21
2	*Board independence*	0.664 (87.5)***	-0.016 (-0.53)	0.001 (9.56)***	0.001 (1.24)	-0.007 (-2.71)***	4464	0.021
3	*Leadership structure*	0.455 (23.46)***	0.715 (9.13)***	0.001 (9.64)***	-0.001 (-3.09)***	0.007 (0.98)	4464	0.036
4	*Busyness of board*	0.220 (27.21)***	0.094 (2.89)***	0.001 (20.65)***	-0.001 (-3.99)***	-0.012 (-4.42)***	4464	0.098
5	*Managerial ownership*	0.145 (18.33)***	0.066 (2.06)**	-0.001 (-16.42)***	0.001 (4.56)***	0.009 (3.29)***	4464	0.069
6	*Blockholder ownership*	0.366 (29.67)***	-0.120 (-2.41)**	-0.001 (-16.19)***	0.001 (2.35)**	-0.006 (-1.42)	4464	0.057
7	*Institutional ownership*	0.347 (35.07)***	0.208 (5.2)***	0.001 (12.27)***	-0.003 (-17.68)***	0.010 (2.77)***	4464	0.101
8	*CEO equity-based pay*	0.326 (25.96)***	-0.097 (-1.95)*	0.001 (10.75)***	-0.001 (-3.56)***	0.017 (3.8)***	2672	0.054
9	*CEO ownership*	0.045 (16.08)***	-0.022 (-1.91)*	-0.001 (-9.03)***	-0.001 (-0.89)	0.001 (0.05)	3648	0.021
10	*G-index*	8.346 (63.13)***	1.188 (2.26)**	0.001 (3.32)***	0.002 (0.98)	0.084 (1.76)*	2176	0.007

Table 10. The Relationship among Deregulation, Market Competition, and Changes in Governance Structure: Trucking Industry

This table presents regression analyses among individual governance characteristics of deregulated trucking firms, Herfindahl-Hirschman Index (*HHI*), and deregulation effect. All variables are as defined in Table 2 and Table 5 and winsorized at the 5th and 95th percentiles. We compute *t*-values (in parentheses) with heteroskedasticity-consistent standard errors if tests reject homoskedasticity at the 10% significance level (White, 1980). The number of observations varies due to data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

Model	*Dependent Variables*	*Intercept*	*HHI*	*Dumde*	*Size*	*Debt*	*MB*	*N*	*R2*
				Panel A: Deregulation Trucking Firms					
1	*Board size*	6.356 (7.54)***	-0.096 (-0.03)	-0.382 (-1.68)*	0.003 (9.08)***	-0.009 (-2.1)**	-0.02 (-0.1)	384	0.218
2	*Board independence*	0.378 (3.78)***	0.439 (1.19)	-0.060 (-2.22)**	0.001 (5.9)***	0.002 (4.5)***	-0.03 (-1.87)*	384	0.106
3	*Leadership structure*	0.701 (2.91)***	-0.198 (-0.22)	0.069 (1.06)	0.001 (0.71)	-0.003 (-2.6)***	-0.03 (-0.62)	384	0.019
4	*Busyness of board*	0.207 (2.54)**	0.030 (0.11)	0.004 (0.2)	0.001 (1.8)*	0.002 (4.21)***	-0.08 (-5.43)***	384	0.109
5	*Managerial ownership*	0.434 (4.05)***	-0.201 (-0.51)	-0.016 (-0.55)	-0.001 (-4.42)***	-0.002 (-3.9)***	0.03 (1.32)	384	0.071
6	*Blockholder ownership*	0.365 (2.59)***	0.526 (1.01)	0.169 (4.45)***	-0.001 (-1.78)*	0.001 (0.07)	-0.12 (-4.87)***	384	0.15
7	*Institutional ownership*	0.365 (4.1)***	-0.301 (-0.91)	0.008 (0.33)	0.001 (10.27)***	-0.002 (-5.17)***	0.04 (2.57)**	384	0.326
8	*CEO equity-based pay*	-0.088 (-0.77)	0.749 (1.62)	-0.041 (-1.28)	0.001 (5.96)***	-0.001 (-1.05)	-0.03 (-1.77)*	288	0.156
9	*CEO ownership*	0.025 (0.36)	0.426 (1.52)	0.030 (1.5)	-0.001 (-4.37)***	-0.001 (-4.41)***	0.03 (3.06)***	288	0.16
10	*G-index*	3.579 (1.44)	1.972 (0.19)	0.311 (0.42)	-0.002 (-2.18)**	0.106 (6.27)***	0.42 (1.34)	128	0.253
Model	*Dependent Variables*	*Intercept*	*HHI*	*Trend-Adjusted Dummy*	*Size*	*Debt*	*MB*	*N*	R^2
				Panel B: Deregulation Trucking Firms and Industrial Matched Firms					
1	*Board size*	6.196 (25.36)***	0.582 (0.8)	-0.996 (-5.7)***	0.003 (15.5)***	-0.007 (-2.00)**	0.33 (3.36)***	768	0.283
2	*Board independence*	0.708 (28.48)***	-0.106 (-1.42)	-0.110 (-6.19)***	0.001 (2.88)***	0.001 (1.14)	-0.04 (-3.56)***	768	0.069
3	*Leadership structure*	0.776 (12.74)***	-0.114 (-0.62)	-0.006 (-0.13)	0.001 (3.04)***	-0.004 (-4.12)***	-0.06 (-2.42)**	768	0.041
4	*Busyness of board*	0.167 (7.59)***	0.166 (2.53)**	-0.003 (-0.2)	0.001 (1.43)	0.001 (2.62)***	-0.03 (-3.57)***	768	0.034
5	*Managerial ownership*	0.206 (8.12)***	0.295 (3.9)***	0.037 (2.03)**	-0.001 (-7.82)***	-0.001 (-1.12)	-0.01 (-0.63)	768	0.086
6	*Blockholder ownership*	0.412 (11.72)***	-0.009 (-0.08)	0.193 (7.69)***	-0.001 (-2.44)**	0.001 (0.78)	-0.06 (-4.50)***	768	0.117
7	*Institutional ownership*	0.324 (12.87)***	-0.199 (-2.65)***	0.002 (0.13)	0.001 (13.14)***	-0.003 (-7.45)***	0.09 (8.53)***	768	0.303
8	*CEO equity-based pay*	0.403 (12.66)***	-0.453 (-4.92)***	-0.120 (-5.57)***	0.001 (1.24)	-0.002 (-3.38)***	0.01 (0.73)	576	0.152
9	*CEO ownership*	0.050 (3.96)***	0.282 (7.53)***	0.044 (5.17)***	-0.001 (-6.55)***	-0.001 (-5.07)***	0.00 (-0.36)	672	0.186
10	*G-index*	8.285 (12.08)***	-1.870 (-0.90)	-1.825 (-4.01)***	-0.001 (-0.76)	0.050 (3.49)***	-0.02 (-0.10)	256	0.127

Table11. The Relationship among Deregulation, Market Competition, and Changes in Governance Structure: Telecommunication Industry

This table presents regression analyses among individual governance characteristics of deregulated telecommunication firms, Herfindahl-Hirschman Index (HHI), and deregulation effect. All variables are as defined in Table 2 and Table 6 and winsorized at the 5th and 95th percentiles. We compute *t*-values (in parentheses) with heteroskedasticity-consistent standard errors if tests reject homoskedasticity at the 10% significance level (White, 1980). The number of observations varies due to data availability. ***, **, and * represent 1%, 5%, and 10% significance levels.

Model	*Dependent Variables*	*Intercept*	*HHI*	*Dumde*	*Size*	*Debt*	*MB*	*N*	R^2
				Panel A: Deregulation Telecommunication Firms					
1	*Board size*	8.590 (48.76)***	-5.745 (-6.12)***	-0.326 (-2.61)***	0.001 (17.76)***	-0.022 (-7.81)***	0.255 (4.03)***	2232	0.177
2	*Board independence*	0.663 (56.34)***	-0.133 (-2.12)**	-0.046 (-5.51)***	0.001 (5.65)***	0.001 (2.89)***	-0.007 (-1.67)*	2232	0.027
3	*Leadership structure*	0.419 (14.13)***	0.174 (1.1)	0.035 (1.67)*	0.001 (5.31)***	-0.001 (-0.64)	-0.014 (-1.29)	2232	0.015
4	*Busyness of board*	0.214 (16.65)***	0.106 (1.55)	-0.008 (-0.92)	0.001 (14.9)***	-0.001 (-4.49)***	-0.003 (-0.58)	2232	0.105
5	*Managerial ownership*	0.120 (9.72)***	0.463 (7.04)***	-0.010 (-1.13)	-0.001 (-8.97)***	0.001 (3.16)***	0.005 (1.17)	2232	0.081
6	*Blockholder ownership*	0.282 (13.82)***	0.659 (6.07)***	0.068 (4.74)***	-0.001 (-11.53)***	0.001 (1.84)*	0.002 (0.28)	2232	0.087
7	*Institutional ownership*	0.303 (20.61)***	0.298 (3.81)***	0.001 (0.1)	0.001 (5.6)***	-0.003 (-10.54)***	0.002 (0.46)	2232	0.068
8	*CEO equity-based pay*	0.302 (14.19)***	-0.029 (-0.26)	0.046 (2.91)***	0.001 (5.42)***	-0.002 (-5.6)***	0.020 (2.63)***	1336	0.054
9	*CEO ownership*	0.042 (9.05)***	0.023 (0.92)	0.001 (0.09)	-0.001 (-4.71)***	0.001 (2.67)***	-0.002 (-1.1)	1824	0.016
10	*G-index*	8.350 (43.39)***	-4.230 (-4.14)***	-0.689 (-4.71)***	0.001 (8.96)***	0.013 (3.65)***	0.082 (1.18)	1088	0.101
Model	*Dependent Variables*	*Intercept*	*HHI*	*Trend-Adjusted Dummy*	*Size*	*Debt*	*MB*	*N*	R^2
				Panel B: Deregulation Telecommunication Firms and Industrial Matched Firms					
1	*Board size*	8.271 (69.56)***	0.608 (1.32)	-0.432 (-4.39)***	0.001 (32.47)***	-0.018 (-10.19)***	-0.023 (-0.6)	4464	0.213
2	*Board independence*	0.697 (85.69)***	-0.103 (-3.29)***	-0.070 (-10.41)***	0.001 (10.5)***	0.001 (0.76)	-0.009 (-3.31)***	4464	0.044
3	*Leadership structure*	0.506 (24.14)***	0.580 (7.17)***	-0.108 (-6.23)***	0.001 (10.16)***	-0.001 (-3.4)***	0.004 (0.64)	4464	0.044
4	*Busyness of board*	0.224 (25.54)***	0.084 (2.48)**	-0.008 (-1.15)	0.001 (20.68)***	-0.001 (-4.04)***	-0.013 (-4.48)***	4464	0.098
5	*Managerial ownership*	0.142 (16.62)***	0.072 (2.18)**	0.005 (0.73)	-0.001 (-16.42)***	0.001 (4.59)***	0.009 (3.32)***	4464	0.069
6	*Blockholder ownership*	0.320 (24.12)***	0.004 (0.07)	0.099 (9.04)***	-0.001 (-17.03)***	0.001 (2.8)***	-0.004 (-0.94)	4464	0.074
7	*Institutional ownership*	0.381 (35.7)***	0.119 (2.89)***	-0.071 (-8.07)***	0.001 (12.98)***	-0.003 (-18.17)***	0.008 (2.34)**	4464	0.114
8	*CEO equity-based pay*	0.331 (24.48)***	-0.111 (-2.15)**	-0.011 (-0.97)	0.001 (10.79)***	-0.001 (-3.58)***	0.017 (3.77)***	2672	0.054
9	*CEO ownership*	0.041 (13.63)***	-0.011 (-0.91)	0.009 (3.57)***	-0.001 (-9.35)***	-0.001 (-0.72)	0.001 (0.14)	3648	0.024
10	*G-index*	8.636 (61.03)***	0.372 (0.69)	-0.670 (-5.51)***	0.001 (4.13)***	0.001 (0.54)	0.080 (1.69)*	2176	0.021

Table 12. Changes in Operating Performance around Deregulation Year for the Deregulated Industries

This table presents mean and median changes in operating performance for firms in two deregulated industries between the two years preceding the deregulation and four years following the deregulation (*t+2*, *t+5*). Operating return on asset and matched-firms-adjusted operating return on assets are two proxies used to measure the operating performance. Operating return on asset is operating income before depreciation divided by total book asset. Matched-firms-adjusted-performance is firm's operating return on asset minus the median operating return on asset for the portfolio of matching firms. Panel A reports the results for the trucking industry and panel B reports the results for the telecommunication industry. All variables are winsorized at the 5th and 95th percentiles. Differences in mean and median are assessed using a t-test and a Wilcoxon rank-sum test. ***, **, and * represent 1%, 5%, and 10% significance levels.

	Year t-2	*Year t+2*	*Year t+3*	*Year t+4*	*Year t+5*	Change between *Years t-2* and *t+2*	Change between *Years t-2* and *t+3*	Change between *Years t-2* and *t+4*	Change between *Years t-2* and *t+5*
Panel A: Trucking Industry									
1. Operating Return on Assets									
Mean	0.196	0.167	0.174	0.175	0.165	-0.029***	-0.022***	-0.021***	-0.032***
Median	0.200	0.180	0.173	0.175	0.169	-0.011***	-0.016***	-0.015***	-0.022***
2. Matched-Firms-Adjusted Operating Return on Assets									
Mean	0.023	-0.027	-0.016	0.009	0.005	-0.050***	-0.040***	-0.014	-0.018
Median	0.028	-0.026	-0.019	-0.005	-0.006	-0.037***	-0.036***	-0.019	-0.021
Panel B: Telecommunication Industry									
1. Operating Return on Assets									
Mean	0.094	0.075	0.075	0.064	0.072	-0.019***	-0.019***	-0.029***	-0.022***
Median	0.108	0.096	0.095	0.088	0.089	0.000	-0.002***	-0.005***	-0.004***
2. Matched-Firms-Adjusted Operating Return on Assets									
Mean	-0.003	0.005	0.004	0.005	0.002	0.008	0.007	0.008	0.005
Median	-0.002	-0.015	-0.001	0.000	-0.001	-0.007	0.000	0.000	0.000