Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

David Reppenhagen Date

Contagion vs. Intrinsic Factors of Accounting Policy Choice

By
David Reppenhagen
Doctor of Philosophy

Business

Dr. Gregory Waymire
Advisor

Dr. Jan Barton
Committee Member

Dr. Peter Demerjian
Committee Member

Dr. Gary Hecht
Committee Member

Accepted:

Lisa A. Tedesco, Ph.D.
Dean of the Graduate School

Date

Contagion vs. Intrinsic Factors of Accounting Policy Choice

By

David Reppenhagen,
M.Acc., University of Georgia, 1999
B.B.A., University of Georgia, 1998

Advisor: Gregory Waymire, Ph.D.

An abstract of
A dissertation submitted to the Faculty of the Graduate School of Emory University in partial fulfillment of the requirements for the degree of
Doctor of Philosophy in Business
2010

Abstract

Contagion vs. Intrinsic Factors of Accounting Policy Choice

By David Reppenhagen

I examine how a firm's accounting methods can be influenced by the choices of other firms, which I label contagion. I model accounting method choice as a combination of intrinsic propensities to adopt a method and contagion effects. I predict contagion of accounting methods occurs for two reasons: 1) adoption decisions of other firms are informative for the adoption decision and 2) prior adoptions change the net benefits of the decision. I test these predictions in the stock option expensing setting where firms had the choice to use the intrinsic or fair value method. Using a firm-level diffusion model, I document evidence consistent with my predictions. I also predict that the strength of contagion will vary based on the characteristics of the accounting choice. Specifically, I expect that the presence of direct cash flow effects of an accounting choice (e.g., tax effects) will be associated with less influence of contagion factors relative to accounting choices without any direct cash flow effects. I test these predictions in the inventory and depreciation method settings. Since inventory has a direct impact on taxes, due to the tax conformity rule, I expect contagion will be less influential in the accounting choice decision than in the depreciation setting. The data is consistent with this prediction. However, the prediction is across empirical settings, so I cannot provide a test of statistical significance. Thus any inferences must be made cautiously.

Contagion vs. Intrinsic Factors of Accounting Policy Choice

By

David Reppenhagen
M.Acc., University of Georgia, 1999
B.B.A., University of Georgia, 1998

Advisor: Gregory Waymire, Ph.D.

A dissertation submitted to the Faculty of the Graduate School of Emory University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Business
2010

Acknowledgements

I wish to acknowledge the help and support of a number of individuals that were instrumental in bringing my dissertation to completion. First and foremost, my wife, Sandra, supported me through many years of school working through the frustrations, disappointments, and eventually celebrations that are a part of this process. Without her emotional, spiritual, and yes, financial support, I would have never completed this dissertation. I am deeply grateful for her companionship and encouragement. I am also grateful for the many friends and family members that encouraged me along the way and to God for helping me, in spite of myself, to persevere through a process that was at times quite painful but ultimately was for my good.

I am grateful for the support and guidance of my committee: Gregory Waymire (chair), Jan Barton, Peter Demerjian, and Gary Hecht. They have read more versions of this paper than anyone should. Their guidance, support, patience (and at times impatience) was instrumental in helping me finish this process. I appreciate the helpful comments received from Sudipta Basu, Joel Demski, Victoria Dickinson, Rajib Doogar, Kathryn Kadous, Marcus Kirk, Robert Knechel, Kevin Kobelsky, Gopal Krishnan, Per Olsson, Mark Peecher, David Shinn, Jenny Tucker, the faculty and PhD students at Goizueta Business School, and from workshop participants at Baylor, Drexel, Florida, Illinois at Urbana-Champaign, Lehigh, and Mississippi State. In addition, I would like to thank Michael Parzen for several discussions about event history analysis, Anand Swaminathan for assistance with estimating diffusion models, and Andy Leone for assistance with PERL regular expressions. Thank you to Susan Klopper who helped me with accessing several of the business library databases. Acknowledgement is also due to Mark Richardson who helped me stay focused during an especially challenging part of this process. Special thanks are due to the Deloitte Foundation and the Goizueta Business School for funding my research. Portions of this dissertation will be published in the September 2010 issue of the Review of Accounting Studies journal (see Springerlink.com for a version titled “Contagion of accounting methods: evidence from stock option expensing”).

While I have received much guidance and support on this dissertation, all errors or omissions remain my own.

TABLE OF CONTENTS

CONTENT	PAGE

List of Figures

List of Tables

Appendices

1. Introduction

A significant amount of research has been generated on the determinants of firms' accounting methods (Fields et al. 2001, Watts & Zimmerman 1990, Holthausen & Leftwich 1983). Despite this, current models of accounting choice leave significant opportunities for additional insight into these choices (Fields et al. 2001, 258). I argue that this is due, in part, to a lack of attention to the effects of contagion, defined as the transmission of an idea, practice, or behavior through the influence of other agents (Borgatti & Foster 2003). The main focus of this paper is to explore how contagion of accounting methods would occur by highlighting the mechanisms enabling contagion in the stock option expensing setting.

Contagion between firms has been documented in numerous contexts, including the choice of stock exchange (Rao et al. 2000), the frequency of acquisitions (Haunschild 1993), entrance into new product markets (Korn & Baum 1999), and the adoption of poison pills and golden parachutes (Davis & Greve 1997). While these examples suggest contagion in material, economic events, behaviors consistent with contagion have also been documented in other settings where the benefits are more uncertain, including the adoption of the multidivisional corporate form (Palmer et al. 1993), the creation of investor relations offices (Rao & Sivakumar, 1999), the adoption of International Organization for Standardization accreditation (Chua & Petty 1999), and the amount and extent of organization-level charitable giving (Galaskiewicz & Wasserman 1989). Most accounting methods probably fall into this later group, but the uncertainty of benefits has been shown to actually *increase* the effect of contagion in a setting (Haunschild & Miner 1997, Haunschild 1994).

The first research question examines how contagion occurs. There are two reasons why firms would be influenced by prior adopters: 1) information-based—prior adoptions provide information that is relevant to the firm's adoption decision (Lieberman & Asaba 2006) and 2) spillover-based—prior adoptions change the net benefits of the decision. For information-based contagion, I group the predictions into two categories: a) information transferred through communication channels between the prior adopter and the firm (e.g., director interlocks, common auditor, same geographic region) and b) information inferred from prior adopters belonging to certain reference groups (e.g., industry members and large/successful firms). For spillover-based contagion, I predict the prior adoption by an industry rival will increase the likelihood of the firm adopting.

Extending the analysis on the influence of prior adoptions (information-based and spillover-based), I examine a second research question on which firms are more susceptible to contagion. That is, some firms will be influenced more by prior adoptions than others. I develop predictions about which firms will be more susceptible to contagion based on their capability to monitor other firms and their motivation to seek out other firms' decisions (Greve 2005).

I test these predictions in the stock option setting. The stock option setting provides a recent, material example of a change in accounting methods. In addition, the stock option setting contains a degree of environmental uncertainty with respect to the

Financial Accounting Standards Board's (FASB) involvement that allows me to predict a strong contagion effect (Abrahamson & Rosenkopf 1993). The setting allows for the collection of the full event history of a period when two alternative methods were allowed. In addition, detailed adoption dates are available, which facilitates my research design.

I test my hypotheses using an event history model tailored for diffusion processes (Strang & Tuma 1993). The diffusion model is designed to clearly separate out the intrinsic propensities to adopt and the contagion effects. As opposed to traditional diffusion models that are at the population level (e.g., Bass 1969), the Strang & Tuma (1993) model explains firm-level adoption decisions.

My empirical analysis of the contagion effects in stock option expensing broadly supports my hypotheses concerning contagion. The results provide evidence that information-based contagion through direct communication channels and reference groups increases the probability of adoption. Additionally, the data supports the hypothesis that spillover-based contagion occurs based on the prior adoption by a rival. Lastly, the susceptibility to prior adoptions seems to vary based on firm characteristics, especially firm size and industry concentration.

My third research question investigates whether the strength of contagion will vary based on the characteristics of the accounting choice. Specifically, I expect the presence of direct cash flow effects of an accounting choice will be associated with less influence of contagion factors relative to accounting choices without any direct cash flow effects. This prediction rests on the notion that uncertainty of the consequences increases the prevalence of contagion and the presence of direct cash flow effects reduces the uncertainty of the choice. I test this prediction in the inventory and depreciation method settings. Since the inventory method has a direct impact on taxes, due to the tax conformity rule, I expect contagion will be less influential in that accounting choice decision than the depreciation setting.

One goal of the paper is to address a fundamental question, how do accounting methods become rooted in practice? To address this, I examine the diffusion (i.e., the spread) of accounting methods across firms. I highlight the role of prior adopters in the accounting policy decision process, a role not significantly acknowledged in recent accounting choice research.[1] I also explicitly model the timing dimension of these choices. Thus, this study suggests a more complete view of how managers make accounting choices. I also introduce a new method, a firm-level diffusion model, to accounting research that can be used to study the spread of other accounting phenomena.

In section 2, I trace the historical development of some select accounting method choices. Section 3 develops my hypotheses concerning contagion. In section 4, I describe the research design used to test my hypotheses. Section 5 presents the data and results from the stock option expensing sample related to research questions one

[1] There are some recent papers examining the influence of other firms in other accounting settings (e.g., Kedia & Rajgopal (2007), Tse & Tucker (forthcoming)). This paper is also related to information transfer studies (e.g., Gleason et al 2008) but generally those studies focus on how investors' views of company A are impacted by actions of company B. In addition, there is a significant literature on analyst herding.

and two. Section 6 presents the evidence about research question three from the inventory and depreciation settings. Section 7 concludes.

2. Historical Background of Accounting Choices

The development of accounting institutions (e.g., accounting methods) is likely path dependent (North 1991); thus, understanding the origins of accounting institutions is fundamental for research that seeks to understand modern accounting (Waymire & Basu 2008). Relatedly, economic transactions and their accounting treatments co-evolve over time (Basu & Waymire 2006), so examining the origins of the underlying transactions as well as the accounting treatment provides additional insight into accounting methods. Therefore, in this section I briefly review the origins of stock option expensing, inventory valuation, and depreciation of long-lived assets.

2.1 Stock Options and Expensing

The origin of employee stock options dates to at least the 1920s (Washington & Rothschild 1962, 569). The introduction of employee options was likely related to income taxes. The first (court-upheld) tax on personal incomes became law in 1913 (Brazell et al. 1989). The Revenue Act of 1921 introduced a capital gains rate that was lower than the ordinary income rate (Auten 1999). The progressive nature of the personal income tax thus imposed a cost on cash compensation that was not present on gains from stock options, which were taxed at the lower capital gains rate. Also, during this period Berle and Means (1932) were calling for ways to align managers' incentives with owners' incentives, and employee stock options helped fulfill that goal.

The tax status of options affects the spread of stock option plans. Prior to 1945, taxation at the capital gains rate was available for stock option gains. As a result, up to 35% of NYSE companies utilized stock options between 1928 and 1937 (Baker 1940). In 1945, the Treasury Department required stock options to be treated as ordinary income, and the popularity of stock option plans dropped dramatically (Washington & Rothschild 1962, 581). Stock options received favored tax status in the Revenue Act of 1950 (Washington & Rothschild 1962, 573; Holderness et al. 1999). And a 1951 ruling by the American Institute of Certified Public Accountants (AICPA) allowed firms to keep the costs of restricted stock options off of the income statement (Ellig 2006).

As a result of these developments, the broad-based use of stock options spread such that by 1956, well over 50% of NYSE firms had stock plans (Washington & Rothschild 1962, 569). Accounting Principles Board (APB) No. 25, issued in 1972, introduced the intrinsic method, which required expensing the amount of the market price of the stock that was in excess of the exercise price (APB 1972).

The use of broad-based stock option plans expanded further, especially with the growth of high-tech firms. Start-up firms in the semi-conductor industry, for example, used options to lure talented employees away from more established firms in the late 1960s to 1970s (Chamillard 2003). Other high-tech firms began using this strategy of compensating their employees without draining cash. There is also evidence that a change to the tax code in 1993, which limited the deductibility of cash compensation over $1 million, increased the use of stock options as compensation due to a substitution effect (Balsam & Ryan forthcoming).

2.2 Inventory and Valuation

The last-in-first-out (LIFO) method for inventory proceeded from the desire of managers to match current costs to current revenues and to obtain favorable tax treatment. The predecessor to LIFO was the base stock method, which matches current costs to current revenues on the income statement and allows firms to avoid large fluctuations in the inventory account due to input price fluctuations (Davis 1982).[2] In 1930, the Supreme Court upheld a Treasury Department ruling, disallowing the base stock method for tax purposes due to the considerable discretion in the method. Thus, LIFO was developed as a response to that decision (Pincus 1989, 1997).

Industry trade associations appear to have played a role in the development and spread of LIFO. The American Petroleum Institute (API), for example, helped to develop the LIFO method and lobbied the American Institute of Accountants (Davis 1982). The API and several other industry associations lobbied Congress to obtain codified acceptance of LIFO for taxes (Pincus 1989). In addition, the American Retail Federation was instrumental in extending the use of LIFO to retail inventories (Davis 1982). The

[2] The base stock method defines a "normal" amount of inventory and changes in the value of that inventory are ignored. Cost of goods sold then comes from purchases that increase inventory above that normal level and thus match current costs to current sales.

LIFO method was deemed "generally accepted" by the American Institute of Accountants (the AICPA's predecessor) in 1936 (Davis 1982).

LIFO was first allowed for tax purposes in the 1938 Revenue Act (Pincus 1989, 1997). The tax conformity rule for inventory methods was mandated the following year in the 1939 Revenue Act (Davis 1982). In 1947, LIFO was codified as generally accepted accounting in Accounting Research Bulletin 29 (Pincus 1989). Thus, taxes seem to play a crucial role for the inventory method.

2.3 Long-Lived Assets and Depreciation

Depreciation was developed in the 1830s and 1840s with the rise of industries that extensively utilized long-lived assets (Brazell et al. 1989). This preceded taxes on corporate income in the U.S., so there must be other factors that led to its development. Firms were trying to account for large expenditures in one period for assets whose productivity and gradual wear and tear occurred over several periods (Campbell 1951). Littleton (1933, 240) argues that an additional necessary condition was the incentive for careful calculation of net profit, which arose with the limited liability and going concern features of the corporate form. The result was a focus on preserving the capital stock and careful determination of the amount allowable for dividends (i.e., retained earnings).

While taxes did not lead to the development of the concept of depreciation, there is evidence that the corporate income tax deduction for depreciation helped to spread the acceptance of depreciation for financial reporting among firms in the U.S. in the 1910s and 1920s (Kern 2000). Also, the Committee on Accounting Procedure (ARB #44) allowed accelerated methods of depreciation *after* the Internal Revenue Code allowed those methods in 1954 (Holthausen 1981).

A related force pushing for the acceptance of depreciation is the influence of regulatory bodies. For example, Sivakumar & Waymire (2003) document the use of the retirement method by railroads and their aversion to depreciation. Regulatory intervention by the Interstate Commerce Commission (ICC) in 1907 required railroads to switch to depreciation for some of their long-lived assets (Heier 2006). In addition, the courts and state utility commissions dealt extensively with the issue of depreciation in determining allowable rates of return for public utilities (Nash 1930).

Lastly, industry experience likely played a role in determining the firm's depreciation method and their implementation of the method. The U.S. Chamber of Commerce in 1921 counseled firms to compare their experience with depreciation to that of their industry and also cited several industry trade groups that were studying alternative depreciation methods (McCullough 1921).

3. Hypotheses Development

This paper examines the diffusion (i.e., the spread) of accounting methods and the role of prior adoptions in that process. In this section, I lay out the conceptual case for the contagion of accounting methods. Then I discuss and develop predictions around two potential explanations for contagion. Also, predictions are made concerning the types of firms most influenced by prior adoptions.

3.1 Research Question One: How Does Contagion Occur?

How would contagion occur in the context of accounting methods? Consider a hypothetical case of contagion in a population of firms (see figure 1 for a timeline). At time t, a new business transaction is developed in response to incentives for innovation. At time t+1, an accounting method is proposed to deal with the transaction. Generally, the firms that develop the innovation must decide how to account for the transaction first but proposals could come from external parties (e.g., industry trade association, auditors, consultants, or academics). In addition, due to changes in the external environment at time t, new accounting treatments could be proposed for old transactions at time t+1.[3]

[INSERT FIGURE 1 HERE]

Once managers become aware of the new accounting method, they will estimate the net benefits of the method and develop a preference concerning adoption of the method (Rogers 2003, 176), which I label the intrinsic propensity to adopt. This estimate is developed initially without consideration of other firms' decisions since no firms have adopted at this point.[4] Managers then decide whether to adopt the method in period t+1 based on the following:

---

[3] In the diffusion of innovations literature, newness to an agent includes whether the agent has previously adopted the innovation (Rogers 2003, 12).

[4] Managers may very well consider ex ante the future decisions of other managers. My focus, however, is on how managers react to the ex post realization of those decisions from other managers. If managers have already factored in the ex ante probability of another firm adopting the method, this should bias against my results.

$$ADOPT = \begin{cases} 1 \ \ if \quad E(NetBenefits_t) > c \\ 0 \ otherwise \end{cases}$$

So, managers will choose to adopt in a period if their expectation of the net benefits exceeds a firm-specific cutoff.[5]

The subset of firms with a sufficiently high propensity adopts the new method in period t+1. In period t+2, the managers that have not adopted may revise their net benefits based on other firms' adoptions and decide to adopt or wait. This process continues until there is no additional revision of net benefits sufficient to induce adoption or all firms have adopted.

So, which prior adoptions would influence the decision? Based on the simplified decision process above, firms are influenced by prior adopters for two reasons: 1) the prior adopters have information or experience that affects the estimate, E(·), of the net benefits (i.e., information-based contagion) and 2) the prior adoptions actually change the net benefits of adopting (e.g., spillover-based contagion).[6]

3.1.1 Information-Based Contagion

[5] The decision to adopt in a given period is likely analogous to exercising an option. Managers have discretion as to the period of adopting and likely consider the expected benefits for multiple future periods during their decision.

[6] The prior adoptions that produce spillover effects could also provide information that will improve the estimate of the net benefits. Thus, for some firms, these two explanations may occur simultaneously and are likely difficult to distinguish empirically.

Managers make decisions, including financial reporting decisions, under conditions of uncertainty (Knight 1921, ch.7; Alchian 1950; North 2005, 13).[7] When faced with uncertainty about an outcome, managers will seek ways to reduce that uncertainty by gathering more information (Rogers 2003, 21). Most managers have little experience with changing accounting methods (Dichev & Li 2006), so they must search externally for information about the consequences of changes. One source of information is other managers that are solving similar problems.[8]

This information can be communicated directly or inferred from the prior adopters' visible adoptions. The type of information being transferred directly is the reaction of investors (including institutional investors), analysts, business press, and the probability, type, and timing of regulator intervention. In the following paragraphs, I discuss some potential communication channels as well as some firms whose visible prior adoptions will be the most relevant, which I label reference groups.

Sharing a common member on respective boards of directors (i.e., a board interlock) is potentially the most direct form of communication of a firm with a prior adopting firm. Firms will have direct access to the decision-making process of another firm through a board interlock (Mizruchi 1996) and, therefore, can understand the net

[7] These authors have slightly different definitions of uncertainty but essentially they refer to the inability of individuals to know a unique probability distribution of outcomes for an event. They all agree that this ignorance is the normal condition that individuals face in most situations rather than the situation of risk.

[8] The most relevant information would be the direct consequences of other firms' accounting choices and how those consequences directly map into the potential adopter's situation. However, this information is likely difficult to observe.

benefits of the accounting method more explicitly. This communication of information between firms is one of the major functions that interlocks serve (Useem 1984, 46).[9]

The probability of transmitting ideas or practices from one firm to another will increase as the proximity (distance) between prior adopters and potential adopters increases (decreases). Strang and Soule (1998, 245) state that the "most common finding in diffusion research is that spatially proximate actors influence each other." Geographic proximity could enable executives to gather more information about another firm's operations and practices (Ivkovic & Weisbenner 2005), which includes accounting practices (Kedia & Rajgopal 2007). This could occur through social interaction (e.g., local executive conferences, country club membership, and charitable events) or due to more exposure in the local press.

Firm adoptions can also be communicated and given additional importance by the external auditor. The auditor is responsible for attesting to the adequacy of the financial statements, including the significant accounting policies used by the firm. If the firm is considering changing one of those accounting policies, then the auditor will likely influence that decision (Trombley 1989; Gibbons, Salterio, & Webb 2001). The auditor could accumulate the preferences of some of its more important clients and, thus, communicate a set of "best practices" to other firms.[10]

Based on the preceding discussion, Hypothesis 1a, in alternative form, predicts:

---

[9] Board interlocks have been associated with the transmission of corporate behavior in multiple settings: poison pills (Davis 1991), golden parachutes (Davis & Greve 1997), investor relations departments (Rao & Sivakumar 1999), stock exchange defections (Rao et al. 2000), backdating stock options (Bizjak et al 2007), and numerous others.

[10] The auditor can also influence accounting choice by deciding, independent of its client base, on the merits of a particular accounting treatment and promote that treatment to its clients.

H1a. The prior adoption of a firm connected by a communication channel is positively related to the likelihood of adoption.

The adoption decisions of firms in the same industry convey information for the firm's own adoption decision. Firms in the same industry likely face a similar set of intrinsic propensities to adopt; thus, adopting the practice might lead to a similar outcome. The consequences of prior adoptions in the same industry are likely to be especially salient to the firm due to its familiarity with other industry members. In addition, the number of adoptions in the same industry is relevant if agents underweight their private information signal in the presence of the cumulative influence of other agents' decisions (Banerjee 1992, Bikhchandani et al. 1992).[11]

Firms will often imitate the practices of successful firms in an attempt to gain a similar level of success (Haveman 1993; Haunschild & Miner 1997; Henrich & Gil-White 2001). This is because in an uncertain environment when the determinants of success are not directly observable, often the best strategy is to copy the behavior of those that are successful (Alchian 1950, Henrich 2004).

Based on the preceding discussion, Hypothesis 1b, in alternative form, predicts:

H1b. The prior adoption by a member of the firm's reference group is positively related to the likelihood of adoption.

[11] One significant difference between contagion as specified here and the herding literature is that the communication, or information, channels have been more thoroughly developed in the contagion literature.

3.1.2 Spillover-based Contagion

Spillover effects result when costs or benefits accrue to one party from the actions of an external party not under its control (Buchanan & Stubblebind 1962). For an accounting choice context, the external parties are other firms facing the same accounting choice decision. If the prior adoption by another firm results in costs or benefits to the firm facing the decision, then that firm will weight that prior adoption in its decision process.

The most direct form of a spillover effect is due to competition. Competition in product markets can lead to strategies of imitation (Bothner 2003).[12] Firms imitate their rivals to maintain competitive parity (Gimeno et al. 2005). But, competition also occurs in the capital markets over investor funds (Beaver 1998, 12). Firms may compete for a lower cost of capital, higher institutional ownership, and higher analyst following. Financial reporting and other disclosures are “products” firms use to compete in the capital markets. Some investors will choose from alternative stocks based partly on the quality of the information in the financial statements (Beaver 1998, 8) and some accounting methods might be more informative than others (Bartov & Bodnar 1996). Thus, firms will choose to imitate the accounting choices of their rivals if they desire to maintain competitive rivalry (i.e., comparability) in financial reporting. Therefore, Hypothesis 2, in alternative form, states:

---

[12] Strategies of differentiation can also be the result of competition. Likely, it is this strategy that could cause the initial firms to adopt a practice that is different from the rest of the population. Firms that follow these strategies are necessary to start the diffusion process.

H2. The prior adoption by a rival is positively related to the likelihood of adoption.

3.2 Research Question Two: Which Firms Are More Susceptible to Contagion?

The influence from prior adopters likely differs across firms (Strang & Soule 1998). Some firms will be more susceptible to contagion effects than others (Strang & Tuma 1993).[13] The degree that firms are susceptible to contagious learning (i.e., information-based contagion) is a function of their motivation and capability (Greve 2005). Poorly performing firms are motivated to imitate other firms' methods or practices in a search to increase performance. As far as capability, large firms would presumably have greater resources to devote to analyzing practices and methods of other firms and subsequently, incorporating those methods into their organization. Thus, the following hypotheses (in alternative form) are made based on characteristics of the firm making the adoption decision:

H3a: Less profitable firms will be more susceptible to information-based contagion than more profitable firms.

H3b: Larger firms will be more susceptible to information-based contagion than smaller firms.

The extent to which firms will be influenced by competitive rivals might also vary based on firm characteristics. Firms operating in concentrated industries will likely be more attentive to their direct competitors than firms operating in diffuse industries with

[13] I view susceptibility as essentially moderating the relationship between the influence of prior adoptions and the likelihood of contagion.

many competitors. Therefore, the extent that firms are influenced by the adoptions of rivals will depend on industry concentration.

> **H3c**: Firms in more concentrated industries will be more susceptible to rivalry-based contagion than firms in less concentrated industries.

3.3 Research Question Three: Does Contagion vary among accounting choices?

The prior section argued one reason for contagion was uncertainty about the distribution of outcomes for the accounting practice. As the uncertainty about the outcomes increases, then the motivation to seek additional information from other agents increases and the likelihood of imitation increases. In other words, when there is high uncertainty about the means-end relationship of a choice, firms will place even greater weight on the actions of other firms than when there is less uncertainty (Haunschild & Miner 1997, Abrahamson & Rosenkopf 1993). There is evidence to suggest that uncertainty may actually reduce contagion. Strang & Still (2006) find agents in situations with very high uncertainty were more likely to refer to external consultants and academics rather than other firms. However, as this appears to be a limiting case, Hypothesis 5 predicts the following:

> **H4.** There is a positive association between the strength of the contagion effects and the uncertainty about the net benefits of an accounting choice.

This hypothesis cannot be statistically tested directly since it is a comparison across settings. Therefore, I will present evidence for the hypothesis by comparing, within each setting, the relative improvement of the model with intrinsic plus contagion effects against model with only intrinsic effects. I predict in the high uncertainty setting, contagion effects will improve the intrinsic only model relatively more than contagion effects will improve the intrinsic only model in the low uncertainty setting.

4. Research Design

In this section, I first discuss the model specification used to test the hypotheses. Then, I provide evidence of the hypotheses about contagion effects. Lastly, I discuss the robustness of the results.

4.1 Model

My hypotheses deal with the influence of prior adoptions on the adoption decisions of potential adopters. This process of contagion enables the diffusion of an accounting practice across a population. Therefore, I model the adoption of accounting methods using Strang and Tuma's (1993) additive heterogeneous diffusion model. This model belongs to the class of event history, or duration, models but is designed for diffusion processes. The model is commonly used in the management literature for identifying contagion within a set of potential adopters (see Strang & Soule 1998, Lieberman & Asaba 2006, Blossfeld et al. 2007, 176).[14] As an event history model, it excels at handling two aspects of event history data that standard regression techniques

[14] Some of the settings examined with this model include choice of stock exchange (Rao et al. 2000), use of poison pills and golden parachutes (Davis & Greve 1997), radio station strategy (Greve 1995), and the diffusion of tetracycline (Strang & Tuma 1993).

do not: censoring and independent variables that change over time (Box-Steffensmeier & Jones 2004, Ch. 2).[15]

The specification of their model is:

$$r_n(t) = \exp(\boldsymbol{\alpha}'\mathbf{x_n}) + \exp(\boldsymbol{\beta}'\mathbf{v_n}) * [\ \Sigma_{S(t)} \exp(\boldsymbol{\gamma}'\mathbf{w_s} + \boldsymbol{\delta}'\mathbf{z_{ns}})\ ]$$

where $r_n(t)$ is the propensity that firm *n* will adopt in period *t* given that the firm has not adopted in the preceding periods, $\boldsymbol{\alpha}'$, $\boldsymbol{\beta}'$, $\boldsymbol{\gamma}'$, and $\boldsymbol{\delta}'$ are vectors of coefficients for the variables in the vectors $\mathbf{x_n}$, $\mathbf{v_n}$, $\mathbf{w_s}$, and $\mathbf{z_{ns}}$ respectively. More specifically, $r_n(t)$ represents the hazard rate, which is the probability of firm *n* adopting in the next instant of time, $t + \Delta t$, given that the firm has not previously adopted (formally, $r_n(t) = \lim_{\Delta t \to 0} \Pr[Y_n(t + \Delta t)=1 \mid Y_n(t)=0] / \Delta t$ where Y_n is 1 if the firm adopts and 0 otherwise). The sample is composed of event histories where a firm has one observation for each year they are at risk of adopting.

The model specifies an additive combination of the intrinsic propensity to adopt (the $\mathbf{x_n}$ vector) from the contagion effects ($\mathbf{v_n}$, $\mathbf{w_s}$, $\mathbf{z_{ns}}$). Susceptibility ($\mathbf{v_n}$) represents characteristics of the potential adopter *n* that would moderate the influence of prior adoptions. Infectiousness ($\mathbf{w_s}$) represents the influence of a past adopter *s*. Proximity ($\mathbf{z_{ns}}$) represents the physical or social distance between the potential adopter *n* and the past adopter *s*. For each potential adopter at time t, there is a set of prior adopters that have adopted before time t, which is represented by $\Sigma_{S(t)}$. The influence from each prior

[15] Censoring occurs when event times occur outside of the sample period (Box-Steffensmeier & Jones, 16).

adopter must be considered (i.e., aggregated across all prior adopters in the set S(t)) for each potential adopter at time *t*.

Simulation results show the coefficients of the heterogeneous model are generally unbiased with low variance across a variety of different types of underlying diffusion processes (Greve et al. 1995, Strang & Tuma 1993). Of special significance, omission of additional intrinsic propensity variables generally does not bias the estimators of the contagion variables (Greve et al. 1995, 408). See the Appendix A for a derivation of the model.

4.2 Variable Definitions and Predictions

My hypotheses predict the influence of prior adopters to vary based on their characteristics. H1a predicts prior adoptions by firms with a communication channel to the potential adopter will be positively associated with the likelihood of adoption. Since H1a captures a relational attribute between the prior adopter and potential adopter, I test it by including variables in the proximity vector ($\mathbf{z}_{ns}$). I test for three communication channels: a shared member on the board of directors (*PRIOR_BOARD*), firms geographically within 50 miles of each other (*PRIOR_CLOSE*), and a common external auditor (*PRIOR_AUDITOR*). These variables represent characteristics that the prior adopter and potential adopter share, therefore, these variables are included in the proximity vector ($\mathbf{z}_{ns}$).

H1b predicts that a prior adoption by a member of the firm's reference group is positively related to the likelihood of adoption. To capture common industry, I define *PRIOR_INDUSTRY* as whether the prior adopter is in the same 3-digit Standard Industrial Classification (SIC) industry group as the potential adopter. This represents an attribute the prior adopter and potential adopter share, so the variable is included in proximity vector ($\mathbf{z}_{ns}$). The other reference group consists of successful firms, which is a characteristic solely of the prior adopter. So, the prior adopter's net sales (*PRIOR_SALES*) is included in the infectiousness vector ($\mathbf{w}_{s}$).

H2 predicts the prior adoption by a rival is positively related to the likelihood of the firm's adoption. My proxy for competitive rival (*PRIOR_RIVAL*) is whether the prior adopter is in the same 3-digit SIC industry and has sales within 50% of the firm's sales (Haveman 1993). Competitive rivalry is a relational attribute and therefore, *PRIOR_RIVAL* is included in the proximity vector ($\mathbf{z}_{ns}$).

H3a, H3b, & H3c predict that some firms will be more susceptible to influences from prior adoptions than other firms. I will test these hypotheses by including variables in the susceptibility ($\mathbf{v}_{n}$) vector. H3a predicts that less profitable firms will be more influenced by prior adopters, so I include *PROFIT* and expect a negative sign. H3b predicts firm size is positively related to susceptibility, so I include *SIZE* and expect a positive sign. H3c predicts higher industry concentration leads to more susceptibility, so

INDUSTRY_CONC, calculated as the Herfindahl-Hirschmann index on the 3-digit SIC level, is included and I expect a positive sign.[16]

Compustat provides SIC industry codes, net sales, auditor codes, and the headquarter address data used to calculate geographic distance. Contagion variables that use industry sales are calculated using segment-level data, when available. To calculate geographic distance between two firms' headquarters I obtain latitudes and longitudes from the U.S. Census Bureau's Gazetteer Place database based on zip code or county and state Federal Information Processing Standards (FIPS) codes.[17] I collect board of director membership data, used to determine interlocks, from the Investor Responsibility Research Center's Directors database and Compact Disclosure's archived CD-ROMs.

The intrinsic propensity to adopt is based on the characteristics of a firm facing an adoption decision without considering any other firm's adoption decision. Prior accounting research has explored this propensity in detail as the firm's agency costs, asset pricing motivations, and regulatory pressures (Fields et al. 2001). I collect data on the intrinsic ($\mathbf{x}_n$) variables from Compustat, Execucomp, Thompson Financial's Institutional Holdings (13f), and SDC Platinum's Corporate Database.

---

[16] While two of these variables are also in the intrinsic vector ($\mathbf{x}_n$), their presence in the susceptibility vector captures a different effect. Intrinsic variables impact adoption due to direct effects on the choice, whereas susceptibility variables impact adoption indirectly through the influence that prior adoptions have on the choice. Thus, susceptibility is like an interaction, or moderating, effect.

[17] The Haversine formula is used to calculate the distance between points 1 & 2 using latitudes (lat) and longitudes (long): distance (1,2) = R * (2*arcsin(min(1,a^1/2))) where R is the radius of the earth (3963 miles or 6378 km) and a=sin(lat2-lat1)/2)^2 + cos(lat1)*cos(lat2)*sin(long2-long1)/2)^2 (Sinnott 1984).

My proxies for agency costs resulting from management compensation contracts are the executive annual bonuses divided by total compensation for the top 5 executives (*EXEC_BONUS*) and the percent of stock and exercisable options owned by the top 5 executives (*EXEC_OWN*). I proxy for agency costs from debt using *LEVERAGE* calculated as book value of debt to total assets. My proxy for information asymmetries (*INSTOWN*) is the level of institutional ownership of the firm's common stock (Bartov & Bodnar 1996). I represent activity in the capital markets (*ACTIVITY*) as the number of times a firm has issued debt or equity in the past three years. I capture regulatory influences from political costs using the log of net sales as firm size (*SIZE*) and net income scaled by total assets (*PROFIT*).

Lastly, the earnings effect of the change is captured as the difference in current earnings under the fair value method compared to the intrinsic method, which is disclosed in the footnotes, scaled by net sales (*OPTION_EXPENSE*). Ceteris paribus, firms prefer higher net income and, thus, are less likely to adopt an income-decreasing earnings change so I expect a negative sign.

Following Aboody et al. (2004), I expect *EXEC_OWN*, *LEVERAGE*, *ACTIVITY*, *SIZE*, and *PROFIT* to be positive while *EXEC_BONUS* and *INSTOWN* are expected to be negative.

See Figure 2 for a review of the model specification and where each hypothesis will be tested within the model's framework. See Appendix B for the definition of the independent variables.

[INSERT FIGURE 2 HERE]

4.3 Model Statistics

All hypotheses are tested relative to a baseline model that includes only intrinsic independent variables specified as the following:

$$r_n(t) = \exp(\boldsymbol{\alpha}'\mathbf{x_n})$$

where $\mathbf{x_n}$ includes variables capturing agency costs, information asymmetry, market activity, regulatory pressures, and the disclosed option expense described in section 3.2.

I test joint significance of variables with a likelihood ratio test between the contagion models and the intrinsic model. I test incremental explanatory power between models using Akaike's information criterion (AIC) (Burnham & Anderson 2002, 61).[18] The intuition is that the data has an inherent amount of information and that by imposing a model a certain amount of that information is lost. The AIC is a measure of that lost information, with lower values indicating a better fit. Differences in AIC values allow a comparison and ranking of competing models (Burnham & Anderson 2002, 75).[19] Based on the differences in AIC, we can compute Akaike weights, which are the relative likelihood of the model compared against all other models being considered ranging from 0 to 100%.[20]

[18] Akaike Information Criterion equals ($-2*\ln L + 2P$) where L is the maximized value of the likelihood function and P is the number of parameters in the model.
[19] AIC Differences are computed as $\Delta_i = AIC_i - AIC_{min}$, where AIC_{min} is the model with the lowest AIC.
[20] Akaike Weight, $w_i = exp(-0.5 * \Delta_i) / \sum_r (exp(-0.5 * \Delta_r))$, where Δ_i is the AIC difference for the current model and the denominator sums across each of the r models considered.

5. Data and Results for Research Questions One and Two

5.1 Empirical Setting

In 1993, the FASB introduced the fair value method in the Exposure Draft for SFAS 123. In developing the exposure draft, the Board met with compensation consultants who advised them that option-pricing models were used to value employee stock options for compensation purposes (FASB 1995 ¶373). The draft was met with significant controversy (FASB 1995 ¶376), which threatened the very existence of the FASB. Thus, after considerable deliberation FAS 123 offered firms two choices concerning treatment of stock-based compensation: 1) the fair value method or 2) the intrinsic value method with footnote disclosure of the effects of the fair value method. The statement was effective for fiscal years that began after December 15, 1995. Initially, relatively few firms adopted the fair value method.

In July 2002 several firms began voluntarily adopting the fair value method of accounting for stock-based compensation (Aboody et al. 2004). In March 2003, the FASB added an employee stock options project to its agenda, suggesting it might require fair value method treatment in 2004. On April 19, 2004, the International Accounting Standards Board (IASB) issued International Financial Reporting Standard (IFRS) 2, which required the fair value method.[21] In December 2004, the FASB issued FAS 123R, which mandated fair value for firms with a fiscal period beginning on or after June 15, 2005 (FASB 2004).[22] Throughout this period, several scandals became public and regulators, both public and private, instituted corporate governance reforms. See Figure 3 for a

[21] The IASB and FASB initially agreed in September 2002 to promote accounting standards convergence.
[22] SEC release 33-8568 delayed the effective date to fiscal *years* beginning on or after June 15, 2005.

timeline describing some of the corporate governance and regulatory events surrounding stock-based compensation, along with the number of firms adopting over time. These events suggest a period of uncertainty in the business environment along with active involvement from the regulators.

[INSERT FIGURE 3 HERE]

5.2 Sample Selection

I use an equity research report from Bear Stearns & Co. to identify the firms that voluntarily chose the fair value method (McConnell et al 2004). This report lists the firms that voluntarily adopted the fair value method for fiscal years beginning on or after December 15, 1995 through December 16, 2004, which was the issuance date of SFAS 123R. According to the report, there were 529 U.S. firms that had voluntarily adopted.[23] The adoption date for each firm is defined as the date when the firm announced the accounting change.

[INSERT FIGURE 4 HERE]

Figure 4 shows the cumulative adoptions of the fair value method over time. As noted earlier, the 1995 to 2001 period had few adoptions and the vast majority of the adoptions occurred in 2002 through 2004. This is based on the full list of adopters from the Bear Stearns List. A graph using only the subset of adopters that are included in the final sample looks very similar.

Table 1 reports how the options sample was determined. I begin with public U.S. firms on Execucomp, which essentially covers current and past members of the S&P

[23] Two U.S. firms were listed twice on the report and their latter observations were removed.

1500. These firms account for the majority of stock market capitalization and some of my variables require Execucomp data. I choose firm-years beginning on or after the FAS 123 effective date (12/15/95) and before the FAS 123R issuance date (12/16/2004). This results in 2,686 firms and 17,123 firm-years. I further refine the sample based on whether firms disclosed material, positive employee stock option expense in the footnotes or issued stock option grants.[24] These criteria yield 16,536 (2654) unique firm-years (firms), which are matched against the list of adopters from Bear Stearns. For adopters, any years after their year of adoption are removed from the sample because once they adopt they are not eligible, or at-risk, to adopt again. This reduces the sample to 16,492 firm-years for 2948 firms.[25] The sample is further reduced based on availability of data for the independent variables, resulting in 14,829 firm-years for 2,420 firms (251 adopters & 2,169 non-adopters). This constitutes my at-risk sample of firm-years (i.e., years where firms *could* have adopted the choice).[26]

[INSERT TABLE 1 HERE]

Table 2 presents the industry membership of the sample. To obtain one observation per firm, I used the industry classification of a random year for the non-adopters and the year of adoption for adopting firms. The percentage of firms in each industry classification suggests that there are not major differences between adopters

---

[24] I proxy for the issuance of stock options to any employees using stock options granted to executives in Execucomp.

[25] The number of firms increases from 2,654 to 2,948 because 294 firms were on the adopter list but not in the at-risk sample. Almost all of these firms are not on Execucomp (278) and thus will drop out in the data requirement step since the executive compensation variables will have missing values.

[26] Although 278 adopters were not included in the final sample, their observations were used when determining their influence on other firms. This correction theoretically prevents a misspecified model and biased estimation (Greve 1996, 44-45). Ignoring this correction does not seem to affect the inferences.

and non-adopters for the majority of the industries. However, there are material differences for Manufacturing (25% vs. 44%) and Financial (41% vs. 10%).

[INSERT TABLE 2 HERE]

5.3 Descriptive Statistics

Table 3 displays differences between firms that adopted the fair value method compared to firms that never adopted. For the adopters, the year the firm announced their adoption is used and for the non-adopters, I chose a random year from the years the firm was at-risk of adopting. The descriptive statistics of intrinsic variables suggest larger, more profitable firms adopted fair value. Adoption was chosen by firms with higher executive bonuses, lower executive ownership, higher leverage, higher institutional ownership, more activity in the capital markets and lower option expense in comparison with non-adopters.[27]

[INSERT TABLE 3 HERE]

Table 4 presents the Spearman correlations of the intrinsic variables.[28] While some of the correlations are significant, mainly due to common scaling, none of the correlations suggests multicollinearity is a significant issue for the intrinsic vector of variables. An untabulated iterative principal factor analysis produces two factors with eigenvalues over one; the intrinsic variables load heavily onto one factor and the contagion variables on the other, supporting the separation of these two vectors for accounting choice decisions.

[27] My results are still supported when I use the natural log of several of the skewed intrinsic variables.
[28] The Pearson correlation coefficient matrix supports similar inferences.

[INSERT TABLE 4 HERE]

Figure 5 presents the Kaplan-Meier estimate of the survivor function, which is the probability of a firm surviving in the population (i.e., not adopting). The y-axis is the proportion of the population still "at-risk" of adopting (or surviving) while the x-axis is the time since the beginning of the sample period in days. The survival curve can be split by groups (e.g., firms with a board interlock to a prior adopter vs. those without) to provide univariate evidence of the impact of independent variables on the time to adopt. For continuous variables, I split firms into two groups based on above or below the median value. Lower (higher) lines indicate a higher (lower) probability of adopting. Comparing intrinsic variables with contagion variables suggests that the contagion variables have more of an impact on distinguishing between firms that adopt and those that do not. Also, these graphs suggest that the impact of contagion variables matter throughout the sample period rather than just the last few years.[29]

[INSERT FIGURE 5 HERE]

5.4 Test of Hypotheses 1, 2, and 3

Table 5 presents the maximum likelihood coefficients from estimating the Strang & Tuma (1993) diffusion model using a modified version of the event history software, RATE (Tuma 1993). First, I estimate coefficients of a baseline model with only intrinsic variables. The results support the predicted signs on four of eight intrinsic variables and statistical significance for three of those variables. The executive bonus and executive

[29] Here I show only 2 intrinsic and 2 contagion variables but untabulated results suggest these inferences generally hold across both sets of variables.

ownership variables are opposite the expected sign, but they lose statistical significance once the contagion variables are added later. *INST_OWN* is also in the opposite direction than predicted. An explanation is found in Ferri and Sandino (2009), which documents that activist shareholders were associated with an increased likelihood of stock option expensing adoption.

Column 1 of Table 5 documents the results from a model with the intrinsic variables and the variables predicted for hypothesis H1a (i.e., proxies for communication channels). *PRIOR_BOARD* is statistically significant in the predicted direction suggesting board interlocks to prior adopters are influential. *PRIOR_CLOSE* is also statistically significant and positive supporting the hypothesis that firms in the same geographic area influence each other. Ties to prior adopters through a common auditor (*PRIOR_AUDIT*) were in the predicted direction but not significant. This is likely due to the sample being restricted to the S&P 1500 firms who are audited almost exclusively by the Big-N auditors. Untabulated analysis suggests that sharing an auditor from the same industry does impact the likelihood of adoption. The information-based variables are jointly significant ($\chi 2$=163.67, p=0.000) and the AIC of the model suggests a significant improvement over the baseline model, providing evidence for H1a.

[INSERT TABLE 5 HERE]

Column 2 of Table 5 documents the results from a model with the intrinsic variables and the variables predicted for hypothesis H1b (i.e., proxies for the influence of reference groups). Firms were influenced by the prior adoptions of large firms as evidenced by a positive and significant coefficient on *PRIOR_SALES*. The variable for industry ties, *PRIOR_INDUSTRY,* was significant and in the predicted direction as well. These variables are jointly significant (χ^2=351.03, p=0.000) and the AIC of the model suggests a significant improvement over the baseline model, providing evidence for H1b.

Column 3 of Table 5 documents the results from a model with the intrinsic variables and the prior adoption of a rival, predicted positive for hypothesis H2. *PRIOR_RIVAL* is significant and in the predicted direction (β=6.107 p=0.00). The AIC of this model is significantly lower than the intrinsic-only model (difference of 185.84), which along with the coefficient strongly supports H2.[30]

Column 4 of Table 5 presents the full model with intrinsic variables and all contagion variables. The inferences from the prior models are essentially the same. The model in column 4 is the preferred model of all the models considered with an Akaike weight of 99% (out of a possible 100%). To provide some sense of the economic significance of the contagion variables, the coefficients can be interpreted as the logged multiplier of the effect of a firm with a prior adopter with a particular attribute versus a firm without that prior adopter (see Greve 1995, 462). For example, *PRIOR_CLOSE* has a coefficient of 1.694 suggesting a firm with an adoption by a geographically close firm is 5.4 times [exp(1.694)] more likely to adopt than a firm without such a prior adoption.

[30] Another interpretation is that rivals have very similar intrinsic propensities to adopt and the coefficient is picking up some unidentified intrinsic propensity to adopt. If that is true, then at the very least the results from H1a & H1b are more strongly supported in column 4 by including a variable that picks up additional intrinsic variables.

Similarly, a firm with a board interlock to a prior adopter is 128 times [exp(4.853)] more likely to adopt than a firm without such a board interlock. For the intrinsic variables, we can compute the effect for a specific change in the variable. For example, an increase in *SIZE* from the 25^{th} percentile to the 75^{th} percentile (a change of 2.11) suggests that a firm at the 75^{th} percentile is 6.4 times [exp(0.882*2.11)] as likely to adopt as a firm at the 25^{th} percentile. Thus, the contagion variables seem to be quite strong.

Table 6 reports the results from adding the susceptibility variables to the baseline model. Again, variables can be in the intrinsic and the susceptibility vector at the same time. However, their influence in the two vectors is quite different since variables in susceptibility are moderating the influence of prior adoptions. Since H4a & H4b are motivated by information-based contagion, I add the susceptibility variables for *PROFIT* and *SIZE* to the model with information-based variables in column 1 and 2 respectively. *PROFIT is* in the opposite direction but insignificant. The *SIZE* variable is significant and positive suggesting larger firms attend to prior adoptions more closely than smaller firms. To test H4c, I included *INDUSTRY_CONC* in a model with *PRIOR_RIVAL* since the hypothesis is about rivalry-based contagion. In column 3, the *INDUSTRY_CONC* variable is positive and significant suggesting firms in more concentrated industries attend to the prior adoptions of their rivals more closely than firms in less concentrated industries. The results support H3b and H3c but H3a is not supported.

[INSERT TABLE 6 HERE]

5.5 Robustness Checks

In this section, I explore alternative specifications of the model to determine if the evidence supporting the hypotheses is robust.

One potential argument against my choice for sample period is that there was a shock in 2001/2002 from the accounting scandals that shifted the weights placed on the intrinsic variables. Thus, the argument is that the process that led to adoptions post-scandal era differs materially from the process in place previously. If this is the case, then some of the contagion variables might be picking up this pre-shock vs. post-shock effect. However, results from running the analysis for only the 2002 and beyond time period still broadly support my inferences.[31]

Another concern is that the adopting firms were heavily concentrated in certain industries, especially Financial, Insurance, & Real Estate (see Table 2). The original tests could not control for industry membership due to software restrictions. When I exclude financial firms from the sample and re-run my main tests, all inferences are unchanged (support for *PRIOR_CLOSE* is weakened but still present).[32]

Since the benchmark is the intrinsic only model, I examine alternative specifications of the *INTRINSIC* vector. Since oil and gas industries may garner additional political scrutiny (Bowen et al. 1995), I include sales from oil and gas firms. The investment opportunity set has also been associated with accounting choice

---

[31] Also, the intrinsic vector has better support with *INSTOWN* & *ACTIVITY* loading significantly in the predicted direction

[32] This is not surprising as many of the financial firms were located in the same city (New York).

(Skinner 1993). Thus, I include research and development expense and the market-to-book ratio. For market activity, the number of issuances is split into equity and debt to control for the possibility of differential impacts. Also, I include the net proceeds of equity issued scaled by total assets as an alternative proxy of market activity. I also control for excess executive compensation (over $1M per executive per year) and marginal tax rates due to tax effects (Balsam & Ryan forthcoming; Blacconiere et al. 2008). I control for outside director's stock ownership (Aboody et al. 2004). Ferri and Sandino (2009) find that stock option expensing was influenced by shareholder proposals set forth by institutional owners. I control for activist institutional ownership (Cremers & Nair 2003) as a proxy for this effect. Alternative, but less available, proxies for information asymmetries are analyst coverage and forecast dispersion (Barron et al. 1998). While some of these variables load significantly, none of these modifications change my inferences about the hypotheses.

6. Data and Results for Research Question Three

6.1 Empirical Settings

Hypothesis 4 predicts the uncertainty of the accounting choice increases the strength of contagion effects relative to intrinsic effects. My proxy for the uncertainty of an accounting choice decision is whether there are direct cash flow effects of the choice. I argue that in cases where there are direct cash flow effects from the choice, there is less uncertainty. These cash flow effects are likely strongest in cases where taxes and regulation play a significant role. Based on the review of the origins and development of the choices in this paper, I contend that the inventory choice has more direct cash flows than the depreciation or stock option settings due to the tax conformity rule. Thus, contagion variables are predicted to have a weaker relative role than intrinsic variables in the inventory setting and a stronger relative role in the depreciation and stock option setting.

6.1.1 Inventory Valuation and Costing

Firms have discretion over the method used to allocate inventory costs between cost of goods sold and ending inventory. For many firms, (especially manufacturing and merchandising firms) the choice of inventory method is material to the income statement and balance sheet and as such is an important accounting choice to study (Bowen et al. 1995). As discussed in section 2, LIFO has been “GAAP” since the 1930’s and FIFO was generally accepted probably long before that. So, firm’s have had choice of inventory methods for quite some time. I am interested in how choices diffuse through a population so I will examine changes in inventory method rather than cross-sectional variation.

I adjust the Strang & Tuma (1993) model specification to include variables related to inventory. Following Bowen et al. (1995), I adjust total assets by adding the LIFO reserve and accumulated depreciation to total assets, in an attempt to remove some of the effects of the accounting method choices from the variables. Instead of the *OPTIONS_EXPENSE* variable, I use *INVENTORY_ASSETS*, which is ending inventory scaled by total adjusted assets, and *COGS_SALES*, which is Cost of goods sold minus the change in LIFO reserve scaled by net sales. I use these variables to capture the relative importance of the financial statement accounts that would be impacted by a change in inventory method since I cannot estimate that change directly. I expect taxes to play a significant role in the inventory choice, so I include marginal tax rates (Graham and Mills 2008) interacted with COGS as an estimate of the tax savings.

6.1.2 Depreciation of Long-Lived Assets

The choice of depreciation methods can have significant effects on the balance sheet and income statement of firms (Bowen et al. 1995). Firms have had the discretion to choose among straight-line and various accelerated depreciation methods since Accounting Research Bulletin (ARB) #44 was issued in 1954 (Holthausen 1981). Early studies on firms that change depreciation methods focused on the earnings management potential of changing methods (Archibald 1967, 1972, Cushing 1969, Barefield & Comiskey 1971). Later studies emphasized the implications of debt contracting, management compensation contracting, regulatory pressures, and taxes (Hagerman & Zmijewski 1979, Bowen et al. 1995). As Keating & Zimmerman (2000) point out, these studies mainly provide cross-sectional associations on the determinants of a firm's method with weak explanatory power and that other studies seeking to explain a change in methods (e.g., Holthausen 1981, Sweeney 1994) provide even weaker results.

Similar to the inventory setting, I adjust the Strang & Tuma (1993) model specification to include variables related to depreciation. Instead of the *OPTIONS_EXPENSE* variable, I use *PPE_ASSETS*, which is ending property, plant, and equipment scaled by total adjusted assets, and *DP_SALES*, which is depreciation expense scaled by net sales. I use these variables to capture the relative importance of the financial statement accounts that would be impacted by a change in depreciation method since I cannot estimate that change directly.

6.2 Sample Selection

I use 10K filings from the SEC's EDGAR website to identify whether firms have changed their accounting method. I use this data because of evidence that Compustat does not accurately identify accounting changes (Keating & Zimmerman 2000). I identify firms that have changed their inventory and depreciation methods by examining the audit opinion since auditors are required by auditing standards to include a consistency paragraph when firms make a change in accounting principle.[33] I use Perl to identify the explanatory paragraphs containing accounting method changes and then manually verify the changes. This detection method is likely biased towards finding method changes that have a larger effect on the financial statements since auditors will likely disclose only when the effect on the financial statements meets their materiality threshold. This procedure results in 101 inventory changes and 35 depreciation changes. From those sets, there are 25 changes to FIFO and 14 changes to Straight-Line. These small numbers of adopters suggest that accounting method changes are quite infrequent, consistent with Dichev & Li (2006).

[INSERT TABLE 7 HERE]

[33] Currently, Auditing Standard 6 requires this consistency paragraph; prior to the Public Corporation Accounting Oversight Board's jurisdiction, the AICPA required the consistency paragraph under codified sections AU 420 and AU 508.

I begin my sample selection with firm-years observations of public U.S. firms on Compustat from 1995-2008 (see Table 7).[34] For the inventory sample, I require firm-years with a valid footnote code of the method used and positive amount of the ending inventory account balance or a positive amount of cost of goods sold, resulting in 59,620 firm-years. For the depreciation sample, the footnote code is required and positive amounts are required for property, plant, and equipment or depreciation expense, resulting in 88,178 firm-years. I then require firms to have a central index key (CIK) and an accession number in order to obtain the 10-K reports from the SEC's EDGAR website. This requirement reduces the sample to 52,956 (75,488) firm-years for inventory (depreciation).

Since untabulated analysis of Compustat firms shows a significant trend towards the vast majority of firms using the FIFO (straight-line) method, I will focus on firms that change to exclusive use of FIFO (straight-line). So, I remove firm-years where firms were exclusively using FIFO (SL) in the prior year since these firms cannot switch to those methods. This leaves the inventory (depreciation) sample with 26,944 (54,923) firm-years. Then I remove any firm-years for adopting firms that occur after their adoption year. Essentially, once a firm makes a change, they are removed from the at-risk sample.[35] This removes 20 (57) firm-years from the inventory (depreciation) sample. Lastly, requirements for the independent variables reduces the final sample to 9,937 (15,822) for inventory (depreciation).

---

[34] I chose 1995-2008 due to coverage on the SEC's EDGAR website of 10K filings.
[35] While conceptually, firms may change their depreciation and inventory methods more than once, firms rarely change methods. In addition, I impose this restriction to be consistent with the stock options setting.

6.3 Descriptive Statistics

Table 8 presents the industry composition of the inventory sample. The dominant industry group is manufacturing followed by wholesale trade, retail trade, and services. For the industries where there are adopters, the differences in industry composition relative to the non-adopters do not appear to be significant. However, there are several industries with non-adopters but zero adopters suggesting industry may play a significant role. Similarly, Table 9 presents the industry composition of the depreciation sample. Again, manufacturing is the leading industry for adopters followed by services and transportation. There are a significantly greater number of adopters in manufacturing than non-adopters and several industries do not have adopters. To alleviate the concerns that industry differences are driving the results, I re-run the analysis of H4 by removing the industries with zero adopters. The evidence for H4 is the same, if not stronger, with this restriction.

[INSERT TABLE 8, TABLE 9 HERE]

Table 10 presents the descriptive statistics for adopters and non-adopters for the inventory sample. I chose a random year of each non-adopting firm and the year of adoption for each adopting firm. Generally, the firms that chose to adopt tend to be smaller, less profitable, with higher leverage. They have higher levels of executive ownership, higher relative balances of inventory, and lower estimated tax savings.

[INSERT TABLE 10 HERE]

Table 11 presents descriptive statistics for the depreciation sample. There appears to be significant differences in the magnitudes of several variables related to size and profitability. However, due to even lower numbers of adopting firms in this setting (n=14), there were relatively few variables with statistical significance. Institutional ownership and depreciation expense are the exceptions.

[INSERT TABLE 11 HERE]

6.4 Test of Hypothesis 4

Table 12 presents the diffusion model estimates of the propensity to adopt FIFO for the inventory sample.[36] Since FIFO is generally an income-increasing choice, many of the intrinsic variables have a predicted sign opposite of the stock options setting, which was an income-decreasing choice. *MTR_COGS* is expected to be negative since a change to FIFO would reduce the COGS amount and thus reduce the tax deduction from COGS.[37] For the intrinsic only model, nine of the ten variables are in the predicted direction. *EXEC_OWN*, *INVENTORY_ASSETS*, and *MTR_COGS* are all in the predicted direction and statistically significant. The intrinsic variables are jointly significant ($\chi 2$=46.62, p=0.000) and the AIC for the model is 619.59.

[INSERT TABLE 12 HERE]

When the contagion variables are added to the model, eight of the ten intrinsic variables are still in the predicted direction and three still are statistically significant. In

---

[36] The coefficient estimates for the depreciation setting would not converge using the full model due to multicollinearity of the *PRIOR_RIVAL* variable with the other contagion variables. Therefore, the full contagion models for the inventory and depreciation settings omit *PRIOR_RIVAL*.

[37] MTR_COGS is an interaction term. Adding an additional variable for MTR does not change my inferences.

addition, *SIZE* and *ACTIVITY* become statistically significant but *ACTIVITY* is in the wrong direction. Of the contagion variables, *PRIOR_CLOSE* and *PRIOR_INDUSTRY* are positive and statistically significant as predicted. The full model is jointly significant ($\chi2$=69.43, p=0.000) and the AIC for the model is 608.79. Thus, the full model improves on the intrinsic-only model with an AIC difference of 10.81, which is a 1.74% improvement in model fit.

Table 13 provides the results of estimating the diffusion model on the depreciation sample. Similar to FIFO, Straight-Line is generally an income-increasing choice, so the predicted signs for the depreciation setting are the same as those for the inventory setting. For the intrinsic only model, only five of the nine variables are in the predicted direction. Only *EXEC_OWN* and *INSTOWN* are statistically significant. The intrinsic variables are jointly significant ($\chi2$=17.75, $p<.05$) and the AIC for the model is 392.27.

[INSERT TABLE 13 HERE]

When the contagion variables are added to the model, only four of the ten intrinsic variables are still in the predicted direction; *EXEC_OWN* is still statistically significant. In addition, *PROFIT, LEVERAGE, PPE_ASSETS,* and *DP_SALES* become statistically significant but *LEVERAGE* is in the wrong direction. Of the contagion variables, only *PRIOR_INDSUTRY* is positive and statistically significant as predicted. The full model is jointly significant ($\chi2$=51.60, p=0.000) and the AIC for the model is 370.41.

Thus, the full model improves on the intrinsic-only model with an AIC difference of 21.86, which is a 5.57% improvement in model fit.

Comparing the two sets of results, the contagion variables appear to improve the intrinsic-only model relatively more in the depreciation setting than the inventory setting (5.57% vs. 1.74%). This provides evidence that is consistent with H4. Clearly, I cannot statistically test this hypothesis. That fact along with the small numbers of adopters in my settings precludes me from drawing overly broad inferences from the results.

7. Conclusions

Managers do not make financial reporting choices in isolation. Firms are embedded in a network of other firms (Granovetter 1985). As a result, managers can learn about an uncertain business environment or uncertain business practice from the actions of managers of other firms who are trying to navigate that same environment (Useem 1984, Rogers 2003, 342).

Building on this concept, I develop and test hypotheses on the contagion of accounting method choices. I argue that prior adoptions will cause managers to revise their expectation of the net benefits of adopting the choice due to either information-based contagion or spillover-based contagion (research question one). I obtain data and test my hypotheses using stock option expensing, where firms had a choice between the fair value method and the intrinsic method.

Analysis of stock option expensing provides overall support that contagion (or influence from prior adoptions) does affect the stock option expensing decision. Results provide support of my first hypothesis (H1a), which predicts that communication channels between a prior adopter and potential adopter are associated with an increased likelihood of adoption. This is especially true for board interlocks and geographically close firms. I also find support for influence from informative reference groups (H1b) since prior adoptions by large firms and firms in the same industry are influential for the adoption decision.

I also find evidence that adoption by a competitive rival strongly influences the adoption decision (H2). I interpret this as the prior adoption by a rival made it more costly for the firm to not adopt. Another interpretation is that the prior adoption by a rival provides especially useful information for a firm facing the adoption decision.

Additional tests support the inference that firm size and industry concentration affects a firm's susceptibility to the influence of prior adoptions (research question two). That is, firms vary in how much they are influenced by prior adopters. Overall, my results suggest that prior adopters influence the firm's accounting choice decision.

The third research question addresses whether all accounting choices are equally subject to contagion effects. Can certain aspects of the accounting choice itself predict whether contagion will be a factor in the adoption decision? I predicted that the presence of direct cash flow effects (e.g., taxes) should reduce the influence of contagion. My analysis of the inventory and depreciation method settings provides evidence consistent with this prediction. However, the inability to test the prediction statistically and the scarcity of method changes in the data limit the inferences that can be drawn.

Accounting choice is an important topic for financial accounting research. Regulators have been removing alternative methods from the acceptable set of accounting methods since government oversight began in the 1930s (SEC 2002). The explicit assumption is that there is a significant cost to allowing variation in accounting methods between firms, namely a loss in comparability in performance for investment-related decisions. Given this assumption, it is important to understand how managers *actually* make accounting policy decisions. This paper contributes to that understanding in a novel way.

References

Aboody, D., M. E. Barth, et al. (2004). "Firms' Voluntary Recognition of Stock-Based Compensation Expense." Journal of Accounting Research **42**(2).

Abrahamson, E. and L. Rosenkopf (1993). "Institutional and competitive bandwagons: Using mathematical modeling as a tool to explore innovation diffusion." Academy of Management Review **18**(3): 487-517.

Alchian, A. (1950). "Uncertainty, Evolution, and Economic Theory." The Journal of Political Economy **58**(3): 211-221.

APB (1972). APB Opinion No. 25, Accounting for Stock Issues to Employees. New York, NY, Accounting Principles Board.

Archibald, T. R. (1967). "The Return to Straight-Line Depreciation: An Analysis of a Change in Accounting Method." Journal of Accounting Research **5**: 164-180.

Archibald, T. R. (1972). "Stock Market Reaction to the Depreciation Switch-Back." The Accounting Review **47**(1): 22-30.

Auten, G. (1999). Capital Gains Taxation. The Encyclopedia of Taxation and Tax Policy. J. Cordes, R. Ebel and J. Gravelle, Urban Institute Press.

Baker, J. C. (1940). "Stock Options for Executives." Harvard Business Review **19**(1): 106-122.

Balsam, S. and D. Ryan (forthcoming). "The Effect of Internal Revenue Code Section 162(m) on the Issuance of Stock Options." Advances in Taxation.

Barefield, R. M. and E. E. Comiskey (1971). "Depreciation Policy and the Behavior of Corporate Profits." Journal of Accounting Research **9**(2): 351-358.

Barron, O. E., O. Kim, et al. (1998). "Using Analysts' Forecasts to Measure Properties of Analysts' Information Environment." The Accounting Review **73**(4): 421-433.

Bartov, E. and G. Bodnar (1996). "Alternative accounting methods, information asymmetry and liquidity: Theory and evidence." The Accounting Review **71**(3): 397-418.

Bass, F. (1969). "A new product growth model for consumer durables." Management Science **15**(5): 215-227.

Basu, S. and G. Waymire (2006). "Recordkeeping and Human Evolution." Accounting Horizons **20**(3): 201-229.

Beaver, W. H. (1998). Financial reporting: An accounting revolution. Upper Saddle River, Prentice Hall.

Berle, A. and G. Means (1932). The Modern Corporation and Private Property. New York, Macmillan Publishing Co.

Bikhchandani, S., D. Hirshleifer, et al. (1992). "A Theory of Fads, Fashion, Custom, and Cultural-Change as Informational Cascades." Journal of Political Economy **100**(5): 992-1026.

Bizjak, J., M. Lemmon, et al. (2007). "Option Backdating and Board Interlocks." Available at SSRN: http://ssrn.com/abstract=946787 **February 2007**.

Blacconiere, W., M. Johnson, et al. (2008). "The role of tax regulation and compensation contracts in the decision to voluntarily expense employee stock options." Journal of Accounting & Economics **46**: 101-111.

Blossfeld, H.-P., G. Rohwer, et al. (2007). Event History Analysis With Stata, Lawrence Erlbaum.

Borgatti, S. and P. Foster (2003). "The Network Paradigm in Organizational Research: A Review and Typology." Journal of Management **29**(6).

Bothner, M. S. (2003). "Competition and social influence: The diffusion of the sixth-generation processor in the global computer industry." The American Journal of Sociology **108**(6): 1175.

Bowen, R., L. DuCharme, et al. (1995). "Stakeholders implicit claims and accounting method choice." Journal of Accounting & Economics **20**(3): 255-295.

Box-Steffensmeier, J. M. and B. S. Jones (2004). Event History Modeling: A Guide for Social Scientists, Cambridge University Press.

Brazell, D., L. Dworin, et al. (1989). A History of Federal Tax Depreciation Policy. Office of Tax Analysis, US Treasury Department.

Buchanan, J. M. and W. C. Stubblebine (1962). "Externality." Economica **29**(116): 371-384.

Burnham, K. P. and D. R. Anderson (2002). Model selection and multimodel inference: A practical information-theoretic approach. New York, Springer.

Campbell, J. (1951). "Straight-line method of depreciation." The Accounting Review **26**(1): 40-42.

Chamillard, G. (2003). "Go West Again?" Research Technology Management.

Choudhary, P., S. Rajgopal, et al. (2008). "Accelerated vesting of employee stock options in anticipation of FAS 123-R." Journal of Accounting Research **forthcoming**.

Chua, W. F. and R. Petty (1999). "Mimicry, Director Interlocks, and the Interorganizational Diffusion of a Quality Strategy: A Note." Journal of Management Accounting Research.

Cremers, M. and V. Nair (2005). "Governance mechanisms and equity prices." Journal of Finance **60**(6): 2859-2894.

Cushing, B. E. (1969). "An Empirical Study of Changes in Accounting Policy." Journal of Accounting Research **7**(2): 196-203.

Davis, G. (1991). "Agents without Principles? The Spread of the Poison Pill through the Intercorporate Network." Administrative Science Quarterly **36**(4).

Davis, G. and H. R. Greve (1997). "Corporate Elite Structures and Governanace Changes in the 1980s." American Journal of Sociology **103**(1).

Davis, H. (1982). "History of LIFO." Accounting Historians Journal **9**(1): 1-23.

Dichev, I. D. and F. Li (2006). Growth and Accounting Choice. SSRN eLibrary, SSRN.

Ellig, B. R. (2006). "The Evolution of Executive Pay in the United States." Compensation and Benefits Review **38**(1): 55.

Farrell, J. and G. Saloner (1985). "Standardization, compatibility, and innovation." Rand Journal of Economics **16**(1): 70-83.

FASB (1995). SFAS 123 - Accounting for Stock-Based Compensation. Norwalk, CT, Financial Accounting Standards Board.

FASB (2004). SFAS123R - Share-Based Payment. Norwalk, CT, Financial Accounting Standards Board.

Ferri, F. and T. Sandino (2009). "The impact of shareholder activism on financial reporting and compensation: The case of employee stock options expensing." The Accounting Review **84**(2): 433-466.

Fields, T., T. Lys, et al. (2001). "Empirical research on accounting choice." Journal of Accounting and Economics **31**.

Galaskiewicz, J. and S. Wasserman (1989). "Mimetic processes within an interorganizational field: An empirical test." Administrative Science Quarterly **34**(3): 454-479.

Gibbons, M., S. Salterio, et al. (2001). "Evidence about auditor-client management negotiation concerning client's financial reporting." Journal of Accounting Research **39**(3): 535-563.

Gimeno, J., R. Hoskisson, et al. (2005). "Explaining the clustering of international expansion moves: A critical test in the U.S. Telecommunications Industry." Academy of Management Journal **48**(2): 297-319.

Gleason, C. A., N. T. Jenkins, et al. (2008). "The Contagion Effects of Accounting Restatements." The Accounting Review **83**(1): 83-110.

Graham, J. R. and L. F. Mills (2008). "Using tax return data to simulate corporate marginal tax rates." Journal of Accounting and Economics **46**(2-3): 366-388.

Granovetter, M. (1985). "Economic action and social structure: The problem of embeddedness." American Journal of Sociology **91**(3).

Greve, H. R. (1995). "Jumping ship: The diffusion of strategy abandonment." Administrative Science Quarterly **40**(3): 444.

Greve, H. R. (1996). "Patterns of Competition: The Diffusion of a Market Position in Radio Broadcasting " Administrative Science Quarterly **41**(1): 29-60.

Greve, H. R. (2005). "Interorganizational learning and heterogeneous social structure." Organization Studies **26**(7): 1025-1047.

Greve, H. R., D. Strang, et al. (1995). "Specification and Estimation of Heterogeneous Diffusion Models." Sociological Methodology **25**: 405-420.

Hagerman, R. and M. Zmijewski (1979). "Some economic determinants of accounting policy choice." Journal of Accounting & Economics **1**: 141-161.

Haunschild, P. R. (1993). "Interorganizational imitation: The impact of interlocks on corporate acquisition activity." Administrative Science Quarterly **38**(4): 564.

Haunschild, P. R. (1994). "How much is that company worth?: Interorganizational relationships, uncertainty, and acquisition premiums." Administrative Science Quarterly **39**(3): 391.

Haunschild, P. R. and A. S. Miner (1997). "Modes of interorganizational imitation: The effects of outcome salience and uncertainty." Administrative Science Quarterly **42**(3): 472.

Haveman, H. A. (1993). "Follow the leader: Mimetic isomorphism and entry into new markets." Administrative Science Quarterly **38**(4): 593.

Heier, J. (2006). "America's railroad depreciation debate, 1907 TO 1913: A study of divergence in early 20th century accounting standards." Accounting Historians Journal(June).

Henrich, J. (2004). "Cultural group selection, coevolutionary processes, and large-scale cooperation." Journal of Economic Behavior & Organization **53**: 3-35.

Henrich, J. and F. J. Gil-White (2001). "The evolution of prestige: freely conferred deference as a mechanism for enhancing the benefits of cultural transmission." Evolution and Human Behavior **22**(3): 165-196.

Holderness, C., R. Kroszner, et al. (1999). "Were the good old days that good? Changes in managerial stock ownership since the Great Depression." Journal of Finance **54**(2): 435-469.

Holthausen, R. W. (1981). "Evidence on the Effect of Bond Covenants and Management Compensation Contracts on the Choice of Accounting Techniques." Journal of Accounting & Economics **3**(1): 73-109.

Holthausen, R. W. and R. W. Leftwich (1983). "The economic consequences of accounting choice implications of costly contracting and monitoring." Journal of Accounting and Economics **5**: 77-117.

Ivkovic, Z. and S. Weisbenner (2005). "Local does as local is: Information content of the geography of individual investors' common stock investments." Journal of Finance **60**(1).

Keating, A. S. and J. L. Zimmerman (2000). "Depreciation-policy changes: tax, earnings management, and investment opportunity incentives." Journal of Accounting and Economics **28**(3): 359-389.

Kedia, S. and S. Rajgopal (forthcoming). "Geography and the incidence of financial misreporting." Journal of Financial Economics.

Kern, B. (2000). "The role of depreciation and the investment tax credit in tax policy and their influence on financial reporting during the 20th century." Accounting Historians Journal **Dec**.

Knight, F. H. (1921). Risk, Uncertainty, and Profit. Boston, MA, Hart, Schaffner & Marx; Houghton Mifflin.

Korn, H. J. and J. A. C. Baum (1999). "Chance, imitative, and strategic antecedents to multimarket contact." Academy of Management Journal **42**(2): 171.

Lieberman, M. and S. Asaba (2006). "Why do firms imitate each other?" Academy of Management Review **31**(2): 366-385.

Littleton, A. C. (1933). Accounting evolution to 1900. New York, American Institute Publishing Co., Inc.

Mahajan, V. and R. A. Peterson (1985). Models for Innovation Diffusion. Newbury Park, CA, Sage.

McConnell, P., J. Pegg, et al. (2004). FASB does it: FAS 123(r) requires stock option expensing. Equity Research Report, Bear Stearns & Co.

McCullough, E. (1921). Depreciation: Its treatment in production. U. C. o. Commerce. Washington, D.C., Fabricated Production Department.

Mizruchi, M. (1996). "What do interlocks do? An analysis, critique, and assessment of research on interlocking directorates." Annual Review of Sociology **22**: 271-298.

Nash, L. R. (1930). "Depreciation accounting methods for public utilities." The Accounting Review **5**(2): 125-141.

North, D. C. (1991). "Institutions." Journal of Economic Perspectives **5**(1): 97-112.

North, D. C. (2005). Understanding the process of economic change. Princeton & Oxford, Princeton University Press.

Palmer, D., P. D. Jennings, et al. (1993). "Late adoption of the multidivisional form by large U.S. Corporations: Institutional, political, and economic accounts." Administrative Science Quarterly **38**: 100-131.

Pincus, M. (1989). "Legislative history of the allowance of LIFO for tax purposes." Accounting Historians Journal **16**(1): 23-55.

Pincus, M. (1997). "Stock price effects of the allowance of LIFO for tax purposes." Journal of Accounting and Economics **23**(3): 283-308.

Rao, H., G. Davis, et al. (2000). "Embeddedness, Social Identity, and Mobility: Why Firms Leave the NASDAQ and join the New York Stock Exchange." Administrative Science Quarterly **45**(2).

Rao, H. and Sivakumar (1999). "Institutional Sources of Boundary-Spanning Structure:The Establishment of Investor Relations Departments in the Fortune 500 Industrials." Organization Science **10**(1): 27-43.

Rogers, E. M. (2003). Diffusion of Innovations. New York, NY, Free Press.

SEC (2002). Disclosure in Management's Discussion and Analysis about the Application of Critical Accounting Policies (RIN 3235-AI44). S. a. E. C. ("Commission").

Seethamraju, C. and T. Zach (2003). "Expensing stock options: the role of publicity." Working Paper: Washington University of St. Louis.

Sinnott, R. W. (1984). "Virtues of the Haversine." Sky & Telescope **68**(2): 159.

Sivakumar, K. and G. Waymire (2003). "Enforceable Accounting Rules and Income Measurement by Early 20th Century Railroads." Journal of Accounting Research **41**(2): 397-432.

Skinner, D. J. (1993). "The investment opportunity set and accounting procedure choice : Preliminary evidence." Journal of Accounting and Economics **16**(4): 407-445.

Strang, D. and S. Soule (1998). "Diffusion in Organizations and Social Movements: From Hybrid Corn to Poison Pills." Annual Review of Sociology **24**.

Strang, D. and M. C. Still (2006). "Does ambiguity promote imitation, or hinder it? an empirical study of benchmarking teams." European Management Review **3**(2): 101.

Strang, D. and N. B. Tuma (1993). "Spatial and Temporal Heterogeneity in Diffusion." American Journal of Sociology **99**(3): 614-639.

Sweeney, A. P. (1994). "Debt-covenant violations and managers responses." Journal of Accounting & Economics **17**: 281-308.

Trombley, M. A. (1989). "Accounting Method Choice in the Software Industry: Characteristics of Firms Electing Early Adoption of SFAS No. 86." The Accounting Review **64**(3): 529.

Tse, S. and J. Tucker (forthcoming). "Within-Industry Timing of Earnings Warnings: Do Managers Herd?" Review of Accounting Studies.

Tuma, N. B. (1993). Invoking RATE. Department of Sociology, Stanford University.

Useem, M. (1984). The Inner Circle. New York, Oxford University Press.

Washington, G. T. and V. H. Rothschild (1962). Compensating the Executive. New York, The Ronald Press Company.

Watts, R. L. and J. L. Zimmerman (1990). " Positive Accounting Theory: A Ten Year Perspective." The Accounting Review **65**(1): 131-156.

Waymire, G. and S. Basu (2008). "Accounting as an evolved economic institution." Foundations and Trends In Accounting **2**(1-2).

Figure 1 Diffusion of Methods The figure shows the conceptual case of the diffusion, or spread, of an accounting method through time.

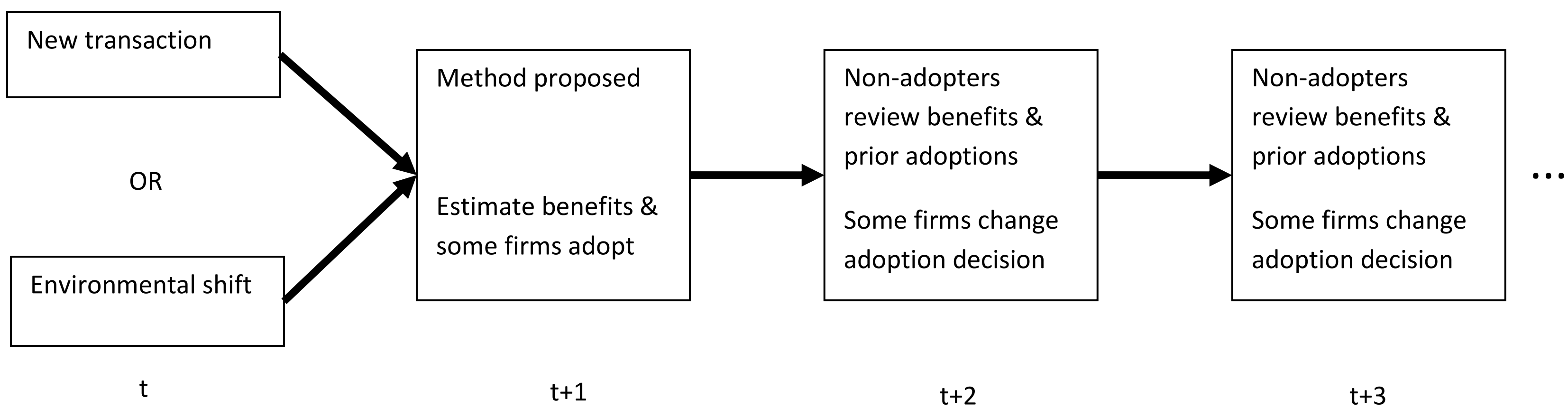


Figure 2 Model Description This figure describes the Strang & Tuma (1993) model that is used to empirically test my hypotheses. The vectors of the model are labeled and the corresponding hypotheses that are tested in each vector are specified. See the Appendix A for details of the model's derivation.

Model Description	Hazard Rate	Intrinsic	Susceptibility	Infectious	Proximity

$$r_n(t) = \exp(\alpha' x_n) \ + \ \exp(\beta' v_n) \ * \ [\sum_{s(t)} \exp(\gamma' w_s + \delta' z_{ns})]$$

Hypotheses		Controls	H3a, H3b, H3c	H1b	H1a, H1b, H2

Figure 3 Stock Options Timeline The figure shows the number of adoptions of the fair value method per month and select corporate governance and regulatory events.

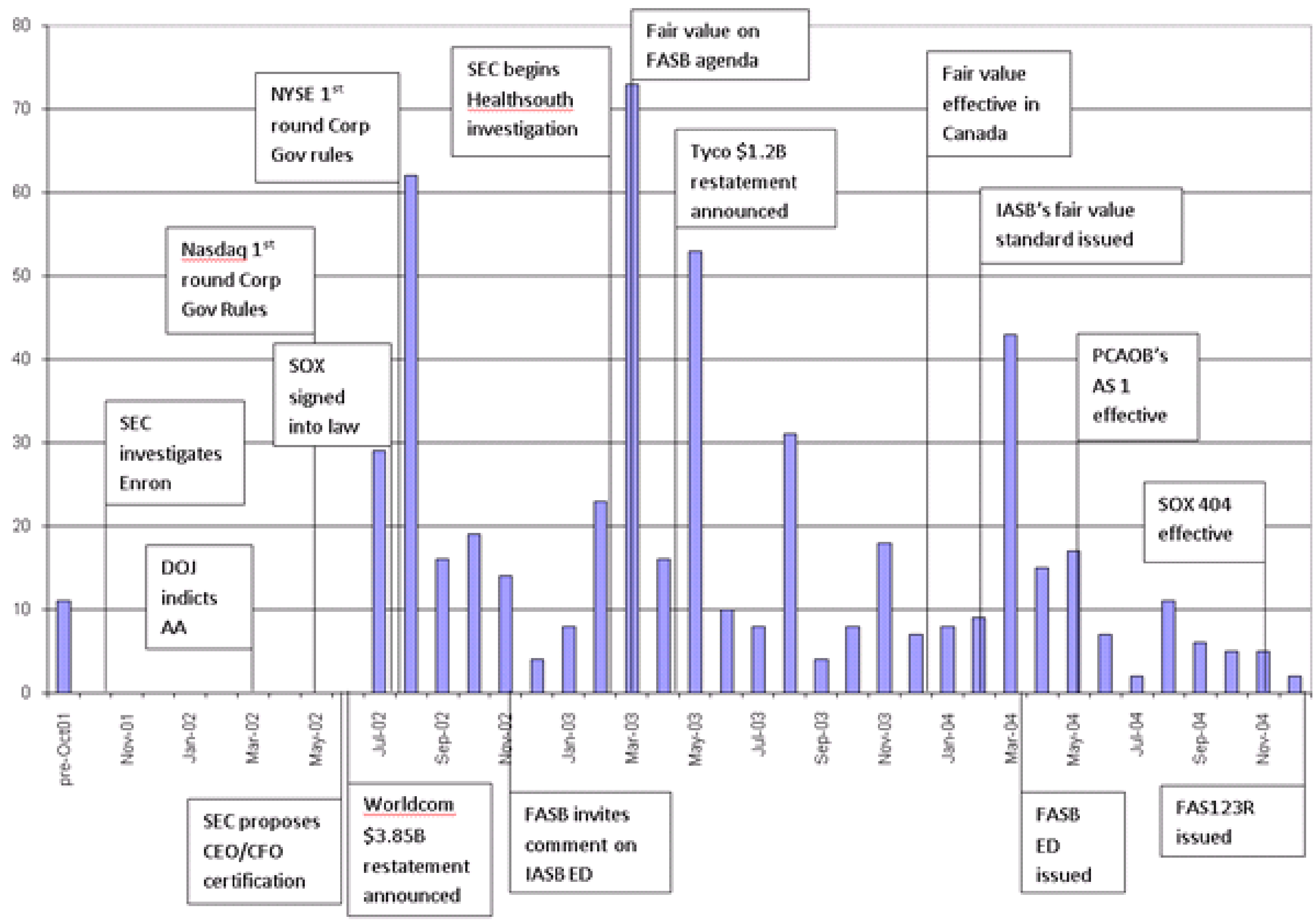


Figure 4 Stock Options Adoptions Over Time The figure shows the cumulative number of adoptions of the fair value method across time since the FASB allowed its use in October 1995. This is based on the Bear Stearns list of 529 U.S. firms that adopted fair value prior to the FASB requiring fair value in SFAS 123R, which was issued in December 2004.

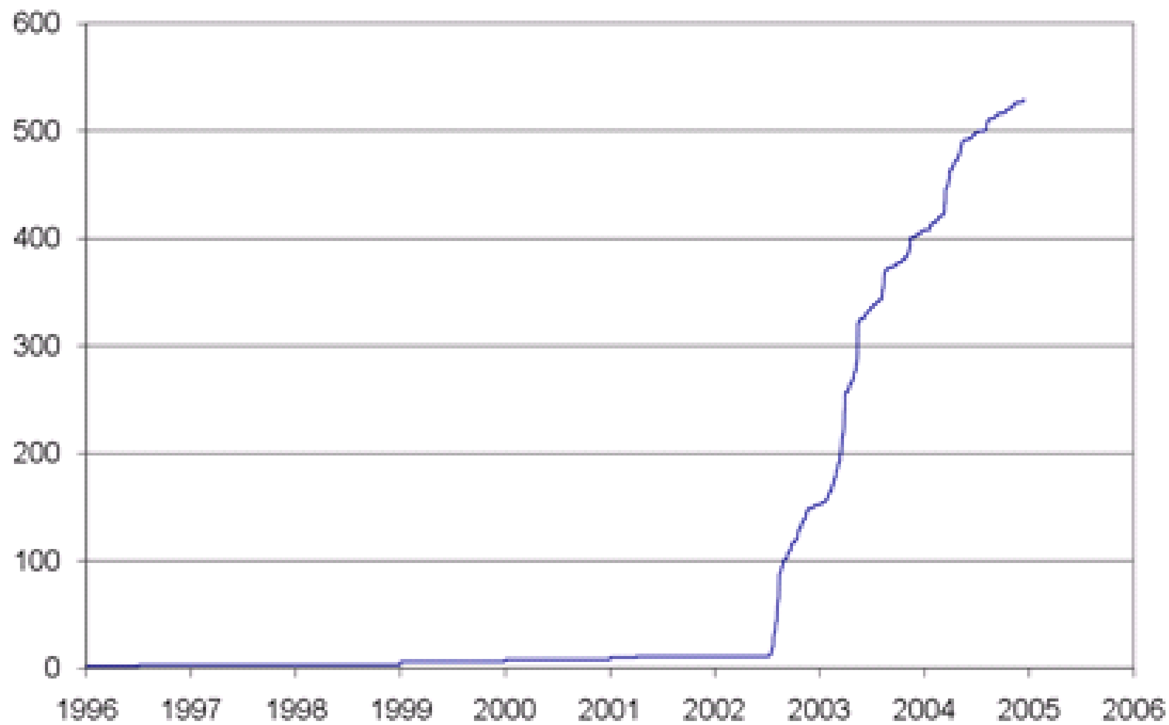
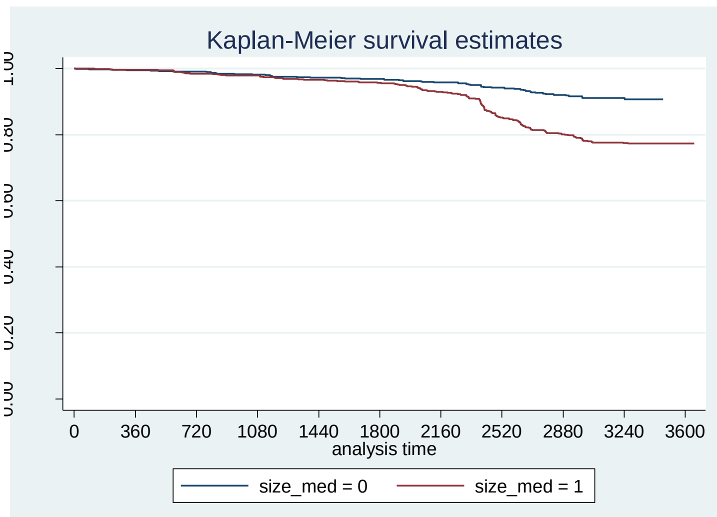


Figure 5 Stock Options Survival Graphs These graphs show the Kaplan-Meier estimate of the survival function based on the sample of firms at-risk of adopting the fair value method for stock option expensing. The graphs show evidence of two intrinsic variables and two contagion variables on the likelihood the firm will not adopt fair value (i.e., survive in the at-risk population). Lower (higher) lines indicate a higher (lower) likelihood to adopt fair value.

Size

(Above Median = 1, Below Median = 0)

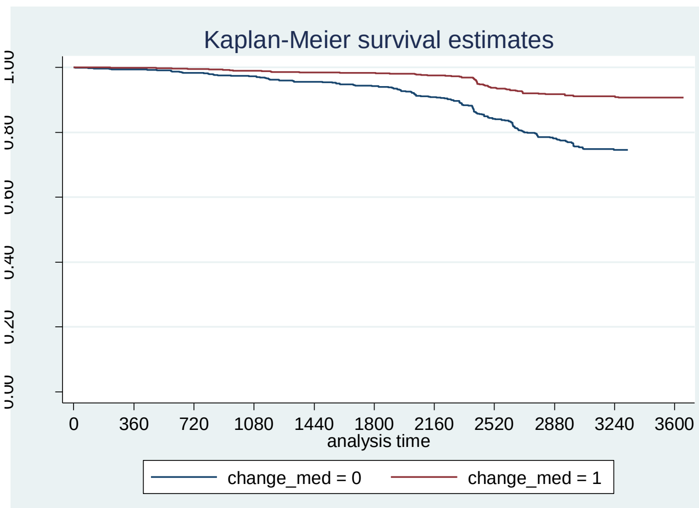


Small

Large

Disclosed Option Expense

(Above Median = 1, Below Median = 0)

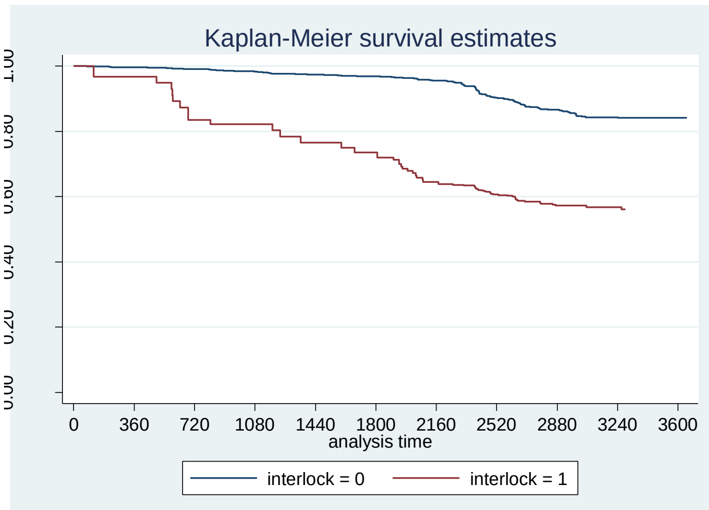


High Expense

Low Expense

Board Interlock

(1 if interlock to prior adopter, 0 otherwise)

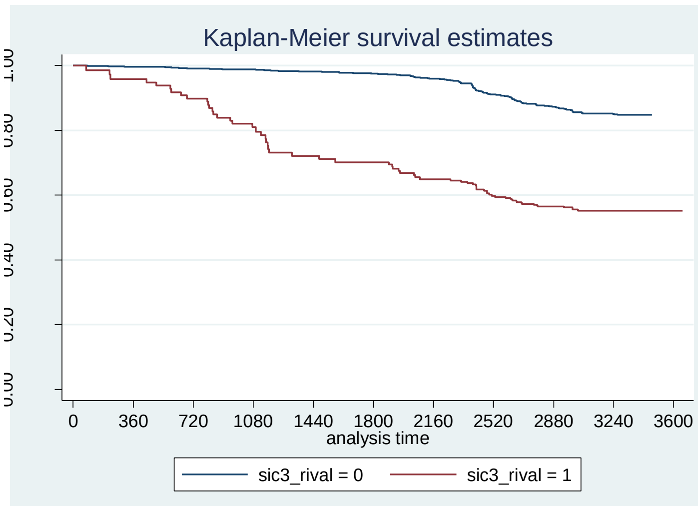


No Interlock

Interlock

Rival

(1 if a rival adopted, 0 otherwise)



No Rival

Rival

Table 1 Sample Selection for Stock Option Expensing

		Firm-Years	Firms
U.S. Public Firms on Execucomp for Sample Period		17,123	2,686
Less: Firms without option grants or disclosed expense	-	587	32
		16,536	2,654
Plus: Additional Adopter Firm-Years (Firms) on Bear Stearns List	+	294	294
		16,830	2,948
Less: Adopter firm-years after their adoption year	-	338	
		16,492	2,948
Less: Observations that did not meet data requirements	-	1,663	528
Total At-Risk Firm-Years in Sample		**14,829**	**2,420**
- *Adopters*		1,517	251
- *Non-Adopters*		13,312	2,169

This table provides the criteria used to select the sample of firm-years that were at-risk of adopting the fair value method for stock option expensing. The sample period begins with fiscal years that begin on or after December 15, 1995, which is the effective date for SFAS 123. The sample period ends with fiscal years that begin before December 16, 2004, the issuance date of SFAS 123R. Firm years must meet the following requirements: 1) Public, U.S. firm covered by Execucomp, which includes the S&P 1500 index, 2) Have issued stock option grants or positive amounts of disclosed stock option expense, and 3) Meet the data requirements for the independent variables. The resulting sample has 14,829 firm-year observations for 2,420 firms.

Table 2 Industry Membership (1-Digit SIC)

Industry Group	**Adopting Firms** N	**Adopting Firms** %	**Non-Adopting Firms** N	**Non-Adopting Firms** %
Agriculture, Forestry, And Fishing	2	0.80	6	0.28
Mining	9	3.59	84	3.87
Construction	4	1.59	24	1.11
Manufacturing	62	24.70	962	44.35
Transportation, Communications, and Utilities	36	14.34	215	9.91
Wholesale Trade	6	2.39	77	3.55
Retail Trade	15	5.98	193	8.90
Finance, Insurance, And Real Estate	104	41.43	213	9.82
Services	12	4.78	389	17.93
Public Administration	1	0.40	6	0.28
	251	100%	2,169	100%

This table provides a comparison of industry membership for the at-risk sample of firms that meet the criteria in table 1. The data for adopters are those years that firms announced their voluntarily adoption of the fair value method (251 firms). The non-adopters are those firms that were at-risk of adopting fair value but never adopted (2,169 firms). For non-adopters, the year included in the analysis was chosen randomly from the years the firm was at-risk of adopting fair value. Industry membership for each firm is based on the Standard Industrial Classification Code Industry Division (1-digit SIC).

Table 3 Descriptive Statistics for Adopting vs. Non-Adopting Firms for Stock Options

	Adopting Firms (N = 251)		**Non-Adopting Firms (N = 2,169)**	
	Mean	**Median**	**Mean**	**Median**
Panel A: Intrinsic Variables				
Net Sales	12,626.74***	3,452.14***	2,556.03	701.33
Net Income	890.57***	179.06***	86.91	32.69
Total Assets	56,329.74***	8,063.35***	3,907.99	834.39
Market Value of Equity	15,896.53***	3,597.08***	3,686.29	846.91
Size	8.14***	8.15***	6.62	6.55
Profit (%)	4.98	2.97	4.87	5.04***
Exec_Bonus (%)	23.36 ***	21.17***	17.80	14.34
Exec_Own (%)	0.03	0.00	0.10*	0.00***
Leverage (%)	29.78***	28.66***	23.13	20.80
InstOwn (%)	64.29***	64.93***	37.76	38.53
Activity	10.29**	1.00***	0.82	0.00
Option_Expense (%)	0.43	0.13	6.66**	0.39***
Industry_Conc	0.14***	0.06*	0.10	0.06
Panel B: Contagion Variables				
Prior_Board (0/1)	0.35***	0***	0.09	0
# Prior_Close	10.63***	4***	5.14	0
# Prior_Auditor	48.04***	30***	39.66	1
# Prior_Industry	6.60***	2***	2.16	0
Prior_Rival (0/1)	0.37***	0***	0.15	0

Table 3 provides descriptive statistics for the sample firms for intrinsic and contagion variables. Separate statistics are provided for adopters and non-adopters for the intrinsic variables. The data for adopters are those years that firms announced their voluntarily adoption of the fair value method (251 firms). The non-adopters are those firms that were at-risk of adopting fair value but never adopted (2,169 firms). For non-adopters, the year included in the analysis was chosen randomly from the years the firm was at-risk of adopting fair value.

For Panel B, the mean value of Prior_Board (Prior_Rival) indicates the percentage of firms with at least one prior board interlock (prior rival). The other contagion variables express the number of prior adopters with that trait (e.g., on average adopters had 48.04 prior adopters with the same auditor).

***, **, * represent significant differences with two-tailed p-values at the .01, .05, and .10 levels respectively, based on t-tests for means and Mann-Whitney-Wilcoxon rank-sum tests for medians. Variable definitions are as follows.

Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)
Leverage	=	Total Debt to Total Assets (%)
InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
Option_Expense	=	Disclosed pro forma amount of stock option expense using the fair value method scaled by net sales (%)
Industry_ Conc	=	Herfindahl-Hirschmann industry concentration index for the firm's 3-digit SIC industry group
Prior_Board	=	Number of prior adopters that share a common board member with the firm
Prior_Close	=	Number of prior adopters geographically within 50 miles of the firm
Prior_Auditor	=	Number of prior adopters that share a common auditor with the firm
Prior_Sales	=	ln(net sales) of the prior adopter summed across all prior adopters
Prior_Industry	=	Number of prior adopters in the same 3-digit SIC industry as the firm
Prior_Rival	=	Number of prior adopters that are rivals where a rival is when a prior adopter is in the same 3-digit SIC industry and their sales are

Table 4 Correlations of Intrinsic variables

	1	2	3	4	5	6	7
(1) Size							
(2) Profit	0.02						
(3) Exec_Bonus	0.17	0.22					
(4) Exec_Own	-0.36	0.06	-0.03				
(5) Leverage	0.29	-0.26	0.05	-0.12			
(6) InstOwn	0.13	0.03	-0.04	-0.01	-0.00		
(7) Activity	0.31	-0.01	0.09	-0.20	0.26	-0.06	
(8) Option_Expense	-0.47	0.01	-0.29	0.13	-0.31	0.15	-0.13

This table reports the Spearman rank-order correlation coefficients of the intrinsic variables for the complete sample (14,829 firm-years). All correlations above .02 magnitudes are significant at the 10% level or better. All correlations above .03 are significant at the 1% level or better. Variable definitions are as follows:

Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)
Leverage	=	Total Debt to Total Assets (%)
InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
Option_Expense	=	Disclosed pro forma amount of stock option expense using the fair value method scaled by net sales (%)

Table 5 Propensity to Adopt Fair Value (H1a, H1b, H2)

Variable	Sign	Baseline	1	2	3	4
		β	β	β	β	β
INTRINSIC (Xn)						
Size	+	0.401^{***}	0.732^{***}	0.878^{***}	0.821^{***}	0.882^{***}
Profit (%)	+	-0.000	$-0.004^{\#}$	0.000	$-0.004^{\#}$	-0.001
Exec_Bonus (%)	-	$0.001^{\#}$	0.001	0.002	0.002	0.002
Exec_Own (%)	+	$-0.058^{\#}$	-6.842	-2.140	-3.009	-3.049
Leverage (%)	+	0.009^{***}	0.010^{**}	0.015^{***}	0.010^{**}	0.014
InstOwn (%)	-	$0.018^{\#}$	$0.022^{\#}$	$0.023^{\#}$	$0.021^{\#}$	$0.023^{\#}$
Activity	+	0.001	0.001	0.000	0.000	0.001
Option_Expense (%)	-	-0.123^{***}	-0.157^{***}	-0.167^{**}	-0.158^{***}	-0.177^{**}
CONTAGION						
Intercept			-14.910^{***}	-14.860^{***}	-15.570^{***}	-16.240^{***}
Infectiousness (Ws)						

Prior_Sales	H1b	+			0.490***		0.561***
Proximity (Zns)							
Prior_Board	H1a	+		6.290***			4.853***
Prior_Close	H1a	+		0.889**			1.694***
Prior_Auditor	H1a	+		0.593			-0.290
Prior_Industry	H1b	+			4.765***		4.267***
Prior_Rival	H2	+				6.107***	1.033*
Log Likelihood			-2629.58	-2547.74	-2494.43	-2534.66	-2463.84
χ^2 Against Null			246.55***	410.22***	516.84***	436.38***	578.03***
χ^2 Against Baseline Model				163.67***	351.03***	189.84***	331.48***
Akaike Information Criterion			5277.16	5121.49	5012.86	5091.32	4961.67
Akaike Weights			<1%	<1%	<1%	<1%	99%

The sample includes 251 firm-years where firms announced their adoption of the fair value method and 14,578 firm-years where firms were at-risk of adopting but did not (a total of 14,829 firm-years). The dependent variable for all models is the propensity of firm i to adopt fair value in period *t*, given that the firm did not adopt prior to *t*. The Baseline model is the intrinsic-only model. I use RATE, an event history software program designed for diffusion models, to produce maximum likelihood estimates (Tuma 1993).

The Likelihood Ratio χ^2 tests the joint significance of the variables in the model and tests the incremental significance relative to the baseline model. AIC is the Akaike Information Criterion. ***, **, * represent statistical significance at the .01, .05, and .10 level or better based on one-tailed p-values for signed predictions and two-tailed otherwise. # represents statistical significance at the .10 level or better but in the direction opposite that predicted. Variables are defined as follows:

Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)
Leverage	=	Total Debt to Total Assets (%)
InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
Option_Expense	=	Disclosed pro forma amount of stock option expense using the fair value method scaled by net sales (%)
Prior_Board	=	Number of prior adopters that share a common board member with the firm
Prior_Close	=	Number of prior adopters geographically within 50 miles of the firm
Prior_Auditor	=	Number of prior adopters that share a common auditor with the firm
Prior_Sales	=	ln(net sales) of the prior adopter summed across all prior adopters
Prior_Industry	=	Number of prior adopters in the same 3-digit SIC industry as the firm
Prior_Rival	=	Number of prior adopters that are rivals where a rival is a firm in the same 3-digit SIC industry whose sales are within 50% of the firm's sales

Table 6 Test of H3a, H3b, H3c – Susceptibility to Prior Adoptions

Variable		Sign	Baseline	1	2	3
			β	β	β	β
INTRINSIC (Xn)						
Size		+	0.401***	0.869***	0.540**	0.850***
Profit (%)		+	-0.000	-0.001	0.000	-0.005#
Exec_Bonus (%)		-	0.001#	0.002	0.001	0.002
Exec_Own (%)		+	-0.058#	-3.064	-1.908	-2.934
Leverage (%)		+	0.009***	0.014	0.014***	0.011**
InstOwn (%)		-	0.018#	0.023#	0.024#	0.021#
Activity		+	0.001	0.001	0.003**	0.000
Option_Expense (%)		-	-0.123***	-0.176***	-0.156***	-0.160***
CONTAGION						
Intercept				-15.990***	-17.880***	-15.490***
Susceptibility (Vn)						
Profit (%)	H3a	-		0.000		
Size	H3b	+			0.398***	
Industry_Conc	H3c	+				0.999**
Infectiousness (Ws)						
Prior_Sales		+		0.532***	0.439***	
Proximity (Zns)						
Prior_Board		+		5.027***	4.584***	
Prior_Close		+		1.687***	1.362***	

Prior_Auditor	+		-0.437	-0.354	
Prior_Industry	+		4.376***	4.277***	
Prior_Rival	+				6.050***
Log Likelihood		-2629.58	-2464.56	-2434.08	-2527.09
χ^2 Against Null		246.55***	576.58***	637.54***	441.59***
χ^2 Against Baseline			330.03***	391.00***	204.99***
Akaike Information Criterion		5277.16	4961.13	4900.16	5078.17
Akaike Weights		<1%	<1%	99%	<1%

The sample includes 251 firm-years where firms announced their adoption of the fair value method and 14,578 firm-years where firms were at-risk of adopting but did not (a total of 14,829 firm-years). The dependent variable for all models is the propensity of firm i to adopt fair value in period *t*, given that the firm did not adopt prior to *t*. The Baseline model is the intrinsic-only model. I use RATE, an event history software program designed for diffusion models, to produce maximum likelihood estimates (Tuma 1993).

The Likelihood Ratio χ^2 tests the joint significance of the variables in the model and tests the incremental significance relative to the baseline model. ***, **, * represent statistical significance at the .01, .05, and .10 level or better based on one-tailed p-values for signed predictions and two-tailed otherwise. # represents statistical significance at the .10 level or better but in the direction opposite that predicted. Variables are defined as follows:

Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)
Leverage	=	Total Debt to Total Assets (%)
InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
Option_Expense	=	Disclosed pro forma amount of stock option expense using the fair value method scaled by net sales (%)

Industry_Conc	=	The Herfindahl-Hirschman industry concentration index based on Net Sales at the 3-digit SIC level
Prior_Board	=	Number of prior adopters that share a common board member with the firm
Prior_Close	=	Number of prior adopters geographically within 50 miles of the firm
Prior_Auditor	=	Number of prior adopters that share a common auditor with the firm
Prior_Sales	=	ln(net sales) of the prior adopter summed across all prior adopters
Prior_Industry	=	Number of prior adopters in the same 3-digit SIC industry as the firm
Prior_Rival	=	Number of prior adopters that are rivals where a rival is when a prior adopter is in the same 3-digit SIC industry and their sales are within 50% of the firm's sales

Table 7 Sample Selection for Inventory and Depreciation Samples

	Inventory	Depreciation
U.S. Public Firm-Years on Compustat for Sample Period	117,100	117,100
Less: Firm-Years with no account values or method footnotes	- 57,480	- 28,922
	59,620	88,178
Less: Firm-Years with no available 10K data	- 6,664	- 12,690
	52,956	75,488
Less: Firm-Years not at-risk for specific method change	- 26,012	- 20,565
	26,944	54,923
Less: Adopter firm-years after their adoption year	- 20	- 57
	26,924	54,866
Less: Firm-Years that did not meet data requirements	- 16,987	- 39,044
Total At-Risk Firm-Years in Sample	**9,937**	**15,822**
- *Adopters (# of Firms)*	25	14
- *Non-Adopters (# of Firms)*	1699	2259

This table provides the criteria used to select the sample of firm-years that were at-risk of adopting the FIFO (Straight-Line) method for Inventory (Depreciation). The sample period contains fiscal years 1995-2008. Firm years must meet the following requirements: 1) Public, U.S. firm covered by Compustat, 2) Must have valid footnote codes to determine inventory (depreciation) method and positive account values of inventory (PP&E) or COGS (Depreciation expense) for the year, and 3) Have 10K available on EDGAR, 4) Must be at-risk for adopting FIFO (Straight-Line) method (i.e., FIFO-only & SL-only firms are excluded), and 5) Meet the data requirements for the independent variables.

Table 8 Industry Membership (1-Digit SIC) For Inventory Sample

	Adopters		Non-Adopters	
Industry Group	**N**	**%**	**N**	**%**
Agriculture, Forestry, And Fishing	0	0.00	8	0.47
Mining	0	0.00	61	3.61
Construction	0	0.00	16	0.95
Manufacturing	15	60.00	991	58.64
Transportation, Communications, and Utilities	0	0.00	112	6.63
Wholesale Trade	4	16.00	87	5.15
Retail Trade	3	12.00	216	12.78
Finance, Insurance, And Real Estate	0	0.00	18	1.07
Services	3	12.00	177	10.47
Public Administration	0	0.00	4	0.24
	25	100%	1690	100%

This table provides a comparison of industry membership for the at-risk sample of firms that meet the criteria in table 7 for the inventory sample. The data for adopters are those years that firms changed their inventory valuation and costing method to the First-In, First-Out (FIFO) method. The non-adopters are those firms that were at-risk of adopting but never adopted. For non-adopters, the year included in the analysis was chosen randomly from the years the firm was at-risk of adopting fair value. Industry membership for each firm is based on the Standard Industrial Classification Code Industry Division (1-digit SIC).

Table 9 Industry Membership (1-Digit SIC) For Depreciation Sample

	Adopters		Non-Adopters	
Industry Group	**N**	**%**	**N**	**%**
Agriculture, Forestry, And Fishing	0	0.00	9	0.40
Mining	0	0.00	27	1.20
Construction	0	0.00	27	1.20
Manufacturing	10	71.43	1054	46.66
Transportation, Communications, and Utilities	1	7.14	193	8.54
Wholesale Trade	0	0.00	100	4.43
Retail Trade	0	0.00	226	10.00
Finance, Insurance, And Real Estate	0	0.00	155	6.86
Services	3	21.43	463	20.50
Public Administration	0	0.00	5	0.22
	14	100%	2259	100%

This table provides a comparison of industry membership for the at-risk sample of firms that meet the criteria in table 7 for the depreciation sample. The data for adopters are those years that firms changed their depreciation method to the straight-line (SL) method. The non-adopters are those firms that were at-risk of adopting but never adopted. For non-adopters, the year included in the analysis was chosen randomly from the years the firm was at-risk of adopting fair value. Industry membership for each firm is based on the Standard Industrial Classification Code Industry Division (1-digit SIC).

Table 10 Descriptive Statistics for Adopting vs. Non-Adopting Firms for Inventory Sample

	Adopting Firms (N = 25)		Non-Adopting Firms (N = 1,690)	
	Mean	**Median**	**Mean**	**Median**
Net Sales	1,049.56	400.12	3,686.95***	706.13
Net Income	20.97	1.30	178.05***	22.71**
Total Assets	1,030.47	426.29	4,377.39***	668.09
Total Adjusted Assets	1,323.13	583.03	5,452.82***	800.06
Market Value of Equity	895.40	191.47	4,754.11***	697.82***
Size	6.04	5.99	6.58	6.56
Profit (%)	0.09	1.59	2.67	4.55*
Exec_Bonus (%)	12.00	12.17	14.78	9.95
Exec_Own (%)	9.19***	1.80***	0.62	0.00
Leverage (%)	29.23**	23.36**	18.97	16.30
InstOwn (%)	37.93	44.06*	29.23	0.17
Activity	0.16	0.00	0.69***	0.00**
Inventory_Assets (%)	18.75**	14.66**	12.94	9.82
COGS_Sales (%)	65.52	69.55	75.13	66.41
MTR_COGS	100.29	30.87	667.29***	74.33**

Table 10 provides descriptive statistics for the inventory sample firms. Separate statistics are provided for adopters and non-adopters for the intrinsic variables. The data for adopters are those years that firms changed their inventory method to the First-In, First-Out (FIFO) method. The non-adopters are those firms that were at-risk of adopting but never adopted. For non-adopters, the year included in the analysis was chosen randomly from the years the firm was at-risk of adopting fair value.

***, **, * represent significant differences with two-tailed p-values at the .01, .05, and .10 levels respectively, based on t-tests for means and Mann-Whitney-Wilcoxon rank-sum tests for medians. Variable definitions are as follows:

Total Adjusted Assets	=	Total Assets plus the LIFO Reserve plus Accumulated Depreciation (Bowen et al. 1995)
Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total adjusted assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)
Leverage	=	Total debt divided by total adjusted assets (%)
InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
Inventory_Assets	=	Ending inventory balance scaled by total adjusted assets (%)
COGS_Sales	=	Cost of Goods Sold minus the change in LIFO reserve scaled by net sales (%)
MTR_COGS	=	COGS minus the change in LIFO reserve times the marginal tax rate

Table 11 Descriptive Statistics for Adopting vs. Non-Adopting Firms for Depreciation

	Adopting Firms (N = 14)		**Non-Adopting Firms (N = 2,259)**	
	Mean	**Median**	**Mean**	**Median**
Net Sales	6,342.01	1,599.97	2,828.01	701.93
Net Income	186.90	7.86	117.78	26.22
Total Assets	7,224.39	1,331.34	4,415.57	748.57
Total Adjusted Assets	8,311.31	1,619.94	5,045.44	893.36
Market Value of Equity	8,000.22	1,550.16	4,177.33	787.37
Size	5.98	7.37	6.61	6.55
Profit (%)	(25.71)	1.18	(1.26)	3.95
Exec_Bonus (%)	10.74	9.72	13.41	8.54
Exec_Own (%)	6.20	0.00	1.52	0.00
Leverage (%)	21.13	13.72	19.87	16.20
InstOwn (%)	22.87	0.00	42.55**	47.86**
Activity	0.50	0.00	0.76	0.00
PPE_Assets (%)	25.96	18.25	19.87	16.19
DP_Sales (%)	17.85	7.45**	9.91	4.02

Table 10 provides descriptive statistics for the depreciation sample firms. Separate statistics are provided for adopters and non-adopters for the intrinsic variables. The data for adopters are those years that firms changed their depreciation method to the straight-line (SL) method. The non-adopters are those firms that were at-risk of adopting but never adopted. For non-adopters, the year included in the analysis was chosen randomly from the years the firm was at-risk of adopting fair value.

***, **, * represent significant differences with two tailed p-values at the .01, .05, and .10 levels respectively, based on t

Total Adjusted Assets	=	Total Assets plus the LIFO Reserve plus Accumulated Depreciation (Bowen et al. 1995)
Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total adjusted assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)
Leverage	=	Total debt divided by total adjusted assets (%)
InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
PPE_Assets	=	Ending net property, plant, and equipment scaled by total adjusted assets (%)
DP_Sales	=	Depreciation expense scaled by net sales (%)

Table 12 Propensity to Adopt FIFO for the Inventory Sample

Variable	Sign	Intrinsic Only β	Intrinsic + Contagion β
INTRINSIC (Xn)			
Size	-	-0.236	-0.382**
Profit (%)	-	0.002	0.008
Exec_Bonus (%)	+	0.000	0.010
Exec_Own (%)	+	0.064***	0.078***
Leverage (%)	+	0.003	0.005
InstOwn (%)	+	0.003	0.002
Activity	+	-0.710	-2.429#
Inventory_Assets (%)	+	0.030**	0.057***
COGS_Sales (%)	+	0.001	-0.000
MTR_COGS	-	-0.002*	-0.017**
CONTAGION			
Intercept			-13.250***
Infectiousness (Ws)			
Prior_Sales	+		0.383
Proximity (Zns)			
Prior_Board	+		14.480
Prior_Close	+		2.531***
Prior_Auditor	+		14.460
Prior_Industry	+		3.108***

Log Likelihood	-298.80	-287.39
χ^2 Against Null	46.62***	69.43***
χ^2 Against Intrinsic Model		22.81***
Akaike Information Criterion	619.59	608.79
Akaike Difference		10.81
% Improvement in AIC		1.74%

The sample includes 25 firm-years where firms changed their inventory method to the First-In, First-Out (FIFO) method and 9,912 firm-years where firms were at-risk of adopting but did not (a total of 9,937 firm-years). The dependent variable for all models is the propensity of firm i to adopt FIFO in period *t*, given that the firm did not adopt prior to *t*. I use RATE, an event history software program designed for diffusion models, to produce maximum likelihood estimates (Tuma 1993).

The Likelihood Ratio χ^2 tests the joint significance of the variables in the model and tests the incremental significance relative to the baseline model. AIC is the Akaike Information Criterion. ***, **, * represent statistical significance at the .01, .05, and .10 level or better based on one-tailed p-values for signed predictions and two-tailed otherwise. # represents statistical significance at the .10 level or better but in the direction opposite that predicted.

Variables are defined as follows:

Total Adjusted Assets	=	Total Assets plus the LIFO Reserve plus Accumulated Depreciation (Bowen et al. 1995)
Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total adjusted assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)

Leverage	=	Total debt divided by total adjusted assets (%)
InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
Inventory_Assets	=	Ending inventory balance scaled by total adjusted assets (%)
COGS_Sales	=	Cost of Goods Sold minus the change in LIFO reserve scaled by net sales (%)
MTR_COGS	=	COGS minus the change in LIFO reserve times the marginal tax rate
Prior_Board	=	Number of prior adopters that share a common board member with the firm
Prior_Close	=	Number of prior adopters geographically within 50 miles of the firm
Prior_Auditor	=	Number of prior adopters that share a common auditor with the firm
Prior_Sales	=	ln(net sales) of the prior adopter summed across all prior adopters
Prior_Industry	=	Number of prior adopters in the same 3-digit SIC industry as the firm

Table 13 Propensity to Adopt SL for the Depreciation Sample

Variable	Sign	Intrinsic Only β	Intrinsic + Contagion β
INTRINSIC (Xn)			
Size	-	-0.173	0.190
Profit (%)	-	-0.001	-0.008***
Exec_Bonus (%)	+	-0.009	-0.023
Exec_Own (%)	+	0.045***	0.165***
Leverage (%)	+	-0.002	-0.079#
InstOwn (%)	+	0.021**	-79.36
Activity	+	-0.015	-8.872
PPE_Assets (%)	+	0.017	0.035***
DP_Sales (%)	+	-0.000	0.035**
CONTAGION			
Intercept			-10.900***
Infectiousness (Ws)			
Prior_Sales	+		-0.154
Proximity (Zns)			
Prior_Board	+		-2.277
Prior_Close	+		-20.28
Prior_Auditor	+		0.761
Prior_Industry	+		4.291***

Log Likelihood	-186.14	-169.21
χ^2 Against Null	17.75**	51.60***
χ^2 Against Intrinsic Model		33.86***
Akaike Information Criterion	392.27	370.41
Akaike Difference		21.86
% Improvement in AIC		5.57%

The sample includes 14 firm-years where firms changed their depreciation method to the straight-line (SL) method and 15,808 firm-years where firms were at-risk of adopting but did not (a total of 15,822 firm-years). The dependent variable for all models is the propensity of firm i to adopt SL in period *t*, given that the firm did not adopt prior to *t*. I use RATE, an event history software program designed for diffusion models, to produce maximum likelihood estimates (Tuma 1993).

The Likelihood Ratio χ^2 tests the joint significance of the variables in the model and tests the incremental significance relative to the baseline model. AIC is the Akaike Information Criterion. ***, **, * represent statistical significance at the .01, .05, and .10 level or better based on one-tailed p-values for signed predictions and two-tailed otherwise. # represents statistical significance at the .10 level or better but in the direction opposite that predicted.

Variables are defined as follows:

Total Adjusted Assets	=	Total Assets plus the LIFO Reserve plus Accumulated Depreciation (Bowen et al. 1995)
Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total adjusted assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)
Leverage	=	Total debt to total adjusted assets (%)

InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
PPE_Assets	=	Ending property, plant, and equipment scaled by total adjusted assets (%)
DP_Sales	=	Depreciation expense scaled by net sales (%)
Prior_Board	=	Number of prior adopters that share a common board member with the firm
Prior_Close	=	Number of prior adopters geographically within 50 miles of the firm
Prior_Auditor	=	Number of prior adopters that share a common auditor with the firm
Prior_Sales	=	ln(net sales) of the prior adopter summed across all prior adopters
Prior_Industry	=	Number of prior adopters in the same 3-digit SIC industry as the firm

Appendix A: Derivation of the Strang & Tuma (1993) Heterogeneous Diffusion Model

The derivation begins with a diffusion model specified at the population level, specifically the mixed-influence model (Mahajan & Peterson 1985). The mixed-influence model captures external influence (i.e., influence from outside of the population) and internal influence (i.e., influence from prior adopters). These influences are represented by the values, *a* and *b,* respectively. Two groups will play a role in the diffusion process: the firms capable of adopting, *n(t)*, and the firms that have previously adopted that serve as spreaders, denoted *s(t)*. The rate that the population members adopt the innovation is denoted *r(t)*.

Thus, the rate of diffusion is modeled as:

$$\mathrm{r(t)} = [a + b\, s(t)]\, n(t) \tag{A1}$$

The degree of external influence, *a*, is proportional to the number of firms at risk of adopting, *n*(*t*). The internal influence, *b*, is based on the number of spreaders, *s*(*t*), times the number of at-risk firms, *n*(*t*).

This model assumes that all members are equally susceptible to the external influence. It also assumes that all prior adopters are equally infectious or influential (i.e., homogeneous influence). Lastly, the intrinsic propensity to adopt does not allow for any variation across individuals because it is at the population level not the individual level.

One way to model at the individual level is to use event-history analysis. The hazard rate of adoption, $r_i(t)$, for each individual is then,

$$r_i(t) = \lim_{\Delta t \to 0} \Pr[\mathrm{Y_n}(t + \Delta t)=1 \mid \mathrm{Y_n}\,(t)=0] \,/\, \Delta t \tag{A2}$$

where $\mathrm{Y_n}$ is 1 if the firm adopts and 0 otherwise and Δt is some arbitrarily small amount of time *t*. Thus, $r_i(t)$ is the limiting probability of firm i adopting in the next instant of time, $t + \Delta t$, given that the firm has not previously adopted.

To convert equation A1 to the population of agents, consider the following:

$$r_n(t) = a + b\, s(t) = a + \Sigma S(t)\, b \quad \text{for every n in the set of } N(t) \tag{A3}$$

Here, $\Sigma S(t)$ represents the set of potential influences from within the population occurring on or before time *t* and *N(t)* represents the set of firms that have not yet adopted.

When including independent variables into hazard models, the right-hand side is exponentiated to guarantee non-negative hazard rates. The additive formulation of this model sums separately the intrinsic propensities function and the contagious function:

$$r_n(t) = \exp(a) + \Sigma_{S(t)} \exp(b) \tag{A4}$$

Now, we can treat *a* as a function of firm-level characteristics, $\mathbf{x}_n$, that affect firm *n*'s intrinsic adoption rate. The concept of internal influence from prior adopters *b* is separated into three vectors: the firm's susceptibility to intrapopulation influence ($\mathbf{v}_n$), the influence of a prior adopter *s* ($\mathbf{w}_s$), and the social proximity between *n* and *s* ($\mathbf{z}_{ns}$). One intercept is identified for all of these contagion vectors. Thus, the model is specified:

$$r_n(t) = \exp(\boldsymbol{\alpha}'\mathbf{x}_n) + \Sigma_{S(t)} \exp(\boldsymbol{\beta}'\mathbf{v}_n + \boldsymbol{\gamma}'\mathbf{w}_s + \boldsymbol{\delta}'\mathbf{z}_{ns}) \tag{A5}$$

where $\boldsymbol{\alpha}'$, $\boldsymbol{\beta}'$, $\boldsymbol{\gamma}'$, and $\boldsymbol{\delta}'$ are vectors of coefficients for the variables in the vectors $\mathbf{x}_n$, $\mathbf{v}_n$, $\mathbf{w}_s$, and $\mathbf{z}_{ns}$ respectively.

Since the $\boldsymbol{\beta}'\mathbf{v}_n$ term does not relate to the set of prior adopters, *S(t)*, then the final specification is

$$r_n(t) = \exp(\boldsymbol{\alpha}'\mathbf{x_n}) + \exp(\boldsymbol{\beta}'\mathbf{v_n}) \, \Sigma_{S(t)} \exp(\boldsymbol{\gamma}'\mathbf{w_s} + \boldsymbol{\delta}'\mathbf{z_{ns}}) \qquad \text{(A6)}$$

The hazard rate of adopting in time t is thus a function of the intrinsic propensities to adopt plus a contagion term, which is based on the firm's susceptibility times the influence of the prior adopters (i.e., infectiousness of prior adopters and proximity of the at-risk firm to the prior adopters).

Appendix B: Variable Definitions

INTRINSIC VARIABLES

Size	=	ln (Net Sales)
Profit	=	Income before extraordinary items scaled by total assets (%)
Exec_Bonus	=	Bonus paid to top 5 Executives scaled by total compensation (%)
Exec_Own	=	Shares and exercisable options owned by top 5 Executives scaled by shares outstanding (%)
Leverage	=	Total Debt to Total Assets (%)
InstOwn	=	% shares outstanding held by institutional investors as of the end of the fiscal year
Activity	=	Number of times the firm has issued debt or equity in last three fiscal years (-2,0)
Option_Expense	=	Disclosed pro forma amount of stock option expense using the fair value method scaled by net sales (%)
Inventory_Assets	=	Ending inventory balance scaled by total adjusted assets (%)
COGS_Sales	=	Cost of Goods Sold minus the change in LIFO reserve scaled by net sales (%)
MTR_COGS	=	COGS minus the change in LIFO reserve times the marginal tax rate
PPE_Assets	=	Ending property, plant, and equipment scaled by total adjusted assets (%)
DP_Sales	=	Depreciation expense scaled by net sales (%)

CONTAGION VARIABLES

Industry_ Conc	=	Herfindahl-Hirschmann industry concentration index for the firm's 3-digit SIC industry group
Prior_Board	=	Number of prior adopters that share a common board member with the firm
Prior_Close	=	Number of prior adopters geographically within 50 miles of the firm
Prior_Auditor	=	Number of prior adopters that share a common auditor with the firm
Prior_Sales	=	ln(net sales) of the prior adopter summed across all prior adopters
Prior_Industry	=	Number of prior adopters in the same 3-digit SIC industry as the firm
Prior_Rival	=	Number of prior adopters that are rivals where a rival is when a prior adopter is in the same 3-digit SIC industry and their sales are within 50% of the firm's sales