Essays in Financial Economics and Law

by

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(Under the direction of Ronald S. Warren)

Abstract

This dissertation considers topics in the intersection of law and economics and financial economics. The common theme running through each chapter is the problem of conflicts of interest that arise when a principal hires an agent to act on his behalf, otherwise known as the principal-agent problem. Specifically, this dissertation deals with the principal-agent problems between state/national government and the citizen and between corporate managers and their shareholders. Chapter 2 focuses on the incentives of state lawmakers in enacting antitakeover legislation, the subsequent effect of state antitakeover laws on target firms in the market for corporate control, and ultimately, how this affects shareholders. Chapter 3 investigates how corporate charters and bylaws that allow a firm to "stagger" their board of directors affects managerial performance. Chapter 4 employs a methodology developed in the finance literature to differentiate between competing theories of economic regulation.

Chapter 2 of the dissertation, entitled "State Poison Pill Endorsement Statutes and the Market for Corporate Control," provides evidence that poison pill endorsement statutes and, to a lesser degree, other constituency statues harm shareholders. Exploiting the variation in such laws at the state level, I show that a firm incorporated in a state with either a poison pill endorsement or other constituency statute has a 1.3% lower expected likelihood of receiving a bid, a large difference considering the typical likelihood of receiving a bid is about 5%. I also

show that, conditional on receiving a bid, the wealth effect around the bid announcement is 2% to 3% lower with a diminished likelihood that other bidders challenge the initial bid for firms incorporated in a state with a pill endorsements statute. This suggests that poison pill endorsement statutes lead to a less competitive market for corporate control. If Delaware's success in attracting firm charters is a result of its permissive stance towards managers in change of control situations, the results of this paper support the "race to the bottom" view in the literature.

Chapter 3, entitled "Explaining the Staggered Board Discount," argues that the documented discount on firms with staggered boards is not evidence that staggered boards destroy firm value. Instead, firms that are already discounted relative to industry peers choose to adopt a staggered board. I find that when the macroeconomic environment is weak, deeply discounted firms, especially those in industries undergoing extensive merger activity, are more likely to choose (or retain) staggered boards than other types of firms. I use three econometric techniques to control for the decision to have a staggered board and find that the staggered board discount suggested by OLS regressions drops, and in some cases, even becomes a small premium. Staggered boards do not necessarily cause a loss of firm value after adoption but rather, are a symptom of other underlying factors that cause the market to impute a discount to the firm.

Chapter 4, entitled "Cap and Trade and the Capture Theory of Regulation," examines the effect of carbon dioxide regulation on the stock price of U.S. firms. This paper looks to overcome what is considered the most significant obstacle in using such methodology to study regulation, timing when market expectations change, by taking advantage of a surprise announcement by President George W. Bush in 2001 that conveyed a sudden reversal in his position towards such regulation. Event studies on the day of this announcement find that industries that are highly "energy-intensive" experience statistically significant stock price reductions between 2 and 7 percent after controlling for marketwide variation. Most other

industries display insignificant abnormal returns. These results support the capture theory of regulation.

INDEX WORDS: Law and economics, Antitakeover law, Antitakeover ammendments, Market for corporate control, Corporate governance, Economics of regulation, Environmental regulation.

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Chapter 1

Introduction

This dissertation considers topics in the intersection of law and economics and financial economics. The common theme running through each chapter is the problem of the conflicts of interest problems that occur when a principal hires an agent to act on his behalf, otherwise known as the principal-agent problem. Specifically, this dissertation deals with principal-agent problems between state/national government and the citizen as well as principal-agent problem between corporate managers and their shareholders. Chapter 2 focuses on the effect of state antitakeover laws that affect target firms' ability to implement poison pills on outcomes in the market for corporate control. Chapter 3 investigates how corporate charters and bylaws that allow a firm to "stagger" their board of directors affects their performance. Chapter 4 employs a methodology developed in the finance literature to differentiate between competing theories of economic regulation.

Whether the competitive effects of leaving corporate antitakeover law in the hands of the states has led to a system that caters to shareholder, or caters to managers at the expense of shareholders, is a continuing debate in the economic, financial, and legal literature. Chapter 2, entitled "State Antitakeover Law and the Market for Corporate Control" takes a new strategy in contributing to the debate. While most of the literature tends to be Delaware-centric, as Delaware is the apparent winner of this competition, I ignore Delaware and exploit variation in antitakeover law in other states in order to identify the effect of antitakeover law and in particular, the poison pill endorsement statute. The evidence presented in this chapter supports the view that poison pill endorsement statutes cater to managers at the expense of shareholders. First of all, I find evidence that having a poison pill endorsement

statutes substantially reduces the number of bids a firm receives. Upon receiving a bid, the takeover process is less competitive as fewer other potential bidders challenge the initial bid and this is reflected in lower returns for shareholders. Since researchers tend to view Delaware as having a manager-friendly legal environment in change of control situations and a permissive attitude towards poison pills, the results of this paper support the "race to the bottom" view in the literature, that antitakeover law caters to managers at the expense of shareholders.

Chapter 3, entitled "Explaining the Staggered Board Discount," provides evidence that previous studies overstate the negative relationship between staggered boards and firm value as they inadequately account for the effect of firm value on the choice to select a staggered board. After reproducing the results in the literature I use a number of econometric techniques to account for the possibility that: (1) residual errors in regressions are likely to be correlated across years for every firm which may inflate the levels of significance of coefficient estimates; (2) there are likely to be unobserved factors that jointly affect both the choice to adopt a staggered board and firm value; (3) the choice to adopt a staggered board is likely to be due, at least in part, to past firm performance and other historical factors. In all of my specifications, I find no significant effect of staggered boards on firm value. The results suggest that any effect of anti-takeover provisions on firm value is not driven by the presence or absence or staggered boards. More broadly, while the focus of my study has been on the valuation effects of staggered boards in particular, my results contribute to the growing literature that highlights the importance of carefully accounting for all aspects of endogeneity when measuring the valuation effects of any governance or anti-takeover provision.

Chapter 4, entitled "Cap and Trade and the Capture Theory of Regulation," studies the economic effects of regulation of carbon-dioxide emissions by examining industry stock price reaction in response to an event believed to convey new information about the likelihood of such legislation. The efficient-markets hypothesis predicts that the markets factor in the probability of future events that would affect a firm's future cash flows. I find consistently

large, negative, and significant abnormal returns for energy-intensive industries in response to the anti-regulatory event. Such a reaction suggests that such regulation benefits industry. The additional findings that larger firms in certain industries react more negatively to our event suggests that larger firms may pursue this regulation to benefit themselves at the expense of smaller firms. Both findings are consistent with the special-interest, or capture, economic theory of regulation and contradict the traditional public-interest view.

Chapter 2

State Antitakeover Law and the Market for Corporate Control

2.1 Introduction

I investigate the effect of one type of state antitakeover law, the poison pill endorsement statute, on the market for corporate control. The results of this paper provide evidence that poison pill endorsement statutes make the market for corporate control less competitive at the expense of shareholders. Specifically, I find that laws enhancing managerial ability to use the poison pill to ward off a takeover bid reduce the number of bids received by the firm, reduce the likelihood that other bidders challenge an initial bid, and result in lower wealth for shareholders. I also find weak evidence that poison pill endorsement statutes increase poison pill frequency, as well as evidence that such laws do not affect the likelihood that a deal is completed once a bid has been made. The results support the "entrenchment" viewpoint, that such antitakeover laws are harmful to shareholders since they protect managers from the disciplining effect of the market for corporate control.

Antitakeover law, which regulates the actions of a firm's managers in change-of-control situations, "is one of the most heavily researched, debated, and litigated areas in corporate law (Barzuza (2009))." States have primary responsibility for regulating corporate affairs and, as a result, researchers argue this leads states to compete for corporate charters (Romano(1987)). The central question in this literature is whether state competition for firms is the outcome of a "race to the top," in which states compete to provide a legal environment that allows managers to maximize shareholder value, or if it is a "race to the bottom," in which states compete to attract managers, exacerbating agency costs that result from the separation of ownership and control at the expense of shareholders (Jensen and Meckling

(1976), Jensen (1986)). As approximately half of all firm incorporate in Delaware, Delaware appears to be the clear winner of this race, and therefore research in this area tends to be Delaware-centric.

I contribute to the literature by asking, simply, how does state antitakeover law, specifically the poison pill endorsement statute, affect target firms in the market for corporate control? In contrast to much of the literature, my strategy is to ignore Delaware completely and exploit the variation in such laws in all other states in order to identify their effects on a number of key takeover outcome variables. The reason I choose to ignore Delaware is that half of all firms incorporate there and identifying the effect of an antitakeover law in a sample that includes Delaware firms would require correctly classifying Delaware state antitakeover law, determining (and controlling) for why a firm selects into Delaware incorporation, and then identifying and controlling for all other Delaware-specific factors that could affect takeovers for firms incorporated in that state. While selection bias is still an issue for my sample of non-Delaware firms, by appealing to the finding of Bebchuk and Cohen (2003), that most non-Delaware incorporated firms simply incorporate in their home state, I argue that the poison pill endorsement treatment is random enough, such that, with the appropriate controls, I can in fact, identify its effects.

I focus on one aspect of antitakeover law, the poison pill endorsement statute, because the poison pill or shareholder rights plan is considered (alongside, perhaps the staggered board (Bebchuk and Cohen (2005)), the most effective defense against takeover since it may be implemented at any time and at little cost to managers, and can deter a bid indefinitely (Velasco(2003)). As a result, the poison pill endorsement statute is, arguably, the most important type of antitakeover statute. Typically, a poison pill is triggered when one shareholder purchases a certain amount of the firm's shares. The poison pill allows other shareholders to purchase new shares at a discount, diluting the shares of the potential acquirer, making it prohibitively expensive for the potential acquirer to take over a firm. A poison pill endorsement statute explicitly authorizes the managers of a target firm to use poison pills in defense

of a hostile takeover. While Delaware does not have an explicit poison pill endorsement statute, it does have a well developed history of case law establishing managerial discretion in choosing to use the poison pill (Bebchuk, Cohen, and Ferrell (2002)).

My empirical strategy consists of modeling the takeover process using a sequential probit model for all but the final stage of the process since the outcome variable in all but the last stage is binary. In doing so, I assume that at each stage the decision that determines the outcome variable is made independently of the choices determining the outcome variables in each of the prior stages. This contrasts with the nested logit model in which it is assumed that decisions are made jointly. While the focus of this paper is the poison pill endorsement statute, I also consider other constituency statutes because of their similarity to poison pill endorsement statutes. Other constituency statutes allow a manager to consider firm constituencies other than the shareholder in justifying a defensive action such as a poison pill. Essentially, such statutes enhance managerial independence in change of control situations and in this respect are similar to poison pill endorsement statutes. Since the relationship between these statutes is unclear, however, I estimate model specifications with and without the other constituency statute and, in certain situations, I include a combination of the two.

The first outcome I examine is the likelihood of receiving a bid. The results reveal a negative, marginally significant coefficient on the poison pill endorsement statute dummy without controlling for other constituency statutes. However, even this marginal statistical significance disappears when I include this control. I speculate that the other constituency statute variable is subsuming some of the causal variation in the poison pill endorsement statute. As a consequence, I construct two variables, one an index composed of the sum of the two statute dummies taking a range of values between 0 and 2, and another dummy indicating the presence of either statute in a state. Estimating separate regressions with each of these combination variables as the primary variable of interest, I find a statistically significant, negative effect of antitakeover statutes on the probability of receiving a bid with

a marginal effect of about -1%, which is substantial when the annual likelihood of receiving a bid is typically around 5%.

In the next stage I estimate a probit model in which the outcome variable is the probability of implementing or retaining a poison pill, conditional on receiving a bid. Without the other constituency statute control, the coefficient on the pill endorsement statute is positive but statistically insignificant. When I include the other constituency control, however, the coefficient becomes statistically significant at the 10% level. This suggests a positive, but imprecisely estimated effect on poison pills. While it seems likely that a poison pill endorsement statue would have a strong, positive effect on poison pill frequency, it is important to consider that a poison pill is an antitakeover device that can be implemented at any time. A credible threat resulting from the ability to use a poison pill may have the desired effect on a bidder, from the target firm's perspective, without the target ever needing to implement the pill (Comment and Schwert (1995)).

In addition to examining the target firm's response to a bid, I also observe its effect on other bidders. In the next stage, I model whether or not a new bidder challenges the initial bid. This measure can be viewed as a proxy for the competitiveness of the bidding process, where an unchallenged bid indicates a lack of competition. For all estimated specifications, the coefficient is negative and statistically significant with a marginal effect ranging between 2% and 3%. This result is reinforced by an OLS regression, with target cumulative abnormal return as the dependent variable in which there is a negative and statistically significant effect of between 2.4% and 3.9%. These combined results suggest, from a shareholder perspective, a suboptimal level of competitiveness of the market for corporate control, not only through reduced bids, but after a bid is received.

This paper provides evidence that the poison pill endorsement statue is detrimental to shareholders because target firms receive fewer bids, and there is less competition to drive the bid price up after firms receive a bid. This finding is consistent with event study results that uncover a negative stock price reaction to the passage of new antitakeover law, as in Ryngaert

and Netter (1988, 1990) and Karpoff and Malatesta (1989). One of the primary arguments supporting poison pill endorsement statutes is that managers use this enhanced power to negotiate higher bids for shareholders. The evidence presented in this paper does not support this view. In the larger scheme of the antitakeover law literature, if Delaware is considered to be the "race" winner as a result of having a more permissive legal environment for managers in change of control situations, especially when it comes to the use of poison pills, the findings in this paper, that generally such a legal environment is harmful to shareholders, weigh in on the side of the "race to the bottom" perspective.

I lay out the rest of the paper as follows. Section 2.2 reviews the literature studying state antitakeover law. Section 2.3 describes the variation in state antitakeover law. Section 2.4 describes the construction of the dataset. Section 2.5 presents the results of the estimation. Section 2.6 provides a summary and some concluding remarks.

2.2 The State Antitakeover Law Literature

Research on corporate antitakeover law spans the legal, financial, and economic literature. Because corporate law is the responsibility of the states, this body of literature seeks to answer the question, how does state competition for corporate charters affect states' incentives to formulate their corporate law? Specifically, does state competition create incentives to produce a legal environment that caters to shareholders or to managers at the expense of shareholders? While this debate is concerned with state corporate law as a whole, at the heart of the debate is state antitakeover law and whether it contributes to the agency costs and conflicts of interests that arise from the separation of ownership and control in the modern corporation (Jensen and Meckling (1976), Jensen (1986)) by shielding managers from the discipline of the market for corporate control.

This debate began with Cary (1974), who describes the results of this competition as a "race to the bottom." He denunciates Delaware, the clear winner of this race, claiming its sole desire is to raise revenue (through corporate taxation), which it achieves by granting

managers unilateral control of the firm (through its antitakeover law). Winter (1977) agrees with Cary that this competition for corporate charters leads to suboptimal legislation for shareholders. However, Winter argues that this negative effect is tempered because a legal framework that is overly harmful to shareholders would excessively raise the cost of capital and lead to a lower job retention rate for managers. Later proponents of the "race to the top" view, that Delaware has become the premier location for firm incorporation because shareholders prefer it, include Romano(1993b) and Easterbrook and Fischel (1996). One of the strongest proponents of the "race to the bottom" view is Bebchuk. Bebchuk (1992) argues that competition creates state incentives to cater to managers, passing laws that overprotect them from the market for corporate control against the wishes of shareholders. Bebchuk (2001) extends this idea by proposing optional federal takeover law for which shareholders can opt in or out.[1]

The most common empirical approach for studying the effect of state corporate law relies on the event study methodology developed in the finance literature. One strategy observes the stock price reaction of firms to news of reincorporation, where a positive stock price reaction provides evidence that the "race" is in the best interest of shareholders, and a negative one gives evidence that it is as shareholders' expense.[2] Despite criticism of this methodology (see Bebchuk and Cohen (2002)), the general conclusion of these studies is that shareholder value responds positively to unexpected incorporation supporting the view that such state competition is beneficial to firms.

Research explicitly studying the effect of antitakeover laws specifically focus event studies on the reaction to news of new antitakeover law. Accordingly, a negative reaction provides evidence that antitakeover laws enhance managerial power in the takeover market at the expense of shareholders, supporting the "entrenchment" hypothesis. A positive reaction provides evidence that state antitakeover law benefits shareholders by allowing managers to

[1]Bebchuk and Ferrell (2002) defends federal regulation of regulatory competition on takeover law.

[2]For example, see Romano (1985), Bradley and Schipani (1989), Heron and Lewellen (1998), and Netter and Poulsen (1989).

ward off inadequate bids and negotiate higher offers. Examples of such a study include Ryngaert and Netter (1988, 1990), who focus on the 1986 Ohio Antitakeover Law and find a subsequent decline in stock prices for Ohio firms. The most comprehensive study of this sort is Karpoff and Malatesta (1989), who examine 40 state antitakeover bills between 1982 and 1987 and find a statistically significant, but small, negative stock price reaction for firms without existing antitakeover devices. Karpoff and Malatesta (1990, 1995) study Pennsylvania's Act 36 and also conclude that the antitakeover law destroyed shareholder wealth. Romano (1993) finds a positive but statistically insignificant stock price response to the passage of other constituency laws, which make it easier for managers to justify stronger defensive actions.

One empirical strategy that does not use the event study approach involves observing measures of performance using accounting data. Examples include Baysinger and Butler (1985), Romano (1996), and Wang (1996), who compare measures of performance following reincorporation. Generally, these studies find no significant difference before and after reincorporation. Another empirical approach in the "race" literature compares measures of firm value for Delaware and non-Delaware firms. Daines (2001) measures performance using Tobin's Q and finds that Delaware firms outperform non-Delaware firms. Subramanian (2004) revisits Daines analysis, excluding the beginning and extending the later years of his sample, and finds this difference declines and loses statistical significance in the late 1990s. He cites this as evidence that either other states caught up to Delaware or the decline in takeover activity in the late 1990s decreased this "Delaware effect."

Bebchuk and Cohen (2003) critique these studies and argue for a new approach. Rather than focusing on these performance measures, they advocate studying the factors that affect the choice of state incorporation (or reincorporation). In a preliminary analysis, they find that an index of antitakeover statutes affects this choice. Similarly, Subramanian (2002) finds that managers migrate to states with antitakeover statutes, although they move away from states with extreme antitakeover statutes. Daines (2001) conducts a similar study and finds

that controlling for other aspects of state antitakeover law, Bebchuk and Cohen's results no longer hold. Kahan (2006) also finds that antitakeover statutes do not affect a state's corporate retention rate; rather, what matters is the flexibility the state's statutes provide firms as well as the quality of the state's judicial systems.

Another article that studies state antitakeover law is Wahal, Wiles, and Zenner (1995). They find firms that opted out of Senate Bill 1310, which made takeovers prohibitively expensive, had lower insider control rights and were less likely to have a poison pill. They cited this as evidence that some boards prefer to be a part of an active market for corporate control while others do not. A recent article studying the effect of the legal takeover environment on the takeover market is Ryngaert and Scholten (2010). They examine defeated bids before and after a 1989 Delaware Supreme Court decision enhancing directors' ability to use antitakeover devices to fight takeover bids. Ryngaert and Scholten find greater wealth effects in the 1990's than in the 1980's for firms that defeat a takeover bid. They also find a higher rate of managerial turnover following a defeated bid in the 1990's, suggesting that the new legal environment did not entrench managers.

Research that uses the variation in state antitakeover law among states to identify its effects is surprisingly sparse. Comment and Schwert (1995) use variation in business combination and control share laws to predict poison pill frequency, and find that poison pills have little effect on the frequency of takeovers across states but are associated with higher bid premia. Bertrand and Mullainathan (2003) look at variation in state adoption of antitakeover laws and find that, in response to antitakeover laws, the creation of new plants decreases, wages increase, and overall productivity and profitability decline. They conclude that this is evidence that managers use the security afforded to them by such laws to enjoy the "quiet life." Garvey and Hanka (1999) find that firms in states that adopt antitakeover laws reduce their leverage, consistent with the managerial entrenchment theory. In contrast, Wald and Long (2007) find that state antitakeover laws are positively associated with debt-to-market

value, although they attribute this as potentially due to such laws lowering firms' market value.

2.3 Types of State Antitakeover Law

2.3.1 Description of state antitakeover law

Table 2.6 describes how Barzuza (2009) classifies the state antitakeover law this paper studies. The first of these is the pill endorsement statute. Typically, a poison pill, or shareholder rights plan, is triggered when one shareholder purchases a certain amount of the firm's shares. The poison pill allows other shareholders to purchase new shares at a discount, diluting the shares of the potential acquirer. This makes it prohibitively expensive for the potential acquirer to take over a firm. A state with a pill endorsement statute endorses the use of poison pills, making it difficult to legally challenge their use.

After a close reading of the statute in each state, Barzuza (2009) classifies pill endorsement statutes into three categories, strong, medium, and weak. A state that allows extreme pills, which prevent future boards from removing a poison pill, is classified as strong. With extreme pills, such as the dead-hand or slow-hand pill, even if a potential acquirer were able to obtain control of the board, it could not remove the poison pill. Also, if the statute gives the board exclusive power over the poison pill, Barzuza classifies the state as strong. An intermediate poison pill endorsement statute allows the use of poison pills but either does not give the board exclusive power over the pill or does not make reference to the board. Finally, a weak statute allows poison pills but subjects them to judicial review.

The second type of antitakeover law I consider is the "other constituency" statute. A strong other constituency statute applies the business judgement rule or rejects enhanced director's duties in change of control situations, making it difficult to legally challenge a board's defensive actions in response to a takeover threat. An intermediate other constituency statute allows directors to take into account the interest of other constituencies of the firm at the expense of shareholders to justify their response to a takeover attempt. Critics of this

type of law argue that, by not requiring directors to prefer shareholders, such a law gives managers the ability to justify too broad a variety of options. Other constituency statutes are similar to poison pill endorsement statutes in that they provide managers with more discretion in change of control situations. They differ in that other constituency statutes make no specific reference to poison pills.

Also using Barzuza's classification, I include as a control whether a firm follows *Unocal*, one of three director's fiduciary standards beyond the business judgement rule established in the Delaware courts. The business judgement rule legally gives managers the benefit of the doubt, presuming that directors make decisions in the best interest of the corporation. If someone wants to challenge whether or not directors are failing to fulfill their responsibility to the shareholders, the burden of proof falls on them. In three separate decisions, Delaware imposed enhanced fiduciary standards on directors in situations related to a potential change in control. The most fundamental of these arose from the court case *Unocal vs. Mesa Petroleum* (1985). Prior to this decision, the courts granted directors the business judgement rule to takeover defenses. As a result of *Unocal*, directors who attempt to block a takeover must show that the takeover threatened corporate policy and that their response was reasonable and proportional to the nature of the threat.

Table 2.6 summarizes these variations in antitakeover laws among states. We see that most of the laws were passed in the latter half of the 1980s. Jensen (1993) describes the vast restructuring of the American economy accomplished through frequent and widespread mergers and acquisitions. This control market, as he describes it, came to an end in the late 1980's, largely as a result of these antitakeover statutes.

2.4 Data

2.4.1 Firm accounting data

I pull firm accounting data from Compustat from fiscal year 1989 to 2005. I choose this timespan because I match lagged accounting data (in fiscal years) to governance data (in

calendar years) which I have for the years 1990-2006. From the Compustat data, I construct the following variables: *Size* is the log of a firm's total assets, *Debt/Assets* is the sum of short term and long term debt divided by total assets, and following the finance literature,[3] *Tobin's Q*, or market-to-book value, is total assets plus market value of common stock minus book value of common stock all divided by total assets. This yields a sample of 61,457 firm-year observations.

2.4.2 State law data

I follow Barzuza's (2009) classification of state antitakeover laws which are summarized in Table 2.6. Based on data on a firm's state of incorporation taken from Compustat, I generate qualitative variables describing the antitakeover laws to which firms in each state are subject. In order to simplify the analysis, I create a poison pill endorsement indicator variable equal to one if a firm is incorporated in a state with a strong or intermediate poison pill endorsement statute and equal to zero otherwise. Similarly, I create an other constituency statute dummy equal to one if the firm is incorporated in a state with a strong or intermediate other constituency statute and zero otherwise. I also create binary variables for firms in states that apply *Unocal*, this time equal to 1 if the state follows the enhanced fiduciary standard and 0 if they reject it. As described in the introduction, I omit Delaware firms.

2.4.3 Governance data

I pull data on antitakeover laws from each publication of the Riskmetrics' governance database. Each publication, covering the years 1990, 1993, 1995, 1998, 2000, 2002, 2004, and 2006, contains detailed data describing antitakeover defenses and other corporate governance related variables. The volumes between and including 1990 and 1995 each contain data for approximately 1500 firms, and the subsequent volumes contain data for about 1900-2000

[3]See Bebchuk and Cohen (2005), Bates, Becher, and Lemmon (2008)

firms. According to Bebchuk, Cohen, and Ferrell (2008), the market capitalization for the firms in each volume comprise 90% of the total U.S. market cap. I follow Gompers, Ishii, and Metrick (2003) and assume that, in the years between volumes, firms are characterized by the same data. I merge these data with the Compustat data matching CUSIPs and Riskmetrics calendar year to Compustat data from the prior fiscal year. This yields a sample of 20,245 firm-years that contain both Compustat and Riskmetrics data. The Riskmetrics variables I use are as follows: poison pill, classified board, supermajority, limits to bylaw amendment, limits to charter amendment, and golden parachute, as these are the governance provisions identified by Bebchuk, Cohen, and Ferrell (2009) as most important. Each is an indicator variable equal to 1 if the firm employs that form of governance in a given year, and equal to 0 otherwise.

2.4.4 Takeover bid data

I obtain data on takeover bids from the Securities Data Corporation (SDC) database. I follow Bates, Becher, and Lemmon (2008) to account for the presence of multibid auctions and follow-on bidding. I sample all bid data from the SDC database for US targets between 1990 and 2006. From this dataset I delete all observations classified as "buybacks," "recaps," or "exchange offers" retaining merger or acquisition bids. I define a bid to be part of an auction sequence of bids if it occurs within 365 days of another bid in the sequence. If there are no bids for a firm in the previous 365 days prior to a bid observation, I classify the observation as an initial bid. I classify a bid as completed if any bids in the auction sequence were completed. I also create a "toehold" variable which is defined as the total number of shares owned by the bidder at the time of the bid announcement divided by the total number of shares outstanding in the target firm. Other variables I collect are: whether or not equity is part of the initial bid, whether the initial bid is structured as a tender offer, and whether the bid included a termination fee. I retain data for initial bids, leaving 3,782 firm-year

observations. I then merge these bid data to my sample of firm governance and accounting data according to firm CUSIP and Riskmetric calendar year.

2.4.5 Announcement return data

Using the sample of firm CUSIPs and announcement dates from my dataset, I calculate event study announcement period cumulative abnormal returns using stock price data from the Center for Research in Stock Prices (CRSP). I use the equal weighted market index return as my proxy for the market return over an estimation window of -100 to -10 days relative to the announcement date to estimate market model parameters. My cumulative abnormal returns are the sum of abnormal returns over the period -1 to +1 around my announcement date where the abnormal returns is the actual return minus the expected return calculated using my market model parameters. This yields a sample of 2,007 cumulative abnormal returns which I merge to the master dataset.

2.4.6 Descriptive Statistics

Table 2.6 presents the number of observations (N), means, and standard deviations (SD) of all of the variables after dividing the sample into firms incorporated in states with a strong or medium poison pill endorsement statutes and firms that are not. It also reports t-statistics from a test of the null hypothesis of equal means for two independent samples with unequal variances. I classify all variables into five types, outcome variables in the market for corporate control, governance variables, firm characteristic variables, bid-level characteristic variables, and variables describing state antitakeover laws other than the pill endorsement statute.

The results in Table 2.6 indicate that the number of firms incorporated in a state with a strong or intermediate poison pill endorsement statute is similar to the number of firms incorporated in a state with a weak or no poison pill endorsement statute. Focusing on the outcome variables, the average firm incorporated in a state with a poison pill endorsement statute is about 6% more likely to have a poison pill (57% vs 51%) and a full percentage

point more likely to receive a bid in a given year (6% vs. 5%), with a statistically significant difference in means. Conditional on receiving a bid, a firm in a state with a poison pill endorsement statute, on average, is less likely to find the initial bid challenged by another bidder (22% to 25%), slightly less likely to complete a bid (73% vs 74%), and tends to receive lower abnormal returns around bid announcement (11% vs 13%), although these differences are not statistically significant.

Examining state law characteristics, we see that firms incorporated in states with poison pill endorsement statutes are much more likely to be incorporated in a state with an other constituency statute (70% vs 23%). This reflects the fact that there is significant overlap among states that have both types of statues. On the other hand, firms under a poison pill endorsement statute are less likely to be incorporated in a state that applies *Unocal* (24% vs 32%), which holds firms to a standard beyond the business judgement rule in change of control situations. This may be evidence that there exist states that are generally more favorable to managers in change of control situations and others that are not.

Among the governance variables, each is more common in states with pill endorsement statutes than in states without. Each of these differences is statistically significant except for limits to bylaw amendments. One could interpret this result in various ways. If one takes the view that being incorporated in a state with a pill endorsement statute is mostly random, then being in a more permissive state leads firms to choose a set of governance provisions that is more favorable to managers. Viewing all these variables as choice variables, another plausible hypothesis is that there are types of firms that prefer a high level of managerial protection and choose both a more protective set of governance of provisions and select into states that provide higher levels of protection.

Data on firm characteristics show that the only statistically significant difference in sample means is size, firms in states with pill endorsement statutes tend to be larger (5.26 vs 5.14). As for bid characteristics, tender offer is the only variable with a statistically signif-

icant difference across samples with whether the bid was structured as a tender offer being more common in states with no pill endorsement statute (11.1% vs 7.3%).

2.5 Estimation

I model a takeover as a multistage process. The first stage involves whether or not a firm receives a bid. The second stages involve the responses to the bid, whether a firm implements a poison pill and whether another firm challenges the bid. The final stage involves whether the bid offer is completed, and if the target is eventually taken over. I also model the effect of receiving a bid on shareholder wealth. Empirically, I model the takeover process using a sequential probit model for determining the probability of receiving a bid, the responses to the bid, and the ultimate outcome of the bid. I use OLS to estimate the effect of a poison pill endorsement statute on the wealth effect of the bid. In choosing a sequential probit (as opposed to a nested logit or multinomial probit) model I assume that the choice leading to the realization of the outcome variable is made independently of the choice leading to the outcome realizations in the other stages.

2.5.1 Receiving a Bid

My baseline specification for the first stage of the sequential probit, measuring the effect of incorporation in a state with a poison pill endorsement statute on the likelihood of receiving a bid, is as follows:

$$BID^*_{it} = \alpha + \beta PPLAW_{it} + \theta X^{statelaw}_{it} + \lambda X^{governance}_{it} + \pi X^{firm}_{it} + d_{it} + \eta_{it} + \epsilon_{it} \qquad (2.1)$$

where BID^*_{it} is a variable that measures the latent probability that a firm receives a bid conditional on a number of covariates. The subscript i indexes the firm and the subscript t indexes the year. ϵ_{it} is assumed to be independently and identically normally-distributed with mean zero. This error term reflects unobservable factors that determine the likelihood that a firm receives a bid. The latent variable is related to the binary outcome variable as

follows:

$$BID_{it} = \begin{cases} 1 & \text{if } BID^*_{it} \geq 0 \\ 0 & \text{if } BID^*_{it} < 0 \end{cases}$$

The vector $X^{statelaw}_{it}$ includes other state law related dummy variables, specifically whether or not a firm is incorporated in a state that has an other constituency statute or applies *Unocal*. $X^{governance}_{it}$ is a vector of dummy variables indicating whether or not a firm has a classified board, requires a supermajority, has limits to bylaw amendments or charter amendments, or has a golden parachute. X^{firm}_{it} is a vector describing firm characteristics: debt/assets, Tobin's Q and size. There are also dummy variables η_{it} indicating the firm's industry (based on two-digit NAICS (North American Industry Classification System) codes). The year and industry dummies help control for merger activity within an industry (see Mitchell and Mulherin (1996)) as well as other time/industry-specific fixed effects. I assume that the covariates in this specification control for selection by a firm into a state with a poison pill endorsement statute.

The coefficient of primary interest is β, with null hypothesis $\beta = 0$, which measures the effect the poison pill endorsement statute has on the outcome variable, in this case, the likelihood that a firm receives a bid. I present the results of the estimation of this model in Table 2.6, first excluding controls for other state laws, then estimating the full specification. I calculate White (1980) robust standard errors which are clustered at the firm level in order to account for correlation in the residuals for a firm across years. Because the coefficients from the probit estimation are difficult to interpret, I also include marginal effects calculated at the variable means. In the specification that excludes other state laws, the estimate of β is negative, although I can not reject the null hypothesis at the 5% significance level, I reject it at the 10% level. The estimated marginal effect indicates that for an average firm, being incorporated in a state with with a poison pill endorsement statute leads to expected probability of receiving a bid one percentage point lower than being incorporated in a state without one. This is consistent with the difference in probability means of receiving a bid presented in the summary statistics (6% vs 5%).

Controlling for other state antitakeover laws, the sign on the coefficient remains negative. However, I can no longer reject the null hypothesis of no effect at any conventional level of significance. As we saw from the summary statistics, there is a high correlation between being in a state with a poison pill endorsement statute and being in a state with an other constituency statute. It is possible the loss in significance is due to including both types of state law variables in the regression and not because of a lack of causal effect. To test this, I generate an index variable ranging from 0-2 that is the sum of the pill endorsement and other constituency dummies. I substitute this variable for the poison pill endorsement and other constituency dummies and present the result of this estimation in columns 1 and 2 of Table 2.6. The effect of this index variable remains negative and is significant at the 5% level. I also create a new dummy variable equal to one if a firm is incorporated in a state with either of these two types of state antitakeover laws. I present the results of my estimation with this as my variable of interest in columns 3 and 4. The coefficient on the effect of the statutes is higher and again is statistically significant at the 5% level. The estimated marginal effect indicates that the average firm incorporated in a state with either a poison pill endorsement statute or an other constituency statute experiences a decreased likelihood of receiving a bid of 1.2 percentage points, a substantial increase considering the average annual probability of receiving a bid is between 5% and 6%.

2.5.2 Poison Pill Response

I specify the following stage of the sequential probit model predicting a target firm's response of adopting or retaining poison pill as follows:

$$PP^*_{it} = \alpha + \beta PPLAW_{it} + \theta X^{statelaw}_{it} + \lambda X^{governance}_{it} + \pi X^{firm}_{it} + d_{it} + \eta_{it} + \epsilon_{it} \qquad (2.2)$$

where PP^*_{it} is a variable measuring the latent probability that a firm implements or retains a poison pill. Again, ϵ_{it} is an independently and identically normally-distributed random variable with mean zero. The latent variable relates to the outcome variable, whether a firm implements or retains a poison pill as follows:

$$PP_{it} = \begin{cases} 1 & \text{if } PP^*_{it} \geq 0 \\ 0 & \text{if } PP^*_{it} < 0 \end{cases}$$

If the latent variable is positive, the model predicts that the firm responds to an outside bid with a poison pill. As before, $X^{statelaw}_{it}$ is a vector of other state antitakeover law variables, $X^{governance}_{it}$ is a vector of corporate governance related variables, X^{firm}_{it} is a vector of variables describing the firm's characteristics, and η_{it} is a vector of dummy variables indicating the ith firm's industry in year t.

Examining the specification without other state law controls, I find that the estimate of β is positive; however, I fail to reject the null hypothesis of zero effect at any conventional significance level. When I control for other state laws, the positive effect of the pill endorsement statute on poison pills is enhanced and significant at the 10% level. This provides evidence that, as I isolate the variation in pill endorsement statutes from the other constituency statute, the effect on poison pills becomes more precisely estimated. This result may be related to the fact that, while both types of statutes enhance managerial discretion in responding to a takeover attempt, other constituency statutes do not explicitly make reference to poison pills. Examining the marginal effect, I find that for an average firm in a state with a poison pill endorsement statute the likelihood of having a poison pill increases by 10 percentage points.

While the precision with which these effects are estimated is not especially high, overall, I take this as evidence that poison pill endorsement statutes increase the use of poison pills as a defense mechanism in the market for corporate control. It is important to consider that, while we would expect poison pill endorsement to affect the use of a poison pill, as Comment and Schwert (1995) point out, a firm without a poison pill may still have the latent threat of a poison pill. Therefore, being incorporated in a state that explicitly condones the use of a poison pill may still enhance the powers of managers of a target firm without the managers ever having to implement the pill. This may explain the lack of a stronger relationship between poison pill endorsement statutes and poison pills.

2.5.3 Challenging a Bid

I specify the following probit model to estimate the effect of a poison pill endorsement statute on whether or not other bidders challenge an initial bid:

$$CHALLENGE^{*}_{it} = \alpha + \beta PPLAW_{it} + \theta X^{statelaw}_{it} + \lambda X^{governance}_{it} + \pi X^{firm}_{it} + \psi X^{bid}_{it} + d_{it} + \eta_{it} + \epsilon_{it} \tag{2.3}$$

where $CHALLENGE^{*}_{it}$ is a variable measuring the latent probability that another firm challenges the initial bid. The latent variable relates to the outcome variable, whether a firm implements or retains a poison pill as follows:

$$CHALLENGE_{it} = \begin{cases} 1 & \text{if } PP^{*}_{it} \geq 0 \\ 0 & \text{if } PP^{*}_{it} < 0 \end{cases}$$

If the latent variable is positive, another bidder challenges the initial bid. As before, $X^{statelaw}_{it}$ is a vector of other state antitakeover law variables, $X^{governance}_{it}$ is a vector of corporate governance related variables, X^{firm}_{it} is a vector of variables describing the firm's characteristics, and η_{it} is a set of dummy variables indicating the firm's industry.

Table 2.6 presents the results of this estimation. For the specifications both with and without other state antitakeover law, the coefficient on the poison pill endorsement statute is large, negative, and highly statistically significant. The estimated marginal effects indicate that for the average firm and bid, being incorporated in a state with a poison pill decreases the likelihood of another bidder challenging the initial bid by 2.8 percentage points with no controls for other state antitakeover laws, and 2.0 percentage points with these controls. I consider an increased likelihood that other bidders challenge the initial bid a proxy for the overall competitiveness of the market for corporate control. This interpretation suggests that poison pill endorsement statutes not only make the control market less competitive before receiving a bid, by decreasing the number of bids, but also less competitive afterwards. Fewer expected competing bidders in a given bid sequence would result in lower wealth gains for shareholders in response to the initial bid. In results presented in the target CAR section, I show that the data confirm this inference.

2.5.4 Completing a Bid

I specify the probit model to estimate the effect of the poison pill endorsement statute on whether or not the initial bid eventually is completed (the target firm is taken over) as follows:

$$COMPLETED^*_{it} = \alpha + \beta PPLAW_{it} + \theta X^{statelaw}_{it} + \lambda X^{governance}_{it} + \pi X^{firm}_{it} + \psi X^{bid}_{it} + d_{it} + \eta_{it} + \epsilon_{it} \tag{2.4}$$

where $COMPLETED^*_{it}$ is a variable measuring the latent probability that the initial bid is completed. The latent variable relates to the outcome variable, whether the initial bid is completed, as follows:

$$COMPLETED_{it} = \begin{cases} 1 & \text{if } COMPLETED^*_{it} \geq 0 \\ 0 & \text{if } COMPLETED^*_{it} < 0 \end{cases}$$

Table 2.6 presents the results from the estimation. The results reveal a positive relationship between incorporation in a state with a poison pill endorsement statute and the likelihood of bid completion; however I cannot reject that the effect is different from zero at conventional significance levels. While previously reported results provide evidence that poison pill endorsement statutes lead to less competitive takeover markets through deterring bids, deterring competition upon receiving a bid, and yielding lower target returns, I find no evidence that such statutes decrease the likelihood of bid completion. This may suggest that potential acquirers choose to make a bid for a firm incorporated in a state that endorses poison pill when they are more confident that the target will receive their bid favorably.

2.5.5 Target Cumulative Abnormal Return

I estimate the effect of a poison pill endorsement statute on a target's cumulative abnormal return follows in response to the bid announcement using OLS regression. I specify the linear model as follows.

$$TARGETCAR_{it} = \alpha + \beta PPLAW_{it} + \theta X^{statelaw}_{it} + \lambda X^{governance}_{it} + \pi X^{firm}_{it} + \psi X^{bid}_{it} + d_{it} + \eta_{it} + \epsilon_{it} \tag{2.5}$$

As before, $X_{it}^{statelaw}$ is a vector of other state antitakeover law variables, $X_{it}^{governance}$ is a vector of corporate governance related variables, X_{it}^{firm} is a vector of variables describing the firm's characteristics. Parameters to be estimated are α, the constant, coefficient vectors β, θ, λ, π, d_{it} the coefficient on the year dummy, and η_{it}, the coefficient on a dummy indicating the firm's industry.

Table 2.6 presents the results of this estimation. Without controlling for other constituency statutes, I find that the poison pill endorsement statute is associated with a 3.9% lower CAR for target firms. One of the primary arguments in favor antitakeover statutes is that they give the managers the power to negotiate a higher price with the bidder. This result does not support this view. It is however, consistent with the result that pill endorsement statutes decrease the number of challenging bidders who may otherwise drive the bidding price up. The coefficient on pill endorsement, controlling for other constituency statutes in column 2, while showing a 3% decline in CAR, is no longer statistically significant. As before, in order to investigate whether this is a simple matter of the other constituency statute variable subsuming variation in poison pill endorsement statutes, I substitute the poison pill/other constituency index variable for the individual variables. Doing so yields a statistically significant coefficient of -2.4% providing evidence that jointly considered, poison pill endorsement and other constituency statutes lead to lower bidder return for shareholders.

2.6 Conclusion

The debate over whether the competitive effects of leaving corporate antitakeover law in the hands of the states has led to a system that caters to shareholder, or caters to managers at the expense of shareholders, continues. I take a new strategy in contributing to the debate. While most of the literature tends to be Delaware-centric, as Delaware is the apparent winner of this competition, I ignore Delaware and exploit variation in antitakeover law in other states in order to identify the effect of antitakeover law and in particular, the poison pill endorsement statute.

The evidence presented in this paper supports the view that poison pill endorsement statutes cater to managers at the expense of shareholders. First of all, I find evidence that incorporating in a state having a poison pill endorsement statute substantially reduces the number of bids a firm receives. Upon receiving a bid, the takeover process is less competitive as fewer other potential bidders challenge the initial bid and this is reflected in lower returns for shareholders. Since researchers tend to view Delaware as having a manager-friendly legal environment in change of control situations and a permissive attitude towards poison pills, the results of this paper support the "race to the bottom" view in the literature literature, that antitakeover law caters to managers at the expense of shareholders.

One clear area for future work is to explore the relationship between other constituency statutes and poison pill endorsement statutes, given their similarities and differences. While this paper touches on the issue, it does not offer clear evidence as to how these two statutes interact in influencing outcomes in the market for corporate control.

Table 2.1: State Law Description

Strong Pill Endorsement Statute	Allows extreme pills (dead-hand or slow-hand) preventing future boards from altering or redeeming poison pills or gives the board exclusive power over the poison pill.
Intermediate Pill Endorsement Statute	Gives the board nonexclusive power to adopt or redeem a pill or gives corporations this power without making the statute making any reference to the board.
Weak Pill Endorsement Statute	Subjects the use of poison pills to judicial review.
Strong Other Constitutency Statute	Applies the business judgment rule (BJR) or explicitly rejects enhanced duties in change-of-control situations.
Intermediate Other Constituency Statute	Explicitly allows directors to take into account other constituencies at the expense of shareholders.
Weak Other Constituency Statute	Allow directors to take into account other constituencies though not explicitly at the expense of shareholder value.

Table 2.2: Variation in State Law

Pill Endorsement Statutes	Strong	GA (1989), MD (1999), VA (1990), CO (1989),
	Intermediate	CT (2003), FL (1989), HI (1988), ID (1988), IL (1989), IN (1986), IA (1989), KY (1984), ME (2003), MI (2001), NV (1999), NJ (1989), OH (1986), OR (1989), PA (1989), RI (1990), SD (1990), SC (2001), TN (1989), UT (1989), WA (1998), WI (1987)
	Weak	NY (1988), NC (1990)
Other Constituency Statutes	Strong	IN (1989), MD (1999), NV (1991), NC (1993), OH (1984), PA (1990), VA (1988)
	Intermediate	AZ (1987), CT (1997), HI (1989), ID (1988), IL (1985), IA (1989), KY (1989), LA (1988), MA (1989), MN (1987), MI (1990), MO (1989), NJ (1989), NM (1987), ND (1993), OR (1989), RI (1990), SD (1990), TN (1988), TX (2006), VT (1998)
	Weak	FL (1989), GA (1989), ME (1986), NE (2007), NY (1987), WI (1987)

Notes: This table presents the distribution of state law as classified and reported by Barzuza (2009). Year the statute became effective is in parentheses.

Table 2.3: Summary Statistics

	Pill Endorsement Statute			No Pill Endorsement Statute			
	N	Mean	SD	N	Mean	SD	t-test DIM
Outcome Variables							
Poison Pill Frequency	5,884	0.570	(0.495)	4,260	0.513	(0.500)	-5.651
Bid Frequency	16,516	0.057	(0.233)	18,696	0.047	(0.211)	-4.431
Challenged Bid	873	0.022	(0.146)	825	0.025	(0.158)	0.500
Completed Bid	949	0.727	(0.446)	877	0.737	(0.441)	0.459
Target CAR	542	0.114	(0.238)	504	0.131	(0.235)	1.123
State Law Characteristics							
Other Constituency Statute	16,516	0.698	(0.459)	18,696	0.231	(0.422)	-98.760
Applies *Unocal* Standard	16,516	0.244	(0.429)	18,696	0.315	(0.464)	14.890
Governance Variables							
Classified Board	5,884	0.612	(0.487)	4,260	0.569	(0.495)	-4.285
Supermajority	5,884	0.189	(0.392)	4,260	0.149	(0.356)	-5.454
Limits to Bylaw Ammendments	5,884	0.145	(0.353)	4,260	0.137	(0.343)	-1.200
Limits to Charter Ammendments	5,884	0.047	(0.213)	4,260	0.012	(0.111)	-10.762
Golden Parachute	5,884	0.662	(0.473)	4,260	0.614	(0.487)	-5.013
Firm Characteristics							
Debt to Assets	15,409	0.309	(2.140)	17,318	0.344	(2.686)	1.301
Tobin's Q	13,908	1.759	(1.550)	15,896	1.766	(1.645)	0.339
Size	16,337	5.261	(2.844)	18,363	5.139	(3.016)	-3.870
Bid Characteristics							
Equity Bid	949	0.552	(0.498)	877	0.543	(0.498)	-0.403
Tender Offer	949	0.073	(0.260)	877	0.111	(0.314)	2.798
Toehold	949	0.048	(0.182)	877	0.044	(0.143)	-0.521
Termination Fee	949	0.080	(0.272)	877	0.059	(0.236)	-1.786

Notes: This table presents descriptive statistics of the sample dividing it according to whether or not the firm was incorporated in a state with a poison pill endorsement statute. I also reports t-statistics from a test of the null hypothesis of equal means for two independent samples with unequal variances. An observation is a firm-year. Poison pill frequency indicates whether the firm had a poison pill. Bid Frequency indicates whether a firm received a bid. Challenged Bid indicates whether or not directors challenged the bid as classified by Riskmetrics. Completed Bid indicates whether the bid was completed. Target CAR indicates the 3-day abnormal return around the bid announcement. Other Constituency Statute indicates that a firm is incorporated in a state with an other constituency statute. Applies *Unocal* indicates that a firm is incorporated in a state that applies Delaware's enhanced standard, *Unocal*. Classified board, Supermajority, Limits to Bylaw Ammendments, Limits to Charter Ammendments, and Golden Parachute are indicator variables describing whether the firm has the type of governance. Debt/Assets is the sum of short term and long term debt divided by total assets. Tobin's Q is total assets plus market value of common stock minus book value of common stock all divided by total assets. Size is the log of total assets. Equity Bid indicates whether the initial bid included an equity offer. Tender Offer indicates whether the initial bid was a tender offer. Termination Fee indicates whether the bid included a termination fee. Toehold refers to the share of the target firm held by the bidder at the time of announcement.

Table 2.4: Probability of Receiving a Bid - 1

	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Pill Endorsement Statute	-0.0790*	-0.0091	-0.0694	-0.0080
	(0.0457)		(0.0509)	
Other Constituency Statute			-0.0370	-0.0043
			(0.0507)	
Applies *Unocal*			-0.069	-0.0079
			(0.0511)	
Classified Board	-0.1279***	-0.0147	-0.1299***	-0.0150
	(0.0487)		(0.0488)	
Supermajority	-0.0002	-0.00002	0.0014	0.0001
	(0.0620)		(0.0618)	
Limits to Bylaw Ammend.	0.0145	0.0017	0.0185	0.0021
	(0.0595)		(0.0594)	
Limit to Charter Ammend.	0.1639	0.0189	0.1646	0.0190
	(0.1131)		(0.1123)	
Golden Parachute	0.2006***	0.0232	0.1984	0.0229
	(0.0516)		(0.0514)	
Size	-0.0527***	-0.0061	-0.0538***	-0.0062
	(0.0153)		(0.0153)	
Debt-to-Assets	0.1819**	0.0210	0.1742***	0.0201
	(0.0893)		(0.0893)	
Tobin's Q	-0.1320***	-0.0152	-0.1304*	-0.0150
	(0.0333)		(0.0329)	
Industry Dummies?	Yes		Yes	
Year Dummies?	Yes		Yes	
No. of Observations	8,958		8,958	
Pseudo R^2	0.05		0.051	

Notes: This table presents probit results modeling the effect of poison pill endorsement statutes on receiving a bid. Other Constituency Statute indicates that a firm is incorporated in a state with an other constituency statute. Applies *Unocal* indicates that a firm is incorporated in a state that applies Delaware's enhanced standard, *Unocal*. Classified board, Supermajority, Limits to Bylaw Ammendments, Limits to Charter Ammendments are indicator variable describing whether the firm has the type of governance. Target announcement CAR indicates the 3-day abnormal return around the bid announcement. Size is the log of total assets. Debt/Assets is the sum of short term and long term debt divided by total assets. Tobin's Q is total assets plus market value of common stock minus book value of common stock all divided by total assets. I classify industry according to 2-digit NAICS codes. Standard errors are clustered at the firm level. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 2.5: Probability of Receiving a Bid - 2

	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Pill End.-OC Statute Index	-0.0533**	-0.0061		
	(0.0267)			
Pill End or OC Statute			-0.1109**	-0.0128
			(0.0483)	
Applies *Unocal*	-0.0693	-0.0080	-0.0529	-0.0061
	(0.0508)		(0.0503)	
Classified Board	-0.1296***	-0.0149	-0.1244**	-0.0143
	(0.0489)		(0.0492)	
Supermajority	0.0010	0.0001	-0.0005	-0.0001
	(0.0617)		(0.0617)	
Limits to Bylaw Ammend.	0.0201	0.0023	0.0212	0.0024
	(0.0593)		(0.0594)	
Limit to Charter Ammend.	0.1638	0.0189	0.1654	0.0191
	(0.1120)		(0.1123)	
Golden Parachute	0.1988***	0.0229	0.1976***	0.0228
	(0.0514)		(0.0515)	
Size	-0.0539***	-0.0062	-0.0548***	-0.0063
	(0.0153)		(0.0152)	
Debt-to-Assets	0.1747**	0.0201	0.1747*	0.0201
	(0.0893)		(0.0901)	
Tobin's Q	-0.0131***	-0.0151	-0.1299***	-0.0150
	(0.0328)		(0.0329)	
Industry Dummies?	Yes		Yes	
Year Dummies?	Yes		Yes	
No. of Observations	8,958		8,958	
Pseudo R^2	0.0505		0.0508	

Notes: This table presents probit results modeling the effect of poison pill endorsement statutes on receiving a bid. Pill End.-OC Statute Index is an index variable constructed as the sum of pill endorsement and other constituency dummy variables. Pill End or OC Statute indicates whether a firm is incorporated in a state with either statute. Applies *Unocal* indicates that a firm is incorporated in a state that applies Delaware's enhanced standard, *Unocal*. Classified board, Supermajority, Limits to Bylaw Amendments, Limits to Charter Amendments are indicator variable describing whether the firm has the type of governance. Size is the log of total assets. Debt/Assets is the sum of short term and long term debt divided by total assets. Tobin's Q is total assets plus market value of common stock minus book value of common stock all divided by total assets. I classify industry according to 2-digit NAICS codes. Standard errors are clustered at the firm level. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 2.6: Determinants of Poison Pill Frequency

	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Pill Endorsement Statute	0.1060	0.0418	0.2542*	0.1003
	(0.1314)		(0.1462)	
Other Constituency Statute			-0.2997**	-0.1182
			(0.1508)	
Applies *Unocal*			0.0942	0.0372
			(0.1514)	
Classified Board	0.6818***	0.2690	0.7111***	0.2805
	(0.1394)		(0.1398)	
Supermajority	-0.1852	-0.0731	-0.2050	-0.0809
	(0.1845)		(0.1822)	
Limits to Bylaw Ammend.	0.2261	0.0892	0.2764	0.1091
	(0.2014)		(0.2042)	
Limit to Charter Ammend.	-0.2944	-0.1162	-0.2741	-0.1081
	(0.3510)		(0.3455)	
Golden Parachute	0.6475***	0.2555	0.6857***	0.2705
	(0.1469)		(0.1453)	
Size	0.0303	-0.1196	0.0296	0.0117
	(0.0485)		(0.0482)	
Debt-to-Assets	-0.0265	-0.0105	-0.0207	-0.0082
	(0.3604)		(0.3631)	
Tobin's Q	-0.0557	-0.0220	-0.0539	-0.0213
	(0.0710)		(0.0707)	
Industry Dummies?	Yes		Yes	
Year Dummies?	Yes		Yes	
No. of Observations	597		597	
chi-squared	103		105	
Pseudo R^2	0.1562		0.1631	

Notes: This table presents probit results modeling the effect of poison pill endorsement statutes on poison pill frequency. Pill Endorsement Statute and Other Constituency Statute indicate that a firm is incorporated in a state with a poison pill endorsement or other constituency statute respectively. Applies *Unocal* indicates that a firm is incorporated in a state that applies Delaware's enhanced standard, *Unocal*. Classified board, Supermajority, Limits to Bylaw Amendments, Limits to Charter Amendments are indicator variable describing whether the firm has the type of governance. Target CAR indicates the 3-day abnormal return around the bid announcement. Size is the log of total assets. Debt/Assets is the sum of short term and long term debt divided by total assets. Tobin's Q is total assets plus market value of common stock minus book value of common stock all divided by total assets. I classify industry according to 2-digit NAICS codes. Standard errors are clustered at the firm level. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 2.7: Probability of Challenging a Bid

	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Pill Endorsement Statute	-0.9212***	-0.0281	-0.7752**	-0.0205
	(0.2800)		(0.3000)	
Other Constituency Statute			-0.3204	-0.0085
			(0.3078)	
Applies *Unocal*			-0.6464	-0.0171
			(0.3545)	
Classified Board	-0.1689	-0.0051	-0.1965	-0.0052
	(0.2666)		(0.2798)	
Supermajority	-0.2045	-0.0062	-0.2051	-0.0054
	(0.3627)		(0.3550)	
Limits to Bylaw Ammend.	0.6507**	0.0198	0.7636*	0.0202
	(0.3035)		(0.3002)	
Limit to Charter Ammend.	0.9401	0.0286	0.9033	0.0238
	(0.6484)		(0.6386)	
Golden Parachute	0.4567	0.0139	0.4558	0.0120
	(0.4154)		(0.4190)	
Tender Offer	1.3447***	0.0410	1.4897**	0.0393
	(0.3838)		(0.3930)	
Equity Bid	-0.0449	-0.0014	-0.0006	-0.00001
	(0.3081)		(0.3025)	
Toehold	-0.2861	-0.0087	-0.2009	-0.0053
	(2.3045)		(2.1477)	
Termination Fee	1.3108***	0.0399	1.3150**	0.0347
	(0.3432)		(0.3457)	
Size	0.0257	0.0008	0.0202	0.0005
	(0.1075)		(0.1063)	
Debt-to-Assets	0.9445	0.0287	0.6945	0.0183
	(0.6901)		(0.6811)	
Tobin's Q	-0.7318**	-0.0222	-0.5966*	-0.0157
	(0.3064)		(0.3166)	
Industry Dummies?	Yes		Yes	
Year Dummies?	Yes		Yes	
No. of Observations	337		337	
chi-squared	97.31		97.91	
Pseudo R^2	0.3500		0.3658	

Notes: This table presents probit results modeling the effect of poison pill endorsement statutes on the likelihood that another bidder challenges an initial bid. Pill Endorsement Statute and Other Constituency Statute indicate that a firm is incorporated in a state with a poison pill endorsement or other constituency statute respectively. Applies *Unocal* indicates that a firm is incorporated in a state that applies Delaware's enhanced standard, *Unocal*. Classified board, Supermajority, Limits to Bylaw Amendments, Limits to Charter Amendments are indicator variable describing whether the firm has the type of governance. Target announcement CAR indicates the 3-day abnormal return around the bid announcement. Toehold refers to the share of the target firm held by the bidder at the time of announcement. Equity bid indicates whether the initial bid included an equity offer. Tender offer indicates whether the initial bid was a tender offer. Termination fee indicates whether the bid included a termination fee. Size is the log of total assets. Debt/Assets is the sum of short term and long term debt divided by total assets. Tobin's Q is total assets plus market value of common stock minus book value of common stock all divided by total assets. I classify industry according to 2-digit NAICS codes. Standard errors are clustered at the firm level. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 2.8: Probability of Completing a Bid

	Coefficient	Marginal Effect	Coefficient	Marginal Effect
Pill Endorsement Statute	0.0501	0.0148	0.0759	0.0223
	(0.1280)		(0.1422)	
Other Constituency Statute			-0.0122	-0.0036
			(0.1450)	
Applies *Unocal*			0.2833*	0.0832
			(0.1480)	
Classified Board	0.0068	0.0020	0.0309	0.0091
	(0.1275)		(0.1298)	
Supermajority	0.2720	0.0802	0.2715	0.0798
	(0.1941)		(0.1901)	
Limits to Bylaw Ammend.	-0.2635	-0.0778	-0.2343	-0.0689
	(0.1898)		(0.1941)	
Limit to Charter Ammend.	0.0040	0.0012	-0.0071**	-0.0021
	(0.3371)		(0.3377)	
Golden Parachute	-0.0140	-0.0041	0.0040**	0.0012
	(0.1497)		(0.1511)	
Tender Offer	0.0865	0.0255	0.0837	0.0246
	(0.2262)		(0.2293)	
Equity Bid	-0.7200***	-0.2124	-0.7196	-0.2114
	0.0865		(0.1399)	
Toehold	0.4401	0.1298	0.5437	0.1598
	(0.7496)		(0.7584)	
Termination Fee	0.5541***	0.1634	0.5539***	0.1627
	(0.2040)		(0.2071)	
Size	-0.0970**	-0.0286	-0.0923**	-0.0271
	(0.0441)		(0.0439)	
Debt-to-Assets	0.4595	0.1355	0.5134	0.1509
	(0.3687)		(0.3790)	
Tobin's Q	0.1403	0.0414	0.1372	0.0403
	(0.0929)		(0.0916)	
Industry Dummies?	Yes		Yes	
Year Dummies?	Yes		Yes	
No. of Observations	594		594	
chi-squared	85.76		94.12	
Pseudo R^2	0.1293		0.1345	

Notes: This table presents probit results modeling the effect of poison pill endorsement statutes on the likelihood that a bid is completed. Pill endorsement statute and other constituency statute indicate that a firm is incorporated in a state with a poison pill endorsement or other constituency statute respectively. Applies *Unocal* indicates that a firm is incorporated in a state that applies Delaware's enhanced standard, *Unocal*. Classified board, Supermajority, Limits to Bylaw Amendments, Limits to Charter Amendments are indicator variable describing whether the firm has the type of governance. Target announcement CAR indicates the 3-day abnormal return around the bid announcement. Toehold refers to the share of the target firm held by the bidder at the time of announcement. Equity bid indicates whether the initial bid included an equity offer. Tender offer indicates whether the initial bid was a tender offer. Termination fee indicates whether the bid included a termination fee. Size is the log of total assets. Debt/Assets is the sum of short term and long term debt divided by total assets. Tobin's Q is total assets plus market value of common stock minus book value of common stock all divided by total assets. I classify industry according to 2-digit NAICS codes. Standard errors are clustered at the firm level. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 2.9: Determinants of Cumulative Abnormal Returns

	Coefficient	Coefficient	Coefficient
Pill Endorsement Statute	-0.0389**	-0.0302	
	(0.195)	(0.0234)	
Other Constituency Statute		-0.0175	
		(0.0255)	
Pill End/O.C. Index			-0.0239**
			(0.0114)
Applies *Unocal*		0.0061	0.0058
		(0.0223)	(0.0219)
Classified Board	0.0589***	0.0605***	0.0609***
	(0.0222)	(0.0227)	(0.0226)
Supermajority	-0.0519**	-0.0528**	-0.0532**
	(0.0263)	(0.0262)	(0.0262)
Limits to Bylaw Ammend.	-0.0385*	-0.0364*	-0.0355
	(0.0214)	(0.0215)	(0.0216)
Limit to Charter Ammend.	0.0713*	0.0743*	0.0743*
	(0.0395)	(0.0398)	(0.0398)
Golden Parachute	-0.0159	-0.0143	-0.0142
	(0.0244)	(0.0245)	(0.0244)
Tender Offer	0.1208***	0.1215***	0.1221***
	(0.0445)	(0.0446)	(0.0452)
Equity Bid	-0.0246	-0.0244	-0.0242
	(0.0230)	(0.0230)	(0.0230)
Toehold	0.0459	0.0471	0.0455
	(0.0662)	(0.0671)	(0.0665)
Termination Fee	0.0497*	0.0517*	0.0517*
	(0.0290)	(0.0293)	(0.0293)
Size	-0.0068	-0.0286	-0.0072
	(0.0066)	(0.0065)	(0.0066)
Debt-to-Assets	-0.0703	-0.0694	-0.0689
	(0.0711)	(0.0717)	(0.0718)
Tobin's Q	-0.0017	-0.0020	-0.0022
	(0.0118)	(0.0119)	(0.0119)
Industry Dummies?	Yes	Yes	Yes
Year Dummies?	Yes	Yes	Yes
No. of Observations	375	375	375
chi-squared			
Pseudo R^2	0.2220	0.1786	0.2235

Notes: This table presents OLS results modeling the effect of poison pill endorsement statutes on 3-day target CAR around bid announcement. Pill endorsement statute and other constituency statute indicate that a firm is incorporated in a state with a poison pill endorsement or other constituency statute respectively. Pill End.-OC Statute Index is an index variable constructed as the sum of pill endorsement and other constituency dummy variables. Applies *Unocal* indicates that a firm is incorporated in a state that applies Delaware's enhanced standard, *Unocal*. Classified board, Supermajority, Limits to Bylaw Amendments, Limits to Charter Ammendments are indicator variable describing whether the firm has the type of governance. Toehold refers to the share of the target firm held by the bidder at the time of announcement. Equity bid indicates whether the initial bid included an equity offer. Tender offer indicates whether the initial bid was a tender offer. Termination fee indicates whether the bid included a termination fee. Size is the log of total assets. Debt/Assets is the sum of short term and long term debt divided by total assets. Tobin's Q is total assets plus market value of common stock minus book value of common stock all divided by total assets. I classify industry according to 2-digit NAICS codes. Standard errors are clustered at the firm level. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Chapter 3

Explaining the Staggered Board Discount

3.1 Introduction

A staggered board divides a corporation's board of directors into separate classes such that each year one of these classes is up for reelection and each class serves terms of equal tenure. This makes winning a board majority difficult for outsiders as they must achieve victories over multiple election cycles as opposed to just one, and thus are often viewed as a mechanism to prevent takeover. Bebchuk and Cohen (2005) and Faleye (2007) document that firms with staggered boards have lower contemporaneous firm value than firms without, a finding that they interpret as evidence for the *"managerial entrenchment"* view of staggered boards. According to this view, staggered boards insulate managers from the market for corporate control, allowing them to pursue their own selfish interests at the expense of shareholders. With a diminished threat of replacement, managers shirk, consume more perquisites, and resist value-creating takeovers attempts *causing* the market value of a firm to be lower. However, even Bebchuk and Cohen (2005) concede that "as is often the case with respect to identified correlations between governance arrangements and firm value, simultaneity issues complicate the interpretation of my findings."

The difficulty in interpreting the results in the literature occurs because the presence of staggered boards in a firm's charter or bylaws is not exogenous. Managers *select* into having a staggered board and its presence is not randomly distributed across firms. A firm that has already been discounted by the market, if, for example, it has poor growth prospects or has been performing poorly, is more likely to become a target for an acquisition. In order to

protect the firm from being taken over, corporate leadership *decides* to implement a staggered board. Empirical analysis that attempts to measure the cross-sectional relationship between firm value and staggered boards, without accounting for the underlying characteristics driving the choice to have a staggered board, will find a negative relationship. Such an analysis will conclude wrongly that staggered boards *cause* lower firm value when it is actually low firm value causing the presence of the staggered board.

It is even theoretically possible that staggered boards actually create value for shareholders by allowing managers to extract higher premiums from acquirers and preventing hostile bidders who make inadequate offers from successfully taking over the firm (DeAngelo and Rice (1983), Stulz (1988)). Stein (1988, 1989) argues that anti-takeover provisions may also enhance firm value by making managers less myopic. According to Stein, managers under constant threat of replacement are likely to make choices that boost short-term earnings rather than maximize the long-run value of the firm. Staggered boards align managers' incentives so that they pursue the latter. The *"credible commitment view"* as described by Rose (2009), suggests that by tying the hands of shareholders and making it difficult for the firm to accept hostile bids, staggered boards encourage other participants in the firm's nexus of contracts (e.g. executives, employees, suppliers) to make greater investments in firm-specific capital, confident that they will not face a hold-up problem with a future successful acquiring firm. This enhances firm value by providing an explicit contractual device that allows the firm to commit to protecting parties that need to make long-horizon investments in the firm. This commitment may be most valuable when the firm is particularly vulnerable to an opportunistic takeover – if, for example, the firm is facing short-term undervaluation because of economic circumstances beyond its control. This view has received some recent empirical support from Bates, Becher, and Lemmon (2008) who find evidence that firms, with and without staggered boards, once targeted, are equally likely to ultimately be taken over. They also find that the presence of a staggered board has no effect on abnormal returns over bid announcement periods.

My study suggests that failure to account for the factors that push firms to adopt staggered boards (or keep them from de-staggering their boards) could lead researchers to overestimate the causal effect of staggered boards on firm value. It may cause us to infer a firm discount that is due to the staggered board itself, rather than underlying firm characteristics for which the presence of the staggered board is merely a symptom. To illustrate this further, consider a firm in an industry where a fundamental technology shock is redrawing the boundaries of the firm. While the firm may possess unique organizational characteristics to take advantage of the new opportunities, information asymmetry and market uncertainty may cause the market to discount the value of the firm thus making it a potential target for an opportunistic acquisition. In this case, adopting a staggered board may actually be value enhancing by providing a commitment device that encourages executives and employees to continue making firm-specific investments in the firm. If such firms are likely to adopt staggered boards, any analysis that ignores the firms' underlying characteristics will attribute any valuation discount to the staggered board.

My formulation does not rule out the possibility that staggered boards are indeed associated with significant agency costs arising from managerial entrenchment. For example, consider a poorly performing firm that is deeply discounted by the market and as such, has become an attractive takeover target. It is possible that managers of this firm may push for the adoption of staggered boards to insulate themselves from the market for corporate control. Nevertheless, even in this case, any ex-post (negative) correlation between the staggered board and firm value is mostly due to the pre-adoption valuation discount itself, rather than being attributable to the adoption of the staggered board.

I start my analysis by reproducing the prior results in the literature and document a strong negative correlation between firm value and having a staggered board in an OLS regression. However, the first indication that staggered boards might not have a strong negative effect on value comes when I cluster the standard errors by firm, i.e., when I account for the possibility that the OLS regression residuals may be correlated across years for a given

firm. This increases the standard error on the estimated coefficient of the effect of staggered boards on value by about 230% and makes the estimated coefficient indistinguishable from zero. This by itself is a new result; prior studies have generally reported OLS results with robust White (1980) standard errors rather than clustered errors.

The next clear indication of the endogeneity inherent in the choice to have a staggered board comes when I conduct my analysis using a simple fixed-effects specification. In this case, the sign of the estimated coefficient on staggered boards flips and the staggered board discount becomes a premium. The sign flip between the OLS and fixed effects regression suggests that staggered boards are not strictly exogenous with respect to firm value and that causality may run from firm value to staggered boards and not the other way around.[1]

Controlling for the decision to adopt a staggered board requires me to identify instruments which explain the presence of staggered boards but are independent of shocks to current value. I identify two sets of instruments which I apply using three separate econometric techniques. The first set of instruments rely on the dynamic nature of my data and consists of using lags of firm value (and lags of other firm characteristics) in the dynamic panel data estimation framework developed by Arellano and Bond (1991) and Blundell and Bond (1998). The intuition is that past firm value (and other historical firm characteristics) is a strong determinant of whether or not a firm has a staggered board. The underlying endogeneity assumption is that any information in the past should be embedded in expected firm value meaning that lags of firm value are independent of current shocks to firm value.

The second set of instruments includes macroeconomic and industry-specific variables that predict the likelihood of a firm adopting or retaining a staggered board. In particular I posit that when the macroeconomic environment is weak, discounted firms in industries where there is extensive merger activity and and a high percentage of firms that already have staggered boards are more likely to adopt or keep their staggered boards. Thus my

[1]For example, Roodman (2008) and Wintoki, Linck, and Netter (2011) show that, all else equal, a negative relation between staggered boards and past firm value could induce a positive bias in the a simple fixed effects estimate of staggered boards on firm value.

instruments for the presence of staggered boards are lags of: (i) GDP growth (ii) number and value of mergers in the industry (iii) the percentage of industry sales of firms with classified boards in the industry. I apply these instruments using two econometric methods – a 2SLS instrumental variables regression and self-selection or treatment regression using Heckman's (1979) two-stage procedure.

In all the specifications in which I account for the endogeneity of staggered boards, the staggered board discount drops. The results suggest that the negative correlation between having a staggered board and firm value is due, at least in part to the endogeneity of a firm's choice to have a staggered board. For example, in the self-selection model, the coefficient on the self-selection correction factor (λ) is negative suggesting that there is a negative relation between choosing to have a staggered board and firm value. This supports my position that underlying characteristics that cause firms to have staggered boards in the first place are also negatively related to firm value and that these underlying characteristics rather than the staggered board itself are responsible for the value discount associated with firms that have staggered boards.

I hasten to add that my analysis does not rule out the possibility that anti-takeover provisions may be associated with value destruction in other ways. Indeed, while not the main focus of my analysis, I find that in most of my specifications a higher number of other anti-takeover provisions that make up the "entrenchment index" of Bebchuk, Cohen, and Ferrell (2009) is associated with lower firm value. So while staggered boards may not be pernicious by themselves (and may even be beneficial), the possibility that firms with staggered boards can more easily adopt other anti-takeover provisions may be one way in which they cause value destruction. However, my results provide strong evidence that any negative relation between anti-takeover provisions and firm value is not driven primarily by staggered boards.

The rest of the paper is organized as follows. Section 3.2 summarizes the literature studying the relationship between staggered boards and firm value and section 3.3 describes

my data and variables. In section 3.4 I reproduce OLS results from previous studies and discuss the shortcomings of OLS and tradition fixed effects regressions in addressing the endogeneity of staggered boards. In section 3.5, I discuss potential exogenous instruments for staggered boards and apply them in 2SLS and self-selection regressions. In section 3.6, I examine the relation between staggered boards and value using a dynamic and dynamic panel data estimation. I conclude in section 3.7.

3.2 Literature Review

Two broad hypotheses underly the empirical literature on the effect of staggered board and other anti-takeover provisions (ATPs) on firm value. The hypothesis that managers adopt ATPs to protect themselves from the market for corporate control at the expense of shareholders is called the *managerial entrenchment* hypothesis. According to this view, these provisions exacerbate agency costs between managers and shareholders (Jensen(1976)) diminishing shareholders' ability to replace managers who are not making value-maximizing decisions (DeAngelo and Rice (1983)). In contrast, the *credible commitment* hypothesis says that, on average, anti-takeover defenses increase shareholder wealth as they allow managers to extract higher premiums from acquirers and prevent hostile bidders who make inadequate offers from successfully taking over the firm (DeAngelo and Rice (1983); Stulz (1988)). Stein (1988, 1989) argue that ATPs may also enhance firm value by making managers less myopic allowing them to focus on maximizing long-term value.

The seminal empirical work on ATPs is Gompers, Ishii, and Metrick (2003) who construct an index of twenty-four management-favoring provisions, including staggered boards, and find a negative correlation between this index and firm value after controlling for a number of firm-specific characteristics. They also find, after sorting firms based on their index, that a portfolio which bought firms in the lowest decile of the index (weakest provisions) and sold firms in the highest decile of the index (strongest provisions) would have earned abnormal returns of 8.5% per year between 1990 and 1999. Bebchuk, Cohen, and Ferrell (2009) restrict

this index to six management-entrenching provisions they argue matter most, still including staggered boards, and again find a negative correlation with firm value. Cremers and Ferrell (2009) expand the Investor's Resposibility Research Center dataset used in these papers back to 1978 and find Bebchuk, Cohen, and Ferrell's results hold with the longer time period. Other studies that look at an array of anti-takeover devices and firm value include DeAngelo and Rice (1983), Jarrell and Poulsen (1987), Daines (2001), and Cremers (2005). Each of these support the entrenchment view.

Focusing on boards, Bebchuk, Coates, and Subramanian (2002) find that the presence of "effective" staggered boards[2] doubles a firm's odds of remaining independent, and halves the odds of it being taken over by the first bidder. They also find that the benefits of increased premiums do not offset the loss to shareholders from not being taken over. Bebchuk and Cohen (2005) find that having a staggered board is negatively correlated with Tobin's Q. Faleye (2007) examines the relationship of staggered boards to CEO turnover and the sensitivity of executive compensation to performance and finds further evidence of entrenchment. Other work that specifically study the effect of staggered boards and firm value include Guo, Kruse, and Nohel (2008), who examine abnormal returns around the decision to destagger boards between 1987 and 2004, and Rose (2009), who analyze the heterogenous impact of staggered boards given their probability of becoming acquired. Both find evidence of entrenchment though Rose identifies a subset of firms for which staggered boards are not harmful. Most recently, Bebchuk, Cohen, and Wang (2010), using event studies, find an increase in firm value following a court ruling that made it more difficult for a staggered board to protect a firm's directors from replacement supporting the notion that staggered boards are used as entrenchment devices.

However, a number of studies have found results that push back on the managerial entrenchment hypothesis interpretation of the negative correlation between staggered boards and firm value. Lehn, Patro, and Zhao (2007) replicate Bebchuk, Cohen, and Ferrell's (2009)

[2]They define "effective" as meaning staggered boards with at least 3 classes that are not subject to 3 specific types of dismantling.

and Gompers, Ishii, and Metrick (2003) studies and find that these results disappear when they include a firm's market to book value between 1980-1985 in their regression – a plausible indication that low firm value cause anti-takeover devices and not the other way around. Johnson, Morman, and Sorescu (2009) find that once you account for industry clustering there is no significant difference between the long-run returns of firms with a high number of ATPs and those with a small number. Also contradicting the entrenchment hypothesis, Bates, Becher, and Lemmon (2008) find evidence that firms with and without staggered boards, once targeted, are equally likely to ultimately be taken over and that their managers equally likely to be retained. They also find that the presence of a staggered board has no effect on abnormal returns over bid announcement periods.

3.3 Data

3.3.1 Sample Selection

My sample includes all firms covered in any of the publications of the Investor Responsibility Research Center databases. Each publication, occurring for the years 1990, 1993, 1995, 1998, 2000, 2002, 2004, and 2006, contains detailed data describing anti-takeover defenses and other corporate governance related variables. The volumes between and including 1990 and 1995 each contain data for approximately 1,500 firms, the following volumes contain data for about 1,900-2,000 firms. According to Bebchuk, Cohen, and Ferrell (2008), the market capitalization for the firms in each volume compose 90% of U.S. total market cap. I follow Gompers, Ishii, and Metrick (2003) and assume that in the years between volumes, firms retain the same data as in the earlier volume. I use firm CUSIP numbers and corresponding years to extract financial data from Compustat. In order to retain as many observations as possible I code missing Compustat values as zero for the following variables: 1-year debt, long term debt, deferred taxes, and R&D expenditures.[3] I also create a dummy for whether or not a firm is missing data on R&D expenditures which is true for about half of my sample.

[3]txdb (14.0% missing, xrd 50.9% missing, dltt 2.9% missing, dd1yr 10.7% missing)

I obtain inside ownership data from Execucomp. Following Gompers, Ishii, and Metrick (2003) I calculate firm age by subtracting the fiscal year from the year stock price data first appeared for the firm in CRSP. I then match financial, inside ownership, and age data to my governance data according to firm CUSIP and fiscal year. This yields a sample of 20,770 observations, composed of 2,741 different firms over the time period 1990-2006.

3.3.2 Measure of Firm Value

Following Gompers, Ishii, and Metrick (2003) and Bebchuk and Cohen (2005), I measure firm value as Tobin's Q which I calculate as the market value of assets divided by the book value of assets. I calculate the market value of assets as the book value of assets plus the market value of common stock minus the book value of common stock and balance sheet deferred taxes. I then industry-adjust firm's Tobin's Q to account for shocks that affect all firms in an industry similarly. I calculate a firm's industry median Q value, defining an industry as those firms with identical two-digit Standard Industrial Classification (SIC) codes. My industry-adjusted Tobin's Q is simply the difference between a firm-year's Tobin Q and median industry Tobin's Q.

3.3.3 Summary Statistics

Table 3.7 presents mean and median values of my variables. TOBINSQ is a firm's industry-adjusted Tobin's Q, my dependent variable. CB, a dummy variable taking a value of 1 when a firm has a staggered board, is my explanatory variable of interest.

I follow Bebchuk, Cohen, and Ferrell (2009) in choosing my control variables, which are identical to those in Bebchuk and Cohen (2005) except that Bebchuk and Cohen (2005) do not control for firm leverage. Thus my control variables are as follows:

- Other is the number of anti-takeover provisions among Bebchuk, Cohen, and Ferrell's Entrenchment index a firm has, excluding classified boards. This value can range

from 0 to 5 and includes the following provisions: limits to shareholder bylaw amendments, supermajority requirements for mergers, supermajority requirements for charter amendments, poison pills and golden parachutes.

- Log(Assets) is the log value of total assets.
- Age is the number of years since the firm was first listed on CRSP.
- Delaware indicates whether the firm was incorporated in Delaware.
- Inside Ownership is the percentage of shares owned by officers and directors.
- ROA is return on assets.
- CAPEX/Assets is the ratio of capital expenditures to total assets.
- R&D/Sales is the ratio of R&D to sales.
- Leverage is the ratio of long-term debt plus debt due in one year to total assets.

3.4 OLS Regressions, Clustered Standard Errors, and Fixed Effects

I start my analysis by carrying out an OLS regression of staggered boards (and other anti-takeover provisions) on firm value – essentially a replication of similar analysis from Bebchuk and Cohen (2005), Faleye (2007), and Bebchuk, Cohen, and Ferrell (2009). In other words, I carry out an OLS regression of the model given by:

$$Q_{it} = \alpha + \beta \mathrm{CB}_{it} + \gamma X_{it} + d_{it} + \eta_i + \epsilon_{it} \tag{3.1}$$

where Q is a firm's industry-adjusted Tobin's Q, CB_{it} is a dummy variable taking a value of 1 when a firm has a staggered board, X_{it} includes the control variables discussed in section 3.3, d_{it} is a year dummy, ϵ_{it} is a residual, and η_i is a fixed unobservable firm effect.

The results of this OLS regression are shown in column (1) of Table 3.7. As in prior literature, I obtain the result that industry-adjusted Tobin's Q is negatively related to whether

or not a firm has a staggered board, and that this result is significant at the 1% level. The magnitude of the coefficient (-0.0597) is similar in magnitude to that found in previous studies (see, for example, Table 6 of Bebchuk, Cohen, and Ferrell (2009)), and the t-statistic based on robust White (1980) standard errors is -3.14.

Petersen (2009) shows that if the residuals from an OLS estimation of (3.1) are correlated across years for a given firm, then standard errors could be biased downwards (and the t-statistics consequently biased upwards). This could lead me to conclude that an estimated coefficient is statistically significant at conventional levels even when this might not be case. For example, if in (3.1), the residual itself contains a fixed firm effect, i.e., if $\epsilon_{it} = \mu_i + \nu_{it}$, then residuals will be autocorrelated.[4] Given the strong persistence and firm-level idiosyncracy in my dependent variable, Q, this is likely to be case. Indeed, additional (untabulated) post-OLS estimation analysis shows strong evidence for first and second-order serial correlation when I use tests of autocorrelation suggested by Arellano and Bond (1991). Given all these, I re-estimate equation (3.1) using OLS and report robust t-statistics that are *clustered* by firm.

The results from an OLS regression with clustered standard errors are shown in column (2) of Table 3.7. The results clearly show that clustering increases the standard errors across all my estimated coefficients. In particular, clustering increases the standard error on the estimated coefficient of the effect of staggered boards on value by about 230% and reduces the t-statistics from a statistically significant -3.14 to an insignificant -1.35, thus making the effect of staggered boards on value indistinguishable from zero at conventional levels. Thus even, OLS regressions suggest a much weaker relationship between staggered boards and firm value once I have controlled for the correlation of standard errors across time by firm. I note however, that the "Other" anti-takeover provisions are still significantly negatively related to firm value even after clustering standard errors.

[4]This would be the case even if $E(\text{CB}_{it}|\nu_i) = 0$.

While clustering OLS standard errors enables me to account for the autocorrelation of residuals for a given firm, it does not account for the fundamental source of endogeneity in the value-staggered boards relationship – there may be unobserved firm effects that jointly determine both value and the choice to adopt a staggered board. In other words, OLS regression assumes that $E(\text{CB}_{it}|\eta_i) = 0$. My first pass at accounting for the potential endogeneity of staggered boards relative to firm value is to include firm fixed effects and estimate the effect of staggered boards on firm value using "fixed effects" or "within" estimation. If I do not control for missing or unobservable explanatory variables that explain the decision to implement a staggered board and are correlated with firm value, my OLS results will be biased. For example, firms with poor managers will probably have a lower value and may be more likely to have staggered boards. However, because managerial ability is not measurable, I can not include it in X_{it} when estimating (3.1).

If I assume that the unobservable firm effects (η_i) are constant over my sample period (if for example, the firms tend to retain managers, or there is a persistent corporate culture of (in)competent management within the firm), I could eliminate the bias resulting from this omission with fixed effects or "within" estimation. This involves estimating (3.1) while specifically including a dummy variable for every firm, or equivalently estimating (3.1) after time-demeaning all the variables to obtain:

$$\ddot{Q}_{it} = \alpha + \beta \ddot{\text{CB}}_{it} + \gamma \ddot{X}_{it} + d_{it} + \ddot{\epsilon}_{it} \tag{3.2}$$

where $\ddot{Q}_{it} = Q_{it} - \overline{Q}_{it}$, $\ddot{\text{CB}}_{it} = \text{CB}_{it} - \overline{\text{CB}}_{it}$, $\ddot{X}_{it} = X_{it} - \overline{X}_{it}$ and $\ddot{\epsilon}_{it} = \epsilon_{it} - \overline{\epsilon}_{it}$.

Column 3 of Table 3.7 presents the results of my fixed effects regression with t-statistics based on robust standard errors that are *clustered* by firm. I see the sign of estimated coefficient on CB changes dramatically. With OLS, I had a coefficient of -0.0597, a discount below the industry median. Including firm fixed effects, the sign flips. Having a staggered board now suggests a statistically significant premium of 0.1755 ($t = 2.03$) above the industry median. As for the controls, other than Delaware incorporation and leverage, all signs and all but one significance level on my control variables match the OLS estimates.

The sign flip in the estimated coefficient of the effect of staggered boards on firm value suggests another way in which staggered boards are endogenous with respect to value. Fixed effects estimates of (3.2) are consistent only if $E(\text{CB}_{it}|\epsilon_{is}) = 0$ for all s, t, i.e., only if a firm's decision to adopt a staggered board is completely independent of past realizations of firm value.[5] Roodman (2008) and Wintoki, Linck, and Netter (2011) show if the explanatory variable (in this case, staggered boards) is related to past realizations of the dependent variable (firm value), the estimated effect of the explanatory variable on the dependent variable could flip signs between OLS and fixed effects estimates. In particular, if having a staggered board is negatively related to past realizations of firm value, then a fixed effects estimate of staggered boards on firm value may be positively biased. The staggered board premium I report in the fixed effects estimates in Table 3.7 may be due to the dynamic endogeneity of staggered boards with respect to firm value.

To further illustrate the intuition behind how endogeneity could actually lead to me to positively overestimate the effect of staggered boards on firm value in fixed effect regressions, consider two firms, A and B. Both firms have the same average performance or value over the sample period, T. As I have noted, traditional fixed-effects regression involves time-demeaning all my variables. Now suppose that at time $t-1$, firm A has suffered a purely exogenous negative value shock so that it is now valued less then firm B, and then proceeds to adopt a staggered board. Meanwhile, firm B, suffering no such value shock, does not adopt a staggered board. However, since both firms ultimately have the same long-run performance, then between time $t-1$ and time t, the value or performance of firm A will rise much faster that of firm B. This would appear to be due to the fact that firm A has a staggered board, while it is in fact due to a mechanical mean reversion of the firms performance. Thus, including firm fixed effects in a regression of value on staggered boards without accounting for past firm value would suggest a positive relationship between staggered boards and firm performance, which is what I observe in Table 3.7.

[5]This is because $\bar{\epsilon}_{it} = (\epsilon_{i,1} + \epsilon_{i,2} + \ldots + \epsilon_{i,s})/T$, and consistent estimation of (3.2) requires $E(\ddot{\text{CB}}_{it}|\ddot{\epsilon}_{it}) = 0$.

An obvious question that arises is this: to what extent does past firm performance affect the decision to adopt, retain or de-stagger a staggered board? I attempt to answer this question by measuring the relation between past values of firm performance and having a staggered board. The results of the analysis are shown in Table 3.7. Since having a staggered board is a binary variable I estimate a linear probability model (LPM) using OLS and a probit. The results show a strong negative association between currently having a staggered board and past firm value, even up to two lags of firm value. This negative association is probably due in part to the persistence of Tobin's Q but also suggests that firms that are discounted today are more likely to have staggered boards in the future.

In summary, the analysis in this section suggests two things. First, an OLS estimate of the effect of staggered boards on firm value may be biased by ignoring unobserved effects that may jointly affect both the decision to adopt staggered boards and firm value. Indeed this bias may be exaggerated if I ignore the autocorrelation of standard errors across years within a firm; failure to cluster standard errors in the presence of autocorrelation inflates t-statistics and exaggerates the significance of coefficient estimates.

Second, a fixed-effects regression, which could ostensibly eliminate unobservable heterogeneity, could itself lead to biased estimates. This is because fixed effects regressions ignore the endogeneity that arises from the possibility that the decision to adopt a staggered board may be due at least in part to the firm's past performance or value. Given the potential unreliability of OLS and fixed-effects regressions in estimating the effect of staggered boards on firm value, I explore IV regressions and dynamic models in the subsequent sections.

3.5 Instrumental Variables

Given the inadequacy of OLS or traditional fixed effects regressions, my first approach towards addressing the potential endogeneity of staggered boards involves identifying *exogenous* instruments for the decision to adopt staggered boards. In other words, I need to find variables that cause a firm to be more or less likely to have a staggered board that also affects

a firm's industry-adjusted value only through the staggered board channel. This is far from straightforward; indeed other studies have noted the difficulty of finding such instruments (see Bebchuk and Cohen (2005), Rose (2009), for example).

With this in mind, I propose the following as instruments for staggered boards:

1. Lagged percentage of total sales in an industry by firms with staggered boards. The greater the number of sales that come from firms with staggered boards the more protected from takeover is the industry. Firms without the cover of a staggered board in a highly protected industry are more likely to become targets. I predict firms in such industries are more likely to implement or retain a staggered board.

2. Lagged number of mergers and total value of mergers within an industry. Mitchell and Mulherin (1996) show that takeover and restructuring activity tend to come as a result of industry shocks. I predict that a firm in an industry in the midst of a takeover wave is more likely to take precautionary action and implement a staggered board.

3. Lagged real GDP: when the economy is in a recession, shares of a firm tend to sell at a discount. Therefore, I predict that when GDP is down firms are more inexpensive and thus more likely to be a takeover target. I predict that in down economic times, firms are likely to respond with a staggered board.

The broad intuition behind the choice of these variables as instruments is that firms faced with exogenous shocks that may temporarily discount their value and make them vulnerable to an opportunistic takeover are more likely to adopt a staggered board. In general, each of these variables is industry-wide and will have an effect on the propensity to adopt (or drop) a staggered board that is similar across all firms in the same industry. As such these variables should be exogenous with respect to *industry*-adjusted Tobin's Q, which is the dependent variable in my regressions. In addition, the fact that these variables vary across industry *and* through time ensures that I have enough cross-sectional variation and power in my instruments to ensure consistent identification.

As a prelude to my instrumental variable regressions, I examine, in Table 3.7, the ability of these instruments to predict the presence of a staggered board. The results could essentially be considered the first-stage of a two-stage instrumental variables regression. I find that the presence of a staggered board provision within a firm is positively related to the number of mergers in the previous year. This supports the perspective that in the midst of a merger wave where takeover is more of a threat, firms defend themselves with staggered boards. I also see that staggered boards are positively related to the share of sales by firms with staggered boards in an industry. This is as expected; if a firm is in an industry that already has a staggered board, the firm is more likely to adopt a staggered board, and vice-versa (regardless of how all the other firms came to adopt staggered boards in the first place). In addition, industries whose firms tend to be defended makes an undefended firm within that industry more vulnerable to takeover. In response, these firms are more likely to choose to implement a staggered board in response. Finally, higher GDP in the previous period is negatively related to having a staggered board. These results support my argument that discounted firm value may actually cause the presence of a staggered board. When the broader economy is weaker and shareholders' level of risk aversion is greater, firms are likely to be undervalued by the market. Management recognizing that their stock price is low and that they can be bought at a discount choose to stagger or retain their staggered boards in response. All together, these results not only support my choice of instruments, but also support my view that staggered boards are choice variables and are more likely in situations where the threat of an opportunistic takeover is greater.

Having established the potential validity of my instrument set, I apply the instruments in two different ways. My first instrumental variable regression strategy is a straightforward two-stage least squares (2SLS) regression where my instruments are used to predict staggered boards boards in the first stage and I run a regression similar to that specified in equation (1) where the realized values of CB are replaced with the predicted values from the first stage.

My second strategy is to use a two-stage Heckman treatment model. Within this context I view firms as "self-selecting" into a staggered board "treatment" and that this selection accounts for the staggered board discount. The treatment model explicitly accounts for the fact that having a staggered board is a *binary* choice variable. In the first stage, I run a probit model in which CB is the dependent variable, of the form:

$$CB^*_{it} = \alpha + \beta X_{it} + \gamma Z_{it} + \epsilon_{it} \tag{3.3}$$

$$CB_{it} = \begin{cases} 1 & \text{if } CB^*_{it} \geq 0 \\ 0 & \text{if } CB^*_{it} < 0 \end{cases}$$

where X_{it} contains all the control variables specified in (3.1) and Z_{it} contains my exogenous instruments. The coefficient estimates from the first stage are then used to determine the "treatment effect", λ.[6] The second stage of the Heckman treatment procedure involves estimating a model of the form:

$$Q_{it} = \alpha + \beta \mathrm{CB}_{it} + \gamma X_{it} + d_{it} + \kappa \lambda_{it} + \epsilon_{it} \tag{3.4}$$

Li and Prabhala (2007) describes self selection as being intuitively similar to an omitted variable bias problem where the omitted variable is λ, the "treatment effect." A significant coefficient on λ is evidence of self-selection and omission of this variable leads to inconsistent estimation of β.

I present the results for my 2SLS and treatment regressions in Table 3.7. In the first column (IV), I report the results of the 2SLS regression. The results show that the estimated effect of staggered boards on firm value, -0.0556 ($t = -0.45$), is smaller in magnitude than that obtained from the OLS regressions and remains statistically insignificant at conventional levels. However, here again I observe that the "Other" anti-takeover provisions remain negatively associated with firm value.

As part of my 2SLS analysis, I include two post-estimation tests of the validity of my instrument set. The first is an over-identification test that gives an indication of the exogeneity of my instruments. I am able to carry out this test because the number of exogenous

[6] see Wooldridge (2002) for the theory and Campa and Kedia (2002) for a similar application.

instruments (four) exceeds the number of endogenous variables (one). The Hansen test for over-identification yields a χ^2-distributed J-statistic with the null hypothesis that my instruments are exogenous. The results in Table 3.7 show that the test yields a J-statistic with a p-value of 0.172 which means that I cannot reject the null hypothesis that my instruments are exogenous.

In addition, I test for the strength of my instruments. A number of authors (see Bound, Jaeger, and Baker (1995) for example) demonstrate how instrumental variable estimates can be biased when the instrumental variables are weakly correlated with the endogenous variables. To determine if this is the case, I first note that the (Cragg-Donald) F-statistic which is based on first-stage regression of CB on my instruments is 111.64. These is well above 10, the "rule of thumb" critical value recommended by Staiger and Stock (1997) when testing for instrument strength. It is also much higher than all critical values in Table 5.1 of Stock and Yogo (2005). This implies that any bias from using the instruments is less than 5% of the bias from an OLS regression, with a 5% level of significance. I take the results of my tests as support that I have found good instruments.

Next I report results from the treatment regression from Table 3.7. Here I see that the sign on the estimated effect of staggered boards on firm value flips from being negative in the 2SLS regression to a positive 0.1550 ($t = 1.23$) in the treatment regression. It however remains statistically indistinguishable from zero at conventional levels. More striking is the fact that the estimated coefficient of λ is negative, as expected, and significant. This indicates the presence of self-selection into having a staggered board, and suggests that characteristics that make firms choose to adopt, retain or drop a staggered board are correlated with firm value. The negative value suggests that firms with a higher probability of adopting a staggered board also tend to be discounted.

3.6 Dynamic Models

While the IV regressions in the previous section offer an improvement over OLS or traditional fixed effect regressions, they still ignore a key aspect of the endogeneity of the relation between staggered boards and value. The IV regressions assume that only the decision to adopt staggered boards is endogenous and that all other variables are exogenous. By instrumenting for just the decision to adopt a staggered board, I assume the strict exogeneity of not just the other anti-takeover provisions but those of the other control variables – Log(Assets), Age, Inside Ownership, ROA, Leverage etc. This assumption is unlikely to hold; any unobserved factors that jointly affect value and the decision to adopt staggered boards is also like to affect a firm's size, leverage or ownership structure, and will most certainly affect the decision to adopt other anti-takeover provisions.

In this section, I estimate the relationship between staggered boards and firm value using a dynamic model and a dynamic panel GMM estimation procedure. This procedure, developed in a series of papers by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) has been used in other aspects of empirical governance research, recent examples of which include Hoechle, Schmid, Walter, and Yermack (2011) and Wintoki, Linck and Netter (2011). Dynamic panel estimation improves on OLS, traditional fixed effects and even 2SLS regressions in at least one of three important ways. First, unlike OLS estimation, it allows me to include firm-fixed effects to account for (fixed) unobservable heterogeneity. Second, unlike traditional fixed-effects estimates, it allows the choice to adopt, retain or drop a staggered board to be influenced by previous realizations of, or shocks to, past value. Third, unlike OLS, fixed effects or 2SLS regressions it allows me to assume that *all* my explanatory variables, including staggered boards and control variables, are endogenous.

The basic dynamic panel consists of three key steps. First, I add lags of the dependent variable (Q) to account for the possibility that past firm value affects both current value and

the presence of a staggered board.

$$Q_{it} = \alpha + \kappa_1 Q_{i,t-1} + \kappa_2 Q_{i,t-2} + \beta CB_{it} + \gamma X_{it} + \epsilon_{it} \tag{3.5}$$

Next I take first-differences of (3.5) in order to eliminate the firm-specific fixed effect.

$$\Delta Q_{it} = \alpha + \kappa_1 \Delta Q_{i,t-1} + \kappa_2 \Delta Q_{i,t-2} + \beta \Delta CB_{it} + \gamma \Delta X_{it} + \nu_{it} \tag{3.6}$$

Finally, I estimate (3.6) via general method of moments (GMM) using lagged values of the explanatory variables as instruments for the current explanatory variables. The last step enables me to account for any biases due to simultaneity or dynamic endogeneity, while the first step removes the omitted variable bias that may arise due to unobserved heterogeneity.

Despite the economic appeal of the basic procedure outlined above, it does have at least three econometric shortcomings. First, Beck, Levine, and Loayza (2000) note that if the original model is conceptually in levels, differencing may attenuate the signal to noise ratio and reduce the power of my tests. Second, Arellano and Bover (1995) suggest that variables in levels may be weak instruments for first-differenced equations. Third, first-differencing may exacerbate the impact of measurement errors on the dependent variables Griliches and Hausman (1986). Arellano and Bover (1995) and Blundell and Bond (1998) argue that we can mitigate these shortcomings and improve the GMM estimator by also including the equation in levels in the estimation procedure. We can then use the first-differenced variables as instruments for the equations in levels in a "stacked" system of equations that includes the equations in both levels and differences. This produces a "system" GMM estimator that involves estimating the following system:

$$\begin{bmatrix} Q_{it} \\ \Delta Q_{it} \end{bmatrix} = \alpha + \kappa_1 \begin{bmatrix} Q_{i,t-1} \\ \Delta Q_{i,t-1} \end{bmatrix} + \kappa_2 \begin{bmatrix} Q_{i,t-2} \\ \Delta Q_{i,t-2} \end{bmatrix} + \beta \begin{bmatrix} CB_{it} \\ \Delta CB_{it} \end{bmatrix} + \gamma \begin{bmatrix} X_{it} \\ \Delta X_{it} \end{bmatrix} + \epsilon \tag{3.7}$$

The results of my dynamic panel data analysis are shown in Table 3.7. To establish a baseline for my dynamic panel data analysis, I show, in the first column, results from a dynamic OLS estimation of the relationship between staggered boards on firm value. While

this does not directly address simultaneity and unobservable heterogeneity, it does address the possibility that the presence of a staggered board is related to past performance or value. I find that the magnitude of the estimated coefficient of staggered boards on firm value, which I obtain as -0.0095 ($t = -0.52$) is significantly lower than what I obtain from the "static" OLS regression (in Table 3.7) and is insignificantly different from zero. However, the other provisions in the entrenchment index continue to be negatively associated with firm value. It is worth noting that R^2 from the OLS regression of the dynamic model (which 51%) is ten times higher than that of the static model (which 5%). This by itself is another factor supporting the viewpoint that past firm value is an important factor in explaining current firm value.

The results of the dynamic panel data GMM estimation are shown in the second column of Table 3.7. Again I find that the effect of staggered boards on firm value, -0.0326 ($t = -0.72$) is statistically indistinguishable from zero. This result suggests that if I account for unobservable heterogeneity and the possible relation between currently having a staggered board and past firm value, there is no significant staggered board discount. The dynamic panel GMM estimate also reveals a much weaker relationship between the "Other" anti-takeover provisions than in other specifications.

Table 3.7 also shows the results of two post-estimation tests of the validity of the dynamic GMM specification as well as the validity of the instrument set. The first test is a test of serial correlation. Table 3.7 shows the results of an $AR(2)$ test of the null hypothesis of no second order serial correlation. If the assumptions of my GMM specification are valid, then by construction the residuals in first differences should be correlated, but there should be no serial correlation in second differences (AR(2)). Results of this test confirms that this is the case: the AR(2) test yields a p-value of 0.206. The second test is a Hansen test of over-identification. The dynamic panel GMM estimator uses multiple lags as instruments. This means that my system is over-identified and this provides me with an opportunity to carry out a test of over-identification. Table 3.7 shows the results of the Hansen test for my

GMM estimates. The Hansen test yields a J-statistic which is distributed χ^2 under the null hypothesis of the validity of my instruments. The results in Table 3.7 reveal a J-statistic with a p-value of 0.107 which I means I cannot reject the null hypothesis of the validity of my instruments.

3.7 Conclusion

This paper provides strong evidence that previous studies overstate the negative relationship between staggered boards and firm value as they inadequately account for the effect of firm value on the choice to select a staggered board. After reproducing the results in the literature I use a number of econometric techniques to account for the possibility that: (1) residual errors in regressions are likely to be correlated across years for every firm which may inflate the levels of significance of coefficient estimates; (2) there are likely to be unobserved factors that jointly affect both the choice to adopt a staggered board and firm value; (3) the choice to adopt a staggered board is likely to be due, at least in part, to past firm performance and other historical factors. In all of my specifications, I find no significant effect of staggered boards on firm value.

The results suggest that any effect of anti-takeover provisions on firm value is not driven by the presence or absence of staggered boards. More broadly, while the focus of my study has been on the valuation effects of staggered boards in particular, my results contribute to the growing literature that highlight the importance of carefully accounting for all aspects of endogeneity when measuring the valuation effects of any governance or anti-takeover provision.

Table 3.1: Summary Statistics

	Mean (Median) of Regression Variables							
	1993	1995	1998	2000	2002	2004	2006	1990-2006
Tobin's Q	0.366	0.387	0.735	0.762	0.326	0.172	0.158	0.465
	(0.027)	(-0.046)	(0.108)	(0.078)	(0.033)	(-0.020)	(-0.027)	(0.031)
Staggered Board	0.582	0.594	0.575	0.580	0.595	0.0592	0.558	0.584
	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Other Provisions	2.009	2.020	2.085	2.225	2.332	2.350	2.320	2.170
	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Assets (millions)	3856.6	4190.8	6022.6	8031.0	9423.1	12132	15744.8	7474.2
	(492.9)	(547.2)	(769.3)	(1042.5)	(1123.4)	(1440.8)	(1851.8)	(869.2)
Age	13.9	13.8	15.0	16.5	18.4	20.6	23.3	16.6
	(8)	(8)	(10)	(10)	(12)	(14)	(17)	(11)
Delaware	0.51	0.53	0.57	0.58	0.60	0.58	0.57	0.56
	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Inside ownership	.0293	0.0339	0.0334	0.030	0.049	0.059	0.143	0.045
	(0.0008)	(0.0008)	(0.0027)	(0.0028)	(0.0033)	(0.0038)	(0.0044)	(0.0023)
ROA	0.025	0.026	-0.017	0.003	-0.026	0.025	0.056	0.011
	(0.036)	(0.040)	(0.035)	(0.035)	(0.023)	(0.039)	(0.044)	(0.0362)
CAPEX/Assets	0.070	0.072	0.072	0.062	0.046	0.040	0.044	0.060
	(0.052)	(0.053)	(0.052)	(0.044)	(0.032)	(0.026)	(0.029)	(0.042)
Leverage	0.203	0.208	0.230	0.229	0.229	0.224	0.221	0.220
	(0.145)	(0.159)	(0.183)	(0.186)	(0.189)	(0.182)	(0.172)	(0.173)
R&D/Sales	0.209	0.350	0.271	0.322	0.246	0.348	0.234	0.357
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Number of Obs	1,005	1,093	1,537	1,473	1,754	1,974	1,911	21,111

Notes: This table reports the mean and median of the board and firm variables of my sample by year. Tobin's Q is a firm's industry-adjusted Q, calculated as market value of assets divided by its book value of assets where market value is the book value of assets plus the market value of common stock minus the book value of common stock and balance sheet deferred taxes. Staggered board is a dummy variable indicating whether a firm has a classified board. Other Provisions is the number of other anti-takeover provisions the firm has in the Bebchuk, Cohen, and Ferrell's (2009) Entrenchment index excluding classified boards. Assets is the total value of total assets. Age is the number of years since the firm was first listed on CRSP. Delaware indicates whether the firm was incorporated in Delaware. Inside ownership is the percentage of shares owned by officers and directors. ROA is return on assets. CAPEX/Assets is the ratio of capital expenditures to total assets. R&D/Sales is the ratio of R&D to sales. Leverage is the ratio of long-term debt plus debt due in one year to total assets.

Table 3.2: OLS and Fixed-Effects Estimation

	OLS	OLS (with clustered std. errors)	Fixed-Effects (with clustered std. errors)
CB	−0.0597***	−0.0597	0.1755**
	(−3.14)	(−1.35)	(2.03)
Other	−0.1094***	−0.1094***	−0.0633***
	(−10.70)	(−4.74)	(−2.97)
Log(Assets)	−0.0376***	−0.0376**	−0.4491***
	(−5.02)	(−2.41)	(−8.87)
Log(Age)	−0.1050***	−0.1050***	−0.0725
	(−7.73)	(−3.52)	(−1.63)
Delaware	0.1174***	0.1174**	−0.0191
	(5.31)	(2.17)	(−0.16)
Inside Ownership	−0.0021	−0.0021	0.0197
	(−0.40)	(−0.22)	(0.70)
Inside Ownership Sq.	−0.0000	−0.0000	−0.0001
	(−0.33)	(−0.18)	(−0.74)
ROA	0.6191***	0.6191*	0.4204**
	(2.73)	(1.72)	(2.43)
CAPEX/Assets	2.2324***	2.2324***	2.3241***
	(10.89)	(5.93)	(6.71)
Leverage	−0.2800*	−0.2800	0.1039
	(−1.77)	(−1.02)	(0.30)
R&D/Sales	0.0353***	0.0353**	0.0278**
	(2.72)	(2.51)	(2.08)
Number of firms	2,741	2,741	2,741
Number of firm-years	20,770	20,770	20,770
R^2	0.050	0.050	0.084

*Notes:*In this table, I report results from the OLS and fixed-effects estimations of the model

$$Q_{it} = \alpha + \beta \mathrm{CB}_{it} + \gamma X_{it} + d_{it} + \eta_i + \epsilon_{it}$$

Q is a firm's industry-adjusted Tobin's Q, CB is a dummy variable taking a value of 1 when a firm has a staggered board, d_{it} is a year dummy, ϵ_{it} is a residual, and η is a fixed unobservable firm effect. Industry-adjusted Tobin's Q is calculated as the market value of assets divided by its book value of assets where market value is the book value of assets plus the market value of common stock minus the book value of common stock and balance sheet deferred taxes. I industry adjust Tobin's Q by by subtracting the firm's industry's median Tobin's Q value defining an industry as those firms sharing a 2-digit SIC code. X_{it} includes the following variables: Other is the number of anti-takeover provisions from Bebchuk, Cohen, and Ferrell's (2009) Entrenchment index that a firm has, excluding classified boards; Log(Assets) is the log value of total assets; Log(AGE) is the number of years since the firm was first listed on CRSP; Delaware indicates whether the firm was incorporated in Delaware; Inside Ownership and Inside Ownership Sq. are the percentage of shares owned by officers and directors and this value squared, respectively; ROA is return on assets; CAPEX/Assets is the ratio of capital expenditures to total assets; R&D/Sales is the ratio of R&D to sales; Leverage is the ratio of long-term debt plus debt due in one year to total assets. t-statistics based on robust standard error are in parentheses; clustering where indicated is by firm. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 3.3: Reverse Causality Estimation

	LPM	Probit
$Q(t-1)$	−0.0115***	−0.0341***
	(−2.87)	(−2.71)
$Q(t-2)$	−0.0086***	−0.0211***
	(−2.90)	(−2.61)
Log(Assets)	0.0028	0.0053
	(0.42)	(0.31)
Log(Age)	−0.0244**	−0.0654**
	(−2.08)	(−2.15)
Delaware	−0.0225	−0.0576
	(−1.03)	(−1.02)
Inside Ownership	−0.0153***	−0.2933
	(−3.96)	(−0.98)
Inside Ownership Sq.	0.0001***	0.0018
	(2.81)	(0.89)
ROA	0.0476*	0.1691**
	(1.91)	(1.96)
CAPEX/Assets	0.0945	0.2490
	(0.58)	(0.60)
Leverage	−0.0242	−0.0664
	(−0.60)	(−0.62)
R&D/Sales	−0.0023*	−0.0128
	(−1.73)	(−1.32)
Observations	18,925	18,925

Notes: In this table, I report results from estimating the following linear probability model

$$CB_{it} = \alpha + \kappa_1 Q_{it-1} + \kappa_2 Q_{it-2} + \beta X_{it} + \epsilon_{it}$$

As well as the following probit model:

$$CB^*_{it} = \alpha + \kappa_1 Q_{it-1} + \kappa_2 Q_{it-2} + \beta X_{it} + \epsilon_{it}$$

$$CB_{it} = \begin{cases} 1 & \text{if } CB^*_{it} \geq 0 \\ 0 & \text{if } CB^*_{it} < 0 \end{cases}$$

Q is a firm's industry-adjusted Tobin's Q, CB is a dummy variable taking a value of 1 when a firm has a staggered board, ϵ_{it} is a residual. Industry-adjusted Tobin's Q is calculated as the market value of assets divided by its book value of assets where market value is the book value of assets plus the market value of common stock minus the book value of common stock and balance sheet deferred taxes. I industry adjust Tobin's Q by by subtracting the firm's industry's median Tobin's Q value defining an industry as those firms sharing a 2-digit SIC code. X_{it} includes the following variables: Other is the number of anti-takeover provisions from Bebchuk, Cohen, and Ferrell's (2009) Entrenchment index that a firm has, excluding classified boards; Log(Assets) is the log value of total assets; Log(AGE) is the number of years since the firm was first listed on CRSP; Delaware indicates whether the firm was incorporated in Delaware; Inside Ownership and Inside Ownership Sq. are the percentage of shares owned by officers and directors and this value squared, respectively; ROA is return on assets; CAPEX/Assets is the ratio of capital expenditures to total assets; R&D/Sales is the ratio of R&D to sales; Leverage is the ratio of long-term debt plus debt due in one year to total assets. t-statistics based on robust standard error are in parentheses. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 3.4: Instrumental Variable Regressions: First Stage

	(1)	(2)
IndSalesWCB	0.3626***	0.3633***
	(21.64)	(21.62)
GDPCA	−0.0000***	−0.0000***
	(−4.14)	(−4.20)
InMergerNum	0.0001***	0.0001***
	(5.64)	(4.51)
InMergerVal		0.0000
		(0.78)
Other	0.1441***	0.1440***
	(48.17)	(48.08)
Log(Assets)	0.0080***	0.0077***
	(3.83)	(3.61)
Log(Age)	−0.0348***	−0.0347***
	(−8.53)	(−8.49)
Delaware	−0.1799***	−0.1794***
	(−23.42)	(−23.29)
Inside Ownership	−0.0147***	−0.0147***
	(−9.42)	(−9.39)
Inside Ownership sq.	0.0001***	0.0001***
	(5.52)	(5.50)
ROA	0.0129	0.0128
	(0.72)	(0.71)
CAPEX/Assets	0.0723	0.0670
	(1.12)	(1.04)
Leverage	−0.0660***	−0.0660***
	(−4.18)	(−4.16)
R&D/Sales	−0.0026**	−0.0026**
	(−2.30)	(−2.32)
Number of firm-years	19,800	19,788
R^2	0.118	0.118

Notes: In this table, I report results from the regression:

$$CB_{it} = \alpha + \beta X_{it} + \gamma Z_{it} + \epsilon_{it}$$

CB is a dummy variable taking a value of 1 when a firm has a staggered board, ϵ_{it} is a residual. X_{it} includes the following variables: Other is the number of anti-takeover provisions from Bebchuk, Cohen, and Ferrell's (2009) Entrenchment index that a firm has, excluding classified boards; Log(Assets) is the log value of total assets; Log(AGE) is the number of years since the firm was first listed on CRSP; Delaware indicates whether the firm was incorporated in Delaware; Inside Ownership and Inside Ownership Sq. are the percentage of shares owned by officers and directors and this value squared, respectively; ROA is return on assets; CAPEX/Assets is the ratio of capital expenditures to total assets; R&D/Sales is the ratio of R&D to sales; Leverage is the ratio of long-term debt plus debt due in one year to total assets. The instrument set, Z_{it} includes the following: IndSalesWCB is the percentage of total sales of firms in industry with a staggered board divided by total sales by all firms in an industry where an industry consists of firms with a common 2-digit SIC code. GDPCA is annual real GDP. InMergerNum is the annual number of mergers in an industry. InMergerVal is the annual dollar value of mergers in an industry. t-statistics based on robust standard error are in parentheses. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 3.5: Instrumental Variable Regressions

	IV	Treatment
CB	−0.0556	0.1550
	(−0.45)	(1.23)
Other	−0.1129***	−0.1440***
	(−5.91)	(−6.94)
Log(Assets)	−0.0323***	−0.0330***
	(−4.26)	(−5.49)
Log(Age)	−0.0982***	−0.0911***
	(−6.93)	(−7.22)
Delaware	0.1299***	0.1694***
	(4.47)	(5.22)
Inside Ownership	0.0006	0.0034
	(0.09)	(0.18)
Inside Ownership Sq.	−0.0000	−0.0001
	(−0.74)	(−0.30)
ROA	0.5824***	0.5774***
	(2.59)	(11.29)
CAPEX/Assets	2.1875***	2.1796***
	(10.37)	(12.10)
Leverage	−0.2573	−0.2454***
	(−1.59)	(−5.39)
R&D/Sales	0.0344***	0.0349***
	(2.71)	(11.27)
Lambda (λ)		−0.1380*
		(−1.77)
Observations	19,783	19,783
R^2	0.049	
Cragg-Donald Wald F statistic	111.64	
Hansen test of over-identification (p-value)	0.172	

Notes: In this table, I report results from the 2SLS and Treatment Effect regression of the model:

$$Q_{it} = \alpha + \beta \text{CB}_{it} + \gamma X_{it} + d_{it} + \epsilon_{it}$$

Q is a firm's industry-adjusted Tobin's Q, CB is a dummy variable taking a value of 1 when a firm has a staggered board, d_{it} is a year dummy, ϵ_{it} is a residual, and η is a fixed unobservable firm effect. Industry-adjusted Tobin's Q is calculated as the market value of assets divided by its book value of assets where market value is the book value of assets plus the market value of common stock minus the book value of common stock and balance sheet deferred taxes. I industry adjust Tobin's Q by by subtracting the firm's industry's median Tobin's Q value defining an industry as those firms sharing a 2-digit SIC code. X_{it} includes the following variables: Other is the number of anti-takeover provisions from Bebchuk, Cohen, and Ferrell's (2009) Entrenchment index that a firm has, excluding classified boards; Log(Assets) is the log value of total assets; Log(AGE) is the number of years since the firm was first listed on CRSP; Delaware indicates whether the firm was incorporated in Delaware; Inside Ownership and Inside Ownership Sq. are the percentage of shares owned by officers and directors and this value squared, respectively; ROA is return on assets; CAPEX/Assets is the ratio of capital expenditures to total assets; R&D/Sales is the ratio of R&D to sales; Leverage is the ratio of long-term debt plus debt due in one year to total assets. Additional instruments used in the first stage of the regressions are as follows: IndSalesWCB is the percentage of total sales of firms in industry with a staggered board divided by total sales by all firms in an industry where an industry consists of firms with a common 2-digit SIC code. GDPCA is annual real GDP. InMergerNum is the annual number of mergers in an industry. InMergerVal is the annual dollar value of mergers in an industry. t-statistics based on robust standard error are in parentheses; clustering where indicated is by firm. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Table 3.6: Dynamic Panel Data Estimation

	Dynamic OLS	Dynamic GMM
CB	−0.0095	−0.0326
	(−0.52)	(−0.72)
Other	−0.0250**	−0.0250
	(−2.12)	(−1.27)
Log(Assets)	−0.0212***	−0.0665**
	(−3.10)	(−2.08)
Log(Age)	0.0035	0.0109
	(0.25)	(0.39)
Delaware	0.0235	−0.1064**
	(1.09)	(−2.51)
Inside Ownership	0.0002	0.0918
	(0.04)	(0.82)
Inside Ownership Sq.	−0.0000	−0.0011
	(−0.33)	(−0.85)
ROA	0.0468	0.3124
	(0.23)	(0.75)
CAPEX/Assets	0.4979**	1.4396
	(2.00)	(1.41)
Leverage	−0.0005	0.0159
	(−0.00)	(0.10)
R&D/Sales	0.0243***	0.0310
	(2.98)	(1.19)
$Q(t-1)$	0.5806***	0.8641***
	(6.99)	(7.00)
$Q(t-1)$	0.0588***	−0.1145
	(2.62)	(−1.46)
Number of firms	2,729	2,729
Number of firm-years	18,923	18,923
R^2	0.510	
$AR(2)$ test (p-value)		0.206
Hansen test of over-identification (p-value)		0.107

Notes: In this table, I report results from the OLS and dynamic panel data GMM estimates of the model

$$Q_{it} = \alpha + \kappa_1 Q_{i,t-1} + \kappa_2 Q_{i,t-2} + \beta CB_{it} + \gamma X_{it} + \epsilon_{it}$$

Q is a firm's industry-adjusted Tobin's Q, CB is a dummy variable taking a value of 1 when a firm has a staggered board, d_{it} is a year dummy, and ϵ_{it} is a residual. Industry-adjusted Tobin's Q is calculated as the market value of assets divided by its book value of assets where market value is the book value of assets plus the market value of common stock minus the book value of common stock and balance sheet deferred taxes. I industry adjust Tobin's Q by by subtracting the firm's industry's median Tobin's Q value defining an industry as those firms sharing a 2-digit SIC code. X_{it} includes the following variables: Other is the number of anti-takeover provisions from Bebchuk, Cohen, and Ferrell's (2009) Entrenchment index that a firm has, excluding classified boards; Log(Assets) is the log value of total assets; Log(AGE) is the number of years since the firm was first listed on CRSP; Delaware indicates whether the firm was incorporated in Delaware; Inside Ownership and Inside Ownership Sq. are the percentage of shares owned by officers and directors and this value squared, respectively; ROA is return on assets; CAPEX/Assets is the ratio of capital expenditures to total assets; R&D/Sales is the ratio of R&D to sales; Leverage is the ratio of long-term debt plus debt due in one year to total assets. t-statistics based on robust standard error are in parentheses; clustering where indicated is by firm. Significance levels are indicated by *, **, ***, for 10%, 5%, and 1%, respectively.

Chapter 4

Cap and Trade and the Capture Theory of Regulation: Evidence from an Event Study

4.1 Introduction

This paper contributes to our understanding of how environmental regulation of greenhouse-gas (GHG) emissions, specifically carbon dioxide, affects the United States economy. On a broader level, this paper looks to answer what influences policy change. The impact of GHG regulation is a controversial topic with important implications. Environmentalists point to environmental and social costs of not regulating, citing scientific evidence of climate change that suggests a trend of rising temperatures attributed to the amount of air pollution. Industrialists point to economic costs of regulating, noting the importance of coal and petroleum as a low-cost source of energy for the American economy (Lohr, 2006).

The focus of this paper is on the economic effects, specifically the economic winners and losers. While environmental regulation increases the costs of firms, its effect on profit and equity value is ambiguous, especially when government chooses cap and trade regulation over a simple pollution tax. The effect is unclear for several reasons. First of all, a portion of the increased costs will be passed on to the affected firms' customers in the form of higher prices. Secondly, not only does environmental regulation raise a firm's own costs, but also the costs of their rivals. Thirdly, the increased costs in an industry may restrict entry. On top of all this, cap-and-trade creates a new valuable commodity, the right to emit a given amount of pollution. Economists have proposed that government hands out a fraction of these valuable commodities for free ("grandfathering") in order to compensate firms for their new increased costs. Bovenberg and Goulder (2000) demonstrate that by grandfathering (as opposed to

auctioning) a small fraction of these permits for free government could easily compensate energy-intensive industries for any loss in profitability[1]. By passing out more permits than is necessary to compensate firms, environmental regulation could actually enhance profitability and equity value.

In this paper I turn to stock prices to determine how the market expects firm and industry profitability to be affected. By taking advantage of a surprise revelation of information by President Bush in March of 2001, this paper attempts to overcome what is generally regarded as the most significant problem when using stock prices to assess the effects of regulation, timing the moment when new information reaches the market. Event studies looking at abnormal returns around my event date support the capture theory of regulation, where regulation benefits industry at the expense of consumers, over the public-interest theory of regulation, where consumers are protected at the expense of industry. The event studies for the industries most reliant on energy sources as an input around the date of President Bush's announcement consistently reveal abnormal returns between -2 and -7 percent. This result does not hold for less energy intensive industries, most of them showing insignificant abnormal returns.

In a statement released on September 29, 2000, as part of his campaign for President against Vice President Al Gore, Governor George W. Bush made an explicit pledge to impose mandatory greenhouse gas emissions reductions on power plants, which account for one-third of the country's carbon-dioxide emissions. Throughout his campaign, Bush expressed support for his "four-pollutant plan" to reduce levels of nitrogen oxides, sulfur dioxide, mercury and carbon dioxide to combat global warming. On January 20, 2001, he took the oath of office. As early as March 3, 2001, Christine Todd Whitman, head of the Environmental Protection Agency under Bush, began making public statements touting the positive impact that his plan would have on the environment and on March 9, 2001, several news agencies reported that Washington was set to begin drafting this legislation.

[1] 15% in the oil and gas industry, 4.3% in the coal industry

The news archives suggest that anticipation of legislation regulating greenhouse gases at this time was significant. Fialka and Cummings (2001) in a *Wall Street Journal* article from March 12, 2001 entitled "Antipollution Proposal From Bush Stems From Unlikely Source: Gore" state "Mr. Bush hopes to revise the Clean Air Act by imposing limits on four major pollutants, including, most controversially, carbon dioxide." Two days earlier, Revkin (2001) in a *New York Times* article entitled "Despite Opposition in Party, Bush to Seek Emissions Cuts" suggests that legislation was not only expected but imminent. He states "several Republicans in important positions in Congress are preparing to propose power-plant legislation that would limit carbon dioxide."

In a letter to Congressmen Chuck Hagel, Jesse Helms, Larry Craig and Pat Roberts dated March 13, 2001, President Bush stated he no longer believed that the government should impose mandatory emissions reductions for carbon dioxide by power plants. In his letter, the President cited "the incomplete state of scientific knowledge" regarding climate change, as well as a recent Department of Energy study concluding such regulation would increase electricity prices. At 12:51 PM that day, the Associated Press released a news report stating "Bush Won't Regulate Carbon Dioxide (Lindlaw, 2001)." On the 14th, *The Wall Street Journal* headline reads, "Bush Does About-Face on Vow To Regulate Carbon Dioxide (Cummings, 2001)," while *The New York Times* says, "Bush, in Reversal, Won't Seek Cut In Emissions of Carbon Dioxide (Jehl, 2001)."

The efficient-markets/rational-expectations hypothesis states that asset prices incorporate all information relevant to a firm's expected future cash flows available at the time. Under this hypothesis, investors factor in the likelihood of GHG emissions regulation in formulating their expectations of firm value. The news archives suggest that before March 13, the market considered such legislation probable. On March 13, President Bush released new information to the public, that he was no longer pursuing regulation of carbon-dioxide emissions. Therefore, the change in stock prices after Bush's announcement should reflect the change in firm profitability with the expectation of regulation diminished. I will test that,

though Bush's plan specifically targets power plants, it would affect the entire energy market for several reasons. The first is that the demand for the different sources of energy are not independent. This will be discussed in further detail in Section 4.2. Also, in the period being studied, the countries of the world had begun ratification of the Kyoto Protocol, a global initiative to reduce greenhouse gases. Because of heavy national debate as to whether the U.S. should also adopt the Kyoto protocol, it is conceivable that the market would consider power-plant regulation the first step towards a broader policy. By disaggregating the United States' economy by industry, I identify how such regulation would affect each of these industries. Further disaggregation of the industries could yield further insight into the winners and losers of regulating carbon dioxide.

Section 4.2 outlines the different empirical predictions under the public-interest and special-interest economic theories of regulation. Section 4.3 examines past research that uses event studies to analyze the effect of regulation and discusses the issues of using this methodology. Section 4.4 describes the construction of the sample and explains the methodology and results. Section 4.5 concludes.

4.2 Economic Theories of Regulation

4.2.1 Consumer Protection Theory of Regulation

Most economic theories of regulation take one of two conflicting viewpoints, that of the "consumer-protection" theory, that regulation serves the public interest at the expense of regulated firms, or the "producer-protection" hypothesis, that regulation serves special interests at the expense of consumers. The former theory has its roots in welfare economics. Tracing back to Pareto (1912), this research perceives government as able to identify market failures and enact regulatory legislation to correct these at little cost so as to maximize social welfare. Examples of such market failures include monopoly power, the underprovision of public goods, externalities, unemployment, and inflation.

Proponents of the anthropogenic global warming hypothesis argue that carbon-dioxide emissions are negative externalities resulting when firms use high carbon-emitting energy inputs in their production or operating process. The carbon dioxide released by these energy sources contributes to the aggregate level of greenhouse gases in the atmosphere, potentially leading to global warming. They assert that as the earth's surface temperature rises, the earth's ocean levels rise as glaciers melt, and the intensity of extreme weather events increases. Because firms do not account for this negative effect on social welfare, the level of coal and petroleum chosen by firms is greater than the welfare-maximizing level. To correct this "market failure," the government regulates.

Washington could enact carbon regulation as a carbon tax, effectively raising the price of polluting, or a cap-and-trade program where they auction off permits, limiting the aggregate quantity of carbon-dioxide emitted and allowing the producers of pollution in the economy to decide who gets to emit how much by buying and selling permits in an open market. Both plans are theoretically equivalent in terms of government revenue and equilibrium price and quantity of pollution, the difference being that in the former, government sets the price of polluting and the market adjusts the quantity, and with the latter, the government sets the quantity of pollution and the markets adjusts the price. [2] The source of energy expected to be most affected by the specific regulation of utilities is coal, which has the highest carbon intensity of any major source of energy. The electric utility companies and independent power generators are the largest markets for coal. As of 2001, they accounted for 89% of coal consumption and made use of coal-fired technology in the generation of 55% of all electricity. Either form of regulation increases the cost of coal inputs. Utilities would be forced to substitute coal for other, more expensive, energy inputs. The effective rise in operating costs of utilities due to regulation, as well as the fall in demand of the coal industry's product, should negatively affect expected future profitability.

[2]The Energy Information Administration provided statistics and other information in this section (eia.doa.gov).

The second largest emitter of carbon dioxide is oil/petroleum. As of 2001, oil accounted for 40% of the U.S. energy supply, fueling industry and transportation. While Bush's promise was to regulate utilities specifically, it is possible that investors' would view the passage of such legislation as the first step towards a broader carbon-regulating policy. Under regulation that includes all industries, transportation and other industries in which oil and oil products are the lowest-cost energy source (and coal is not a realistic option), costs would effectively increase, negatively affecting firms' expected future cash flows. As for the effect on suppliers of oil and petroleum, the decrease in demand for their products would also lower their value. Regulation would hurt pipeline transportation and oil refineries as well, as the fall in demand for oil reduces the demand for their services. As demand for coal and petroleum falls and demand for other energy sources increases, the prices of these alternative energy sources rise and negatively affect any industry that relies on energy as an input.

4.2.2 Producer Protection Theory of Regulation

Empirical evidence from the 1950's and 1960's did not show any relationship between regulation and the reduction of market failure. This led to an alternative theory, called the special-interest, or capture, theory of regulation. According to public choice theory, rent-seeking special interests lobby government agents to implement laws to benefit them at the expense of the general public. Because the costs to the public are spread over the country's many voters, legislators are able to implement these policies unnoticed. Stigler (1971) was the first to extend public choice theory to government regulation. In his paper, incentive-driven politicians pass regulation in exchange for the benefits offered to them by profit-maximizing industries. His theory was later extended by Posner (1975), Peltzman (1976), and Becker (1983) to allow for influence by non-industry special interest groups. Generally, an increase in abnormal returns for an industry following regulation is regarded as support for the special-interest theory.

Maloney and McCormick (1982) propose a theory of how regulation of carbon dioxide emissions could enhance the wealth of industry. Maloney and McCormick show that when government restricts the use of an input to reduce a negative externality, it reduces quantity supplied from an industry. This allows firms within an industry to earn scarcity rents provided that they can restrict entry. Bovenberg and Goulder (2000) use a general equilibrium model to determine the effect of a carbon tax on a number of industries. They show that by freely allocating a small percentage of the permits (as opposed to auctioning them), government can allow firms to maintain their profitability and equity value. Were government to hand out all permits, producers would earn rents far beyond their loss in income due to higher costs. Smale et al (2006) assume Cournot competition and simulate the effects of a carbon tax in Europe. Butraw and Palmer (2008) simulate the effect of a carbon tax on the U.S. electricity. These three simulation studies all find that allocating permits for less than 20% the total quantity of carbon emissions would be adequate to compensate industries for the regulation's effect on their profitability.

The only empirical work that I know of to test predictions of these simulations is Bushnell, Chong, and Mansur (2010). The EU Emission Trading Scheme in place between 2005 and 2007 was one of the first mandatory trading programs. In their paper they examine the stock price response for 100 firms in carbon intensive industries and 600 firms in the broad EUROSTOXX index in Europe following the crash in carbon prices on April 25, 2006. They found that industries tending to be carbon intensive or electricity intensive benefitted from the increase in permit price, consistent with the producer protection hypothesis.

4.3 Usage of Stock Price Data to Measure the Effect of Regulation

Economists have commonly used stock price data to analyze the positive, often unintended, effects of government regulation. Schwert (1981) discusses a number of common problems frequently encountered with this methodology. As addressed earlier, the primary obstacle in using stock prices to determine the effects of new regulation is identifying when the market

anticipates the change. Unlike using financial data to analyze corporate transactions such as initial public offerings and stock splits, which have well-defined announcement dates, the move towards regulation tends to entail numerous legislative and administrative events before the market expects it to become enacted. The efficient-markets hypothesis predicts that, at each event preceding the implementation of regulation, the market will revise its expectation of regulation and factor in this probability in valuing the firm's stock price. Because there is no single moment when the change becomes anticipated, choosing the event window (or windows) to examine may prove difficult. By studying the surprise announcement by President Bush, which I argue to have quickly and drastically reversed the expectations of regulation, my paper hopes to overcome this obstacle.

Another issue discussed by Schwert (1981) is that, when calculating portfolio returns, to make sure potential winners are not grouped with potential losers within a single portfolio as doing so would reduce the power of the study to detect an effect. Consistent with the capture theory of regulation, larger firms in an industry tend to have more resources with which to influence politicians. They may use this influence to pursue regulation that benefits themselves at the expense of smaller firms in their industry. Therefore it is important to further subdivide the industry portfolio according to some measure of size when testing this hypothesis. My paper will look at size effects within an industry as well as discuss other ways to disaggregate an industry that may yield information. A final note of caution by Schwert is that the efficient-markets hypothesis only says that changes in stock price reflect shareholders' best unbiased *prediction* of the effect of regulation. They are still forming a prediction, and as with all predictions, may be wrong. Binder (1985) reiterates the points made by Schwert and offers another caveat in interpreting the results. Evaluating one industry with a single event window, it may be difficult to discern whether the change in stock price is a result of the change in expectations of regulation or if it is the result of some other industry shock not taken into account by the researcher.

An example of this type of research is Maloney and McCormick (1982) who develop a theoretical model in which environmental regulation intended to reduce a negative externality either benefits all firms in an industry (when entry was deterred) or certain firms in an industry with heterogenous firms. They then analyze stock price data of cotton mills following the passage of cotton dust regulation and smelters after the passage of air quality regulation and find positive abnormal returns for both industries, consistent with their special-interest theory. Smith, Bradley, and Jarrell (1986) evaluate abnormal returns, not by industry, but by firm characteristics, as regulation may affect firms based on certain qualities. They specifically examine abnormal returns after regulation imposed price controls on oil prices when OPEC quadrupled the price of oil in 1973. They find that capital gains were determined by whether oil production and refinery firms had access to price-controlled oil.

Prager (1989) uses historical stock price data to test the validity of the traditional view of the Interstate Commerce Act of 1887, that the ICA was part of a populist movement to protect farmers and merchants from the monopoly power of the railroad industry. The revisionist view of this act is that it facilitated collusion by allowing railroad companies to easily fix prices and arrange traffic-sharing. Their event study found an increase in stock prices following regulation, supporting the "capture," perspective. Bartel and Thomas (1987) argue that the Occupational Safety and Health Administration and the Environmental Protection Agency are predatory in that they use regulation to impose costs in an industry asymmetrically at the behest of certain firms to further their own political agendas. Analysis of stock price data of firms disaggregated by size and region supports their argument. Mitchell and Mulherin (1988) use an event study to examine the cigarette advertising ban of 1970 believed to hurt the cigarette industry by reducing demand for their product and instead found that the it benefitted the cigarette industry by deterring entry and eliminating advertising costs.

4.4 Methodology and Results

4.4.1 The Sample

The first step in constructing the sample is to create an industry index of energy intensity because industries that are more energy-intensive are more likely to be affected by carbon regulation. From the Business of Economic Analysis website, I obtain data that classify the 2001 energy, material, and purchased-service inputs (in dollar amounts) of 62 industries spanning most of the U.S. economy. I divide the total dollar amount of their energy inputs as well as service inputs from energy producing industries by their total inputs and obtain a measure of energy-intensity. I rank each industry according to this index and report these results in Table 4.5. We see from this table that petroleum and coal products manufacturing, utilities, and oil gas extraction are the most energy-intensive industries, followed by pipeline transportation and mining (excluding oil and gas). Among the least energy-intensive are information and data processing services and computer systems design. The next step is obtaining the firm CUSIP numbers for each industry. The Bureau of Economic Analysis divides industries according to the North American Industrial Classification System (NAICS). This makes collection of the firm CUSIPs straightforward. Searching the Center for Research in Security Prices (CRSP) database by NAICS numbers, I obtain all available CUSIPs in the year 2001. Because nine "industries" either do not contain firms (such as state and local government) or do not contain enough firms that are publicly traded, they are dropped, reducing the number of industries from 62 to 52. [3]

[3]The following industries were dropped: Transit and ground passenger transportation, Warehousing and storage, Other transportation and support activities, Federal government enterprises, State and local general government, Federal general government, Management of companies and enterprises, Miscellaneous professional, scientific and technical services, Federal Reserve banks, credit intermediation, and related services.

4.4.2 Event Study Analysis

With my industry portfolios, composed of the industries' firm CUSIP numbers and my event date, I proceed to the event study. While I appear to have a clean event date, there is still some ambiguity as to the precise timing when information reaches the market. As a result, in addition to March 13, I include March 12, due to the possibility of trading on insider information (Meuhlbrook, 1992) and March 14, to allow for the possibility of delayed trading, and calculate 3-day cumulative abnormal returns (CARs).

To obtain the expected return, I estimate the market model, to control for marketwide variation, as follows: $R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$ where R_{it} is the return for firm i on day t, R_{mt} is the market return on day t and ϵ_{it} is the zero mean disturbance term. I choose a typical estimation period of 90 days ending on day -10 relative to the event period and use the CRSP equally-weighted index to proxy for the market return, R_{mt}. OLS estimation of industry firms' return on the market return over the estimation period yields $\hat{\alpha_i}$ and $\hat{\beta}_i$. With these estimated coefficients and the market return for our event dates I calculate the expected return as follows: $E[R_{it}|R_{mt}] = \widehat{\alpha}_i + \widehat{\beta}_i R_{mt}$. To calculate abnormal returns, the expected return estimated from the market model is subtracted from each firm's raw return on the event dates: $\epsilon^*_{it} = R_{it} - E[R_{it}|R_{mt}]$.

I then calculate the mean CAR by summing the abnormal returns over my three-day event window and taking the average CAR of each industry. A t-test is used to determine the significance of the abnormal returns.

As described in Section 2, a decline in stock prices in response to regulation is generally regarded as support for the public-interest theory of regulation as regulation is expected to decrease the future profits of an industry, while an increase is regarded as support for the special-interest theory, regulation is expected to increase the industry profits. In our case of an announcement diminishing expectations for regulation, the reverse is true, a negative return provides support for the special-interest theory, and a positive return for the public-interest theory. Table 4.5 and Figure 4.5 present the event-study results that show that for

the highly energy-intensive firms, returns are consistently large, negative, and statistically significant. For industries with an energy intensity greater than .085, all but one have CARs between -2.5% and -6.2% that are significant at the 5.5% level.[4] Of the twenty-five industries with energy intensities between .016 and .085, only eight have significant CARs of which all are smaller than -4% in magnitude. Of the remaining industries, only five yield significant CARs, four of which are positive.

These results suggest that there was an event on this day that systematically affected industries negatively whose production was highly dependent on energy. If the hypothesis that President Bush's announcement that he is reversing course and no longer pursuing regulation of carbon dioxide caused equity holders to reformulate their expectations of firms' future cash flows, then I have support for the special-interest theory of regulation. My results suggest that carbon regulation is another case in which regulation, perceived to be protecting the public-interest at the expense of industry, actually has the opposite effect.

4.4.3 Size Effects

As discussed in Section 3, there are often winners and losers of regulation within the same industry. Under the capture theory of regulation, firms with more resources have more to offer politicians in exchange for passing regulation in their favor. Often the gains of these firms come at the expense of the smaller firms in the industry. For example, a rise in energy costs may force firms with higher average cost curves to exit the market, leaving a greater market share for the surviving firms. As advised by Schwert, to examine the possibility of regulation affecting firms within the same industry differently, the industry portfolio should be subdivided according to some observable characteristic before looking for systematic differences in returns.

[4] A 5.5% significance level is chosen over the typically used 5% level as two of the highly energy-intensive industries are significant at 5.5% but not 5%.

I examine size effects for the 11 highest energy-intensive industries with significant returns. For each industry I estimate the following regression:

$$CAR_i = \alpha_i + \beta_i size_i + \epsilon_i$$

To examine the hypothesis that larger firms gain from the regulation of carbon-dioxide at the expense of smaller firms, I use total shareholder's equity, rather than accounting data such as total assets as a proxy for firm size, because total equity is calculable from the CRSP database using price per share and total shares outstanding. Matching CUSIP firms to Compustat leads to a substantial loss of observations.

Summary statistics of total shareholder's equity for these industries are presented in Table 4.5. Means are in millions of dollars. The industry with the largest firms is petroleum and coal products manufacturing with a mean market capitalization of $8.3 billion, followed by pipeline transportation, and utilities. The smallest of these is truck transportation with a mean market capitalization of $223 million, followed by nonmetallic mineral product manufacturing, and waste management and remediation services.

For each of the eleven industries, I regress individual CAR on total equity using OLS. The statistical results in Table 4.5 show that only the utilities and oil and gas extraction industries yield significant results. The estimated coefficients are negative as would be predicted by public choice theory. The coefficient of -0.45 indicates that a one billion dollar increase in total shareholder's equity is associated with a lower return of nearly half a percentage point. The fact that Bush's announcement was directed towards the utility industry specifically may be related to why there is a result there. Altogether, however, these results provide weak evidence for size effects of regulation.

4.5 Conclusion

This paper studies the economic effects of regulation of carbon-dioxide emissions by examining industry stock price reaction in response to an event believed to convey new information

about the likelihood of such legislation. The efficient-markets hypothesis predicts that the markets factor in the probability of future events that would affect a firm's future cash flows. This paper finds consistently large, negative, and significant abnormal returns for energy-intensive industries in response to the anti-regulatory event. Such a reaction suggests that such regulation benefits industry. The additional findings that larger firms in certain industries react more negatively to our event suggests that larger firms may pursue this regulation to benefit themselves at the expense of smaller firms. Both findings are consistent with the special-interest, or capture, economic theory of regulation and contradict the traditional public-interest view.

Table 4.1: Industry Ranking by Energy Intensity.

Industry	Energy Intensity
Petroleum and Coal Products Manufacturing	0.673
Utilities	0.632
Oil and Gas Extraction	0.393
Pipeline Transportation	0.371
Mining, except Oil and Gas	0.368
Air Transportation	0.227
Waste Management and Remediation Services	0.195
Nonmetallic Mineral Product Manufacturing	0.194
Truck Transportation	0.144
Support Activities for Mining	0.091
Primary Metal Manufacturing	0.090
Paper Manufacturing	0.088
Real Estate	0.085
Farms	0.079
Rail Transportation	0.074
Amusements, Gambling, and Recreation Industries	0.060
Accommodation	0.060
Chemical Manufacturing	0.057
Social Assistance	0.056
Retail Trade	0.054
Food Services and Drinking Places	0.050
Water Transportation	0.045
Administrative and Support Services	0.040
Wholesale Trade	0.036
Construction	0.034
Other Services, except Government	0.034
Textile and Textile Product Mills	0.033
Plastics and Rubber Products Manufacturing	0.032
Fabricated Metal Product Manufacturing	0.029
Wood Product Manufacturing	0.028
Hospitals and Nursing and Residential Care Facilities	0.027
Food, Beverage, and Tobacco Product Manufacturing	0.024
Educational Services	0.023
Printing and Related Support Activities	0.021
Ambulatory Health Care Services	0.020
Rental and Leasing Services and Lessors of Intangible Assets	0.019
Furniture and Related Product Manufacturing	0.018
Apparel, Leather, and Allied Product Manufacturing	0.016
Miscellaneous Manufacturing	0.015
Performing Arts, Spectator Sports, Museums, and Related Activities	0.015
Securities, Commodity Contracts, Investments	0.015
Electrical Equipment, Appliance, and Component Manufacturing	0.013
Machinery Manufacturing	0.012
Motion Picture and Sound Recording Industries	0.012
Computer and Electronic Product Manufacturing	0.011
Forestry, Fishing, and Related Activities	0.010
Legal Services	0.010
Other Transportation Equipment Manufacturing	0.009
Broadcasting and Telecommunications	0.009
Publishing Industries (includes software)	0.009
Information and Data Processing Services	0.008
Computer Systems Design and Related Services	0.008
Motor Vehicle, Body, Trailer, and Parts Manufacturing	0.008

Notes: This table ranks all industries according to their index of energy intensity. The index of energy intensity is calculated by dividing an industry's value of energy-related inputs by the value of their total inputs. 2001 data from the Bureau of Economic Analysis was used.

Table 4.2: Results for Industry Event Studies

Industry	N	EI	CAR	P-value
Petroleum and Coal Products Manufacturing	32	67.3	-3.43*	<.0001
Utilities	138	63.2	-2.51*	<.0001
Oil and Gas Extraction	108	39.3	-4.35*	<.0001
Pipeline Transportation	14	37.1	-3.25*	0.055
Mining, except Oil and Gas	50	36.8	-6.18*	<.0001
Air Transportation	25	22.7	-5.79*	0.0002
Waste Management and Remediation Services	25	19.5	-6.13*	0.052
Nonmetallic Mineral Product Manufacturing	11	19.4	-5.24*	0.012
Truck Transportation	38	14.4	-4.08*	0.001
Support Activities for Mining	30	9.1	-5.12*	<.0001
Primary Metal Manufacturing	67	9.0	-0.74	0.410
Paper Manufacturing	55	8.8	-4.87*	0.001
Real Estate	39	8.5	-1.15	0.239
Farms	15	7.9	0.06	0.975
Rail Transportation	15	7.4	-1.67*	0.053
Amusements, Gambling, and Recreation Industries	25	6.0	0.32	0.851
Accommodation	35	6.0	-1.64	0.087
Chemical Manufacturing	425	5.7	-1.02*	0.030
Social Assistance	4	5.6	0.90	0.699
Retail Trade	271	5.3	0.64	0.279
Food Services and Drinking Places	77	5.0	-1.97*	0.006
Water Transportation	18	4.5	-2.83*	0.010
Administrative and Support Services	104	4.0	-0.04	0.970
Wholesale Trade	192	3.6	0.42	0.508
Construction	75	3.4	-1.82*	0.020
Other Services, except Government	23	3.4	-3.06*	0.012
Textile and Textile Product Mills	25	3.3	-2.08	0.364
Plastics and Rubber Products Manufacturing	54	3.2	-1.37	0.262
Fabricated Metal Product Manufacturing	69	2.9	-0.26	0.741
Wood Product Manufacturing	22	2.8	0.58	0.768
Hospitals and Nursing and Residential Care Facilities	28	2.7	-3.86*	0.007
Food, Beverage, and Tobacco Product Manufacturing	121	2.4	-0.37	0.635
Educational Services	21	2.3	-4.05	0.068
Printing and Related Support Activities	28	2.1	1.74	0.160
Ambulatory Health Care Services	45	2.0	-1.02	0.419
Rental and Leasing Services and Lessors of Intangible Assets	37	1.9	-1.26	0.352
Furniture and Related Product Manufacturing	28	1.8	-0.61	0.477
Apparel, Leather, and Allied Product Manufacturing	76	1.6	-2.47*	0.0002
Miscellaneous Manufacturing	168	1.5	1.17	0.478
Performing Arts, Spectator Sports, Museums, and Related Activities	9	1.5	7.88	0.249
Securities, Commodity Contracts, Investments	118	1.5	-0.95	0.155
Electrical Equipment, Appliance, and Component Manufacturing	90	1.3	1.17	0.147
Machinery Manufacturing	196	1.2	1.31	0.068
Motion Picture and Sound Recording Industries	30	1.2	1.40	0.297
Computer and Electronic Product Manufacturing	719	1.1	3.81*	<.0001
Forestry, Fishing, and Related Activities	3	1.0	1.73	0.306
Legal Services	3	1.0	13.91	0.3318
Other Transportation Equipment Manufacturing	8	0.9	-1.81	0.286
Broadcasting and Telecommunications	155	0.9	-0.08	0.927
Publishing Industries (includes software)	396	0.9	2.47*	0.0002
Information and Data Processing Services	811	0.8	2.11*	<.0001
Computer Systems Design and Related Services	190	0.8	2.88*	0.010
Motor Vehicle, Body, Trailer, and Parts Manufacturing	22	0.8	-3.17*	0.051

Notes: This table presents results from 3-day window event studies around March 13, 2001. The market model controlled for marketwide variation over these days. Industries are ranked according to their index of energy intensity. N is number of observations, EI is energy intensity, and CAR is cumulative abnormal return. An asterisk denotes significance at the 5.5% level.

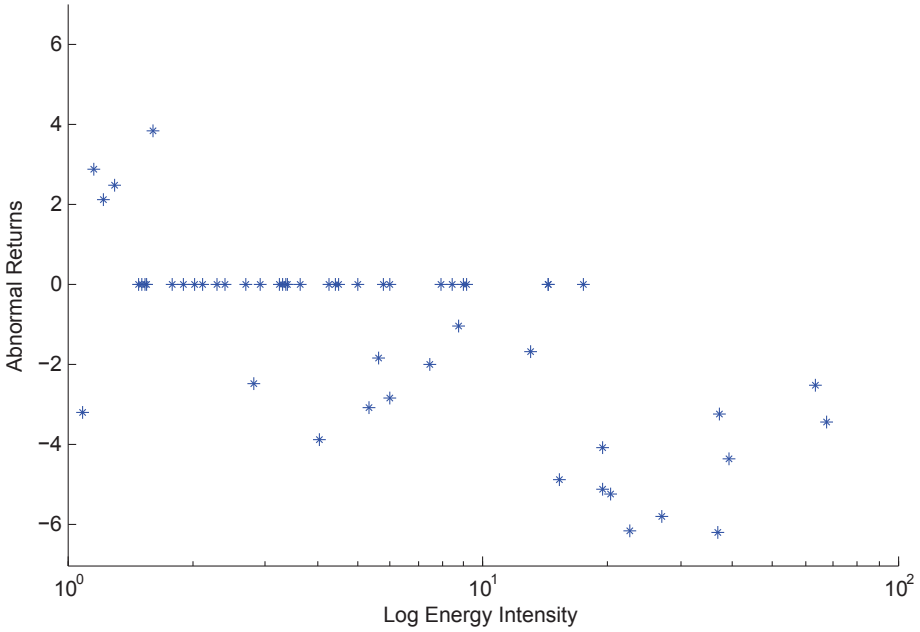

Figure 4.1: Industry Abnormal Returns vs. Energy Intensity

Table 4.3: Total Shareholder's Equity: Summary Statistics ($billions)

		Mean	Std Dev	Min	Max
Petroleum and Coal Products Manufacturing	29	8.319	17.584	0.004	72.344
Utilities	115	3.050	4.964	0.003	28.752
Oil and Gas Extraction	105	1.288	2.709	0.006	16.323
Pipeline Transportation	14	4.250	6.393	0.021	20.363
Mining, except Oil and Gas	58	0.810	1.332	0.004	6.413
Air Transportation	25	1.378	2.704	0.012	12.489
Waste Management and Remediation Services	24	0.902	3.267	0.003	15.913
Nonmetallic Mineral Product Manufacturing	20	0.902	1.464	0.020	4.703
Truck Transportation	35	0.223	0.278	0.001	1.029
Support Activities for Mining	26	2.623	3.931	0.008	18.347
Paper Manufacturing	53	2.770	7.950	0.003	42.602

Table 4.4: OLS: Firm-Level Abnormal Return on Size by Industry:

Industry	Coef.	Std. Err.	t-stat	p-value
Petroleum and Coal Products Manufacturing	-0.003	0.029	-0.12	0.908
Utilities	-0.451*	0.070	-6.45	<.0001
Oil and Gas Extraction	-0.469*	0.202	-2.33	0.022
Pipeline Transportation	-0.209	0.253	-0.82	0.426
Mining, except Oil and Gas	0.470	0.567	0.83	0.41
Air Transportation	0.230	0.507	0.46	0.653
Waste Management and Remediation Services	0.160	0.976	0.16	0.872
Nonmetallic Mineral Product Manufacturing	0.618	0.924	0.67	0.512
Truck Transportation	-10.890*	4.89	-2.23	0.033
Support Activities for Mining	-0.176	0.286	-0.62	0.544
Paper Manufacturing	-0.105	0.176	-0.6	0.552

Notes: Cumulative abnormal return is regressed on a constant and total shareholder's equity for each industry. A coefficient of one means a one billion dollar increase in equity is associated with a one percent increase in abnormal return. An asterisk denotes significance at the 5% level.

Chapter 5

Conclusion

This dissertation considers topics in the intersection of law and economics and financial economics. The common theme running through each chapter is the problem of the conflicts of interest between a principal and the agent he hires to act on his behalf, otherwise known as the principal-agent problem. Specifically, this dissertation deals with principal-agent problems between government and citizen as well as between corporate managers and shareholders. In Chapter 2, which focuses on state antitakeover law, and Chapter 4, which focuses on environmental regulation at the national level, I find evidence of the agent choosing actions detrimental to the principal as a result of following his own divergent interests. In Chapter 2, I find evidence of state policy makers creating a legal environment that benefits corporate managers at the expense of shareholders in an effort to generate tax revenue. In Chapter 4, I find evidence that environmental regulation passed at the national level benefitting industry as the costs of such regulation would be passed on to consumers. In contrast, Chapter 3 casts doubt on evidence in the literature that corporate managers enact staggered boards in order to shield themselves from the discipline of the takeover market, at the expense of shareholders.

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