

## Tilburg University

### Insider trading, shareholder activism, and corporate policies

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## **Insider Trading, Shareholder Activism, and Corporate Policies**



# **Insider Trading, Shareholder Activism, and Corporate Policies**

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan Tilburg University op  
gezag van de rector magnificus, prof. dr. Ph. Eijlander, in het  
openbaar te verdedigen ten overstaan van een door het college voor  
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Peter Cziraki  
Pécs, summer 2011

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## Introduction

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This doctoral thesis focuses on two topics that have received considerable attention from academics, regulators, and the business press over the past decades: insider trading, and shareholder activism.

The first topic, insider trading has been on the front page of many business newspapers as the United States led a crackdown on illegal insider trading on Wall Street. Perhaps the most prominent case was the one brought against billionaire Raj Rajaratnam, the founder of the Galleon Group, Rajat K. Gupta, and several others.<sup>1</sup> Rajaratnam was convicted for fraud and conspiracy, and subsequently sentenced to 11 years of imprisonment and a fine of \$10 million in October 2011. Mr. Gupta was arrested the same month,<sup>2</sup> while 21 other defendants in the Rajaratnam trial took guilty pleas, among them former executives of Bear Stearns, IBM, and Intel.

Given how wealthy these corporate executives are, their gains from illegal insider trading should be rather large for them to risk such behavior. A recent study by Bhattacharya and Marshall (2012), however, shows otherwise. The authors provide empirical evidence that, in fact the dollar profits from these trades cannot justify the risk the insiders took, which means that they were most likely motivated by the mere excitement of getting away with it.

While it is illegal insider trades that make most of the headlines, the academic literature has expanded mostly in the area of legal insider trading. First, insider trading is a useful indicator of how much information insiders actually possess about the firm's future returns. Ravina and Sapienza (2010) show that more shareholder-oriented governance structures reduce the gap between the information of executives and independent directors. By contrast, firms where decision powers are vested with the management are difficult to understand even for the independent directors on the board. Second, because insider trading is indicative of future returns, any investor can hope to make a profit by monitoring how corporate insiders trade – as several hedge funds do. But with stock-

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<sup>1</sup> [http://topics.nytimes.com/top/reference/timestopics/people/r/raj\\_rajaratnam/index.html](http://topics.nytimes.com/top/reference/timestopics/people/r/raj_rajaratnam/index.html)

<sup>2</sup> <http://dealbook.nytimes.com/2011/10/26/gupta-surrenders-to-authorities-on-insider-trading/?ref=global-home>

based compensation increasing at corporations, insiders may trade simply to rebalance their portfolio or to satisfy their liquidity needs. Thus, an important question is which insider trades one should pay attention to. Cohen, Malloy and Pomorski (2012) show that the trading history of insiders can help answer this question. They develop an algorithm to distinguish between insiders who are more likely to place routine trades, and insiders who are “opportunistic”, i.e. purchase stock when they have positive information, and sell when their outlook is negative.

The second topic that my thesis investigates is shareholder activism. Activist shareholders have played an important role in shaping the corporate landscape since the late 1980’s (Karpoff (2001)). While more prevalent in the US, shareholder activism has recently been in the regulatory spotlight in Europe, as the EU issued Directive 2007/36/EC to facilitate cross-border voting in shareholder meetings. Activist interventions have been numerous and of significant impact on both sides of the Atlantic. With an investment stake of 2%, The Children’s Investment Fund called for the splitting up and sale of the large Dutch bank ABN Amro, and succeeded as ABN was sold to a consortium of RBS, Fortis and Banco Santander in 2007.<sup>3</sup> Just recently, Relational Investors gained a board seat at Hewlett-Packard despite owning only 1%. Relational also put pressure on PepsiCo to separate its beverage business, which has been losing ground in the US to Coca Cola.<sup>4</sup> In the Silicon Valley, Third Point has won the fight to oust Yahoo! CEO Scott Thompson, whose academic record had turned out to be “misstated”,<sup>5</sup> while NorthStar Asset Management has bought a share in Google and put forward a proposal to rethink the company’s political contributions.<sup>6</sup>

The academic literature is divided on the usefulness of shareholder activism. First, studies are inconclusive regarding the effect of activism on the profitability and stock price of target firms (Karpoff (2011)). Second, even if target stock prices rise after activist interventions, it remains to be seen whether activist shareholders generate value by exerting discipline (Brav, Jiang and Kim (2012)) or merely redistribute value by increasing the likelihood that the firm will be taken over (Greenwood and Schor (2009)).

The four chapters of the thesis examine insider trading and shareholder activism as phenomena that reflect two general concepts. First, the agency problem between shareholders and managers and second, the informational advantage that corporate insiders, such as managers, or large blockholders enjoy relative to other market participants. The first two chapters use data on

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<sup>3</sup> [http://www.dnb.nl/binaries/DNB%20Timeline%20Fortis%20ABN%20Amro\\_tcm46-261123.pdf](http://www.dnb.nl/binaries/DNB%20Timeline%20Fortis%20ABN%20Amro_tcm46-261123.pdf)

<sup>4</sup> <http://online.wsj.com/article/SB10001424052702304192704577406382525667736.html>

<sup>5</sup> <http://dealbook.nytimes.com/2012/05/04/third-point-demands-yahoo-c-e-o-be-fired-by-monday/>

<sup>6</sup> <http://247wallst.com/2012/06/05/activist-shareholder-targets-googles-political-contributions/>

European corporations and exploit the regulatory differences relative to the United States, or a change in the regulatory environment. The second two chapters use data on corporations in the US.

Chapter 1 relates to the agency problem. The chapter assesses one specific corporate governance device, shareholder-initiated proxy proposals, as a mechanism to mitigate the agency problem. The main finding is that proxy proposals are used less frequently in Europe than in the US, and when they are used, the market perceives them as a signal that behind-the-scenes negotiations between the activist and management have broken down.

The paper is co-authored with Luc Renneboog and Péter Szilágyi. It has been presented at the China International Conference in Finance in Beijing, the Columbia University/Duisenberg School of Finance Business Law and Innovation Conference in Amsterdam, the European Financial Management Association Annual Meetings in Aarhus, the European Financial Management Association Symposium on Corporate Governance and Control in Cambridge, the Law and Finance Roundtable in Oxford, the Portuguese Finance Network's 6<sup>th</sup> Finance Conference in Ponta Delgada, the Wharton-Cambridge Research Day, and a seminar at the University of Cambridge. It has been published in *European Financial Management* (Vol. 16, No. 5, pp. 738–777).

Chapter 2 considers the two general concepts of the thesis simultaneously: it analyzes how the informational advantage of managers is related to proxies for the severity of the agency problem between shareholder and managers. Specifically, it investigates how the profitability of insider trading is related to firm-level corporate governance rules. The conclusion of the paper is that the leopard cannot change its spots: when managers' ability to enjoy some private benefits of control decreases, they try to make up for it by increasing the profitability of their insider trades.

The paper is joint work with Peter de Goeij and Luc Renneboog. It has been presented in at the 2009 Corporate Finance Day at the University of Antwerp, the European Financial Management Association annual meetings in Aarhus, the Financial Management Association European conference in Hamburg, the Summer Workshop of the Hungarian Academy of Sciences, the Workshop on Insider Trading of the Netherlands Authority for the Financial Markets (Amsterdam), and seminars at Bocconi University, Stanford Graduate School of Business, Stockholm School of Economics, Tilburg University, Universität Bonn, and Free University Amsterdam.

Chapter 3 focuses on the second concept: the informational advantage of managers. The paper tracks the insider trading of managers of US banks to understand if they anticipated the poor performance of their banks. I conclude that managers of banks that underperformed during that crisis sold large amounts of stock starting in the 2<sup>nd</sup> quarter of 2006, when the housing market first weakened. The interpretation is that bank managers did not view their investments in the housing

market as value-decreasing *ex ante*. However, they understood that the decline of housing prices would have dire consequences for their bank, and withdrew their equity stakes accordingly.

The paper has been presented at the Adam Smith Workshops in Oxford, the Summer Workshop of the Hungarian Academy of Sciences, and seminars at the Einaudi Institute for Economics and Finance, Bocconi University, Carlos III University, University of California at Berkeley (Haas), University of Toronto (Department of Economics), University of Toronto (Rotman), Cornell (Johnson), University of Illinois at Urbana-Champaign, Federal Reserve Bank of Cleveland, University of New South Wales, University of Washington (Foster), University of Houston (Bauer), European Central Bank, VU University Amsterdam, Warwick Business School, London Business School, University of Amsterdam, Copenhagen Business School, and HEC Lausanne.

Finally, Chapter 4 focuses, once again, on the agency conflict. It examines empirically the relation between two devices that firms use to alleviate the agency issue: managerial equity holdings, and employment contracts. The central question of the paper is whether CEOs' trading in their own firm's stock is influenced by the number of years they have spent, and the number of years they expect to spend in office. Both of these seem to matter: CEOs are less likely to buy stock if they have spent a longer time at the firm, and if they have contracts with longer terms. Building on these findings, the paper then goes on to show that CEO trading can predict CEO turnover. The paper is co-authored with Moqi Xu.

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## Chapter 1

# Shareholder Activism through Proxy Proposals: The European Perspective

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**Abstract:** This paper is the first to investigate the corporate governance role of shareholder-initiated proxy proposals in European firms. Proposal submissions in Europe remain infrequent compared to the US, especially in Continental Europe. In the UK proposals typically relate to a proxy contest seeking board changes, while in Continental Europe they are more focused on specific governance issues. There is some evidence that proposal sponsors are valuable monitors, because the target firms tend to underperform and have low leverage. Sponsors also consider the ownership structure of the firm, because proposal probability increases in the target's ownership concentration and the equity stake of institutional investors. While proposals enjoy limited voting success across Europe, they are relatively more successful in the UK. The outcomes are strongest for proposals targeting the board but are also affected by the target characteristics including the CEO's pay-performance sensitivity. Proposals are met with a significant negative abnormal return of -1.23%, when they are voted upon at general meetings. The low voting support gathered by proposals and the strongly adverse market reaction suggest that shareholders of European companies use proposals as an emergency brake rather than a steering wheel.

### 1. Introduction

Shareholders are the ultimate owners of public companies and should therefore have the final say in decisions such as corporate restructuring, changes in top management, payout policy, or governance structures. The proxy process is one of the means for shareholders to impose their (value generating) suggestions. Some studies regard shareholder-initiated proxy proposals as a useful tool of corporate governance and the proposal sponsors as valuable monitoring agents (Bebchuk, 2005; Harris and Raviv, 2008; Renneboog and Szilagyi, 2009). Others argue that the same proposals have no real control benefits due to their nonbinding nature (Gillan and Starks, 2000; Prevost and Rao,



2000), and that the proponents either disrupt the board's authority unnecessarily or outright pursue their own self-serving agendas (Anabtawi, 2006; Bainbridge, 2006).

While shareholder proposals are rarely mentioned in the European context, the business press regularly cites prominent cases of dissenting shareholders targeting European firms. Activists ousted the chairman of African Platinum as the firm underperformed its industry peers (Bream, 2006), and pushed Dutch banking giant ABN Amro into selling itself (Larsen, 2007). In another well-known example, Acquisitor Holdings targeted the UK dotcom firm Baltimore Technologies. In March 2004, Acquisitor Holdings requisitioned an extraordinary general meeting to replace Baltimore's board of directors. Baltimore claimed that Acquisitor, which then owned 10% of its equity, was opportunistically trying to drive down its share price in a bid to increase its ownership stake (Stewart, 2004). However, Acquisitor pointed out that Baltimore had accumulated trading losses of over GBP 1 billion through its poor acquisition strategy, and even launched a website criticizing the CEO (Shah, 2004a). Leading up to the meeting on May 6, the battle continued in the press. Baltimore revealed plans to transform into a green energy firm and labeled Acquisitor a vulture fund but subsequently apologized (Harrison, 2004). In response, Acquisitor called the green energy concept "outrageous" and increased its stake to over 16% (Boxell, 2004a). At the meeting, Baltimore directors survived a knife-edge vote as shareholders, many of whom had lost personal fortunes, were unhappy with the plans of both Baltimore and Acquisitor (Boxell, 2004b). In his statement to the press, Baltimore's chairman struck a cordial tone when he called for co-operation with Acquisitor and invited negotiations to be conducted privately (Smyth, 2004). As the firm's annual general meeting in July approached, management abandoned the clean energy plan, placing the blame on Acquisitor for a failed takeover (Wendlandt, 2004), and proposed to pay shareholders a special dividend (Klinger, 2004). Acquisitor, which by then had increased its ownership stake to over 25%, successfully blocked the dividend payout (Shah, 2004b). The power struggle ended at the meeting where Acquisitor replaced management with its own nominees (Nuttall, 2004).

These and other notable cases of shareholder proposals show that European shareholders view the proxy process as a viable tool of expressing dissent and disciplining management. However, it is clear that US lessons on the corporate governance role of shareholder proposals may not be readily applicable in the European context. First, proposals in the US are nonbinding even if they pass the shareholder vote, whereas they are legally binding in the UK and in most of Continental Europe. Second, the laws and regulations governing shareholder access to the proxy vary considerably across countries, thereby affecting the incentives of and costs borne by the proponent shareholders. And third, the market-oriented Anglo-American model of corporate

governance is very different from the stakeholder-oriented regimes of Continental Europe. La Porta et al. (1998) show, and Martynova and Renneboog (2008) confirm, that minority shareholders enjoy much better protection under US and UK common law, with Continental European firms often violating the one share-one vote rule by issuing multiple classes of stock, setting up pyramids, or engaging in cross-shareholdings. In Continental Europe, corporate ownership is also more concentrated (Barca and Becht, 2001; Faccio and Lang, 2002), and while banks are predominantly passive investors in the US, they actively engage in proxy voting in countries such as Germany (Franks and Mayer, 2001). Finally, major creditors and employees are often given board representation in Continental Europe, which implies conflicts of interest between the board and outside shareholders (Roe, 2004).

This paper is the first to investigate the corporate governance role of shareholder proposals across Europe, using a sample of 290 proposals submitted in nine countries between 1998 and 2008. While Buchanan et al. (2010) provide an elaborate comparison of proposal submissions in the US versus the UK, our analysis also includes Continental Europe, which is both very different from a corporate governance perspective and quite diverse in itself.

We simultaneously investigate the selection of target firms and proposal success in terms of the voting outcomes and the stock price effects, and make several contributions to the literature. First, compared to the US, proposal submissions remain relatively infrequent in Continental Europe in particular. In the UK, proposals typically relate to a proxy contest seeking personal changes on the board to force a change in corporate strategy. In Continental Europe, the proposal objectives are more focused on specific governance issues, corresponding to the conventional use of shareholder proposals in the US.

Second, we show that the target firms tend to underperform as well as have low leverage, which Jensen (1986) regards as remedy to free cash flow problems. This coincides with the results of Renneboog and Szilagyi (2009) for the US, and provides some indication that the activists sponsoring proposal submissions are valuable monitors. There is also evidence that the proposal sponsors observe the identity of the voting shareholders, to the extent that proposal probability increases in the target firm's ownership concentration as well as the equity stake of institutional investors.

Third, we find that shareholder proposals enjoy relatively modest voting success in both the UK and Continental Europe. The voting outcomes are most fundamentally driven by the issue addressed, and are strongest for proposals that seek personal changes on the board and therefore indicate major governance concerns. However, they are also affected by the characteristics of the

target firm, most notably the extent to which the CEO is incentivized through stock-based pay to protect shareholder interests.

Finally, we find that irrespective of the proposal objectives, the shareholder vote on proposal submissions induces significantly negative stock price effects. This suggests that rather than attribute them control benefits, the market interprets proposals and their failure to pass the shareholder vote as a negative signal of governance concerns. Indeed, consistent with agency considerations the market responds better to proposals submitted against large firms with low leverage. However, the stock price effects are more negative for poorly performing firms with low market-to-book ratios and ill-incentivized CEOs, which indicates that unsuccessful shareholder attempts to exert discipline only exacerbate governance concerns.

The remainder of this paper proceeds as follows. The next section provides an overview of the theoretical and empirical literature on shareholder activism through the proxy process. Section 3 discusses the corporate governance structures of the US, the UK, and Continental Europe, and describes the country-specific laws and regulations governing shareholder-initiated proxy proposals. Section 4 provides a description of our sample and investigates proposal success in terms of the voting outcomes and stock price effects. In Section 5 we use sample selection models to perform a multivariate analysis of both target selection and proposal success. Finally, Section 6 allows for some concluding remarks.

## **2. The literature on shareholder activism through the proxy process**

The separation of ownership and control in publicly listed firms gives rise to agency problems (Jensen and Meckling, 1976), which shareholders of the firm can seek to resolve in several ways. Gillan and Starks (2007) place shareholder activism on a continuum of responses that dissatisfied investors can give to corporate governance concerns. At one extreme of the continuum, shareholders can simply vote with their feet by selling their shares (Parrino, et al., 2003, Admati and Pfleiderer, 2009). At the other extreme is the market for corporate control, where investors initiate takeovers and buyouts to bring about fundamental changes (Jensen and Ruback, 1983). The role of shareholder activism arises when shareholders continue to hold their shares and seek changes within the firm without a change in control. These investors may then press for corporate reforms by negotiating with management behind the scenes, or – especially when management is unresponsive – by submitting proposals for shareholder vote. Armour (2008) views this process as a

private and informal enforcement mechanism, with private and formal mechanisms comprising lawsuits and litigation, and public mechanisms initiated by public bodies.

Bebchuk (2005) and Harris and Raviv (2008) advocate shareholder participation in corporate governance, and argue that proxy proposals are a useful and relevant means of mitigating managerial agency problems. However, Prevost and Rao (2000) point out that even if they pass the shareholder vote, proxy proposals are likely to be ineffective in disciplining management because they are nonbinding in the US under the SEC's Rule 14a-8. The authors add that proposal submissions often convey a negative signal of failed negotiations with management, because institutional activists often try to negotiate behind the scenes and only sponsor proposals as a last resort. The main argument offered against shareholder proposals is that the sponsoring shareholders are likely to pursue their own self-serving agendas (Woidtke, 2002; Anabtawi, 2006; Prevost et al., 2009) or be simply too uninformed to make effective governance decisions (Lipton, 2002; Stout 2007). Bainbridge (2006) goes as far as claiming that proposal submissions should be restricted by the SEC, because they do more damage than good by disrupting the decision-making authority of the board of directors. Notwithstanding, the theoretical results of Harris and Raviv (2008) show that shareholders should have control over corporate decisions, even though they are at an informational disadvantage, and even if their goals differ from maximizing the value of the company.

### *2.1. The role of shareholder proposals in the US*

The empirical US literature finds considerable evidence that shareholder proposals should be regarded as a useful governance tool and the proposal sponsors as valuable monitoring agents. Recent studies confirm that proposal submissions exert pressure on the target firms despite their nonbinding nature, because as much as 40% of the proposals that win a majority vote end up being implemented (Bizjak and Marquette, 1998; Martin and Thomas, 1999; Thomas and Cotter, 2007; Ertimur et al., 2010). Ertimur et al. (2010) show that targets ignoring passed proposals are penalized by drawing negative press and downgrades by governance rating firms, and that their directors are less likely to be reelected and more likely to lose other directorships<sup>1</sup>.

Other studies find that the proposal sponsors tend to have the “correct” objective of disciplining management, and as such claims of their agenda-seeking are exaggerated. Early studies

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<sup>1</sup> Del Guercio, *et al.* (2008) find that dissatisfied activists often target director elections with “just vote no” campaigns.

report that proposal submissions tend to be directed at large, poorly performing firms (Karpoff et al., 1996; Martin and Thomas, 1999). Renneboog and Szilagyi (2009) add that the targets tend to be underlevered as well as have generally poor governance structures. Smith (1996) shows that the proposal sponsors also consider the identity of voting shareholders before deciding whether or not to submit proxy proposals, because the targets tend to have high institutional and low insider ownership.

The literature confirms that the target firm's governance quality is also observed by the voting shareholders. Gillan and Starks (2007) find that the voting results are mostly driven by the proposal objectives and the sponsoring shareholders. However, Ertimur et al. (2010) and Renneboog and Szilagyi (2009) show that irrespective of the issue addressed, proposals draw more voting support if the target has heavily entrenched managers and ineffective boards. Cremers and Romano (2007) report that the identity of the voting shareholders is also relevant. On one hand, voting support increases in institutional and decreases in insider ownership. On the other, insurance firms and banks' trust departments are less likely to vote in favor of shareholder proposals than are other institutional investors. Brickley et al. (1988) and Pound (1988) regard these investors as pressure-sensitive due to their existing or potential business relationships with the firms they invest in, which increases the risk of conflicted voting.

The US literature examines the stock price effects of shareholder proposals around the dates the proxy statements are mailed (Bhagat, 1983; Bhagat and Brickley, 1984). Early event studies find no evidence that the market recognizes shareholder proposals as a relevant control mechanism (Karpoff et al., 1996; Bizjak and Marquette, 1998; Del Guercio and Hawkins, 1999; Prevost and Rao, 2000; Thomas and Cotter, 2007). However, Renneboog and Szilagyi (2009) find that proposal announcements are actually met with significantly positive stock price reactions, which are sensitive to the proposal objectives but are most fundamentally driven by the target firm's past performance and quality of governance structures.

## *2.2. The role of shareholder proposals in Europe*

Shareholder activism through the proxy process is seldom discussed in the European corporate governance literature. Becht et al. (2009) examine the activist strategies of a single institutional investor, the Hermes UK Focus Fund. The study shows that similar to US funds, Hermes rarely submits proxy proposals for shareholder vote, instead negotiating successfully with management

behind the scenes. The authors attribute this to management concerns of the fund requisitioning an extraordinary general meeting, with the looming prospect of a proxy fight. While Klein and Zur (2009) make a similar point for the US, this threat is even larger in the UK where passed proposals are legally binding, and shareholders can remove directors by an ordinary resolution.

Results of a recent survey by McCahery et al. (2009) show that the types of corrective actions considered by most U.S. and Dutch institutional investors are selling shares (80%), voting against the company at the annual meeting (66%) and initiating a discussion with the executive board (55%). Their findings, similarly to Becht et al. (2009) suggest that institutions use a wide range of measures to impact the firm's decisions, some of which take place behind the scenes, unnoticed by the market.

Buchanan and Yang (2008) are the first to perform a comparison of US and UK proposal submissions. The authors find that the target firms tend to be poorly performing in both countries, but report systematic differences in the proposal objectives, the sponsor identities, as well as the voting outcomes. An important insight of the paper is that UK proposals draw more voting support, especially when they target personal changes on the board, and that they are often implemented even if they are later withdrawn. However, subsequent performance improvements are only detected in US firms, as measured by profitability, dividend payout, leverage, and stock price effects.

Girard (2009) is the only study to discuss the governance role of shareholder proposals in Continental Europe, by investigating activist strategies in France. The author examines the success rate of behind-the-scenes negotiations, targeting firms through the media, proposal submissions, and civil law suits. The results show that launching lawsuits is the preferred method of activists engaging firms over governance concerns, and that this particularly aggressive strategy is also more likely to succeed than other forms of activism including the submission of proxy proposals.

Previous studies report no evidence at all on the corporate governance role of shareholder proposals in Continental Europe. An interesting study by De Jong et al. (2006) examines the proposals presented to shareholders at the general meetings of Dutch firms. The authors find that during their sample period, all proposals put to shareholder vote were in fact sponsored by the board of directors. Furthermore, the number of votes cast against these submissions was negligible, with only nine out of 1,583 proposals either rejected or withdrawn.

Overall, the literature is clearly incomplete on the extent to which the proxy process is accessible to European shareholders as a disciplinary device, and if so, whether proposal submissions are useful and effective in mitigating corporate governance concerns. The available

evidence implies considerable variation across Europe in this regard, as is discussed in the following sections of this paper.

### **3. The regulatory environment in European countries**

The corporate governance role of shareholder proposals should heavily depend (i) on the extent to which laws and regulations support shareholder access to the proxy process, and (ii) the rules and practicalities of proxy solicitation. We now assess the differences in this regard across European countries.

#### *3.1. Shareholder access to the proxy process*

A key difference in the legal treatment of shareholder proposals between the US and Europe is that while passed proposals are only advisory in nature in the US, they are legally binding in the UK and most of Continental Europe except the Netherlands. The corporate governance laws and best practices of European countries generally recognize that in order to protect their interests, minority shareholders must be provided with access to general meetings as well as the right to submit proxy proposals for shareholder vote. Nonetheless, the provisions governing shareholder access to the proxy typically remain stringent compared to the US. US shareholders are not allowed to call extraordinary meetings unless the corporate charter or bylaws allow otherwise. However, shareholders owning 1% of the voting shares or USD 1,000 in market value may submit proxy proposals for shareholder vote.

Table 1 provides an overview of the legal requirements for submitting proxy proposals and convening extraordinary meetings in nine European countries. The table shows that the required voting capital varies considerably across countries. In the UK, shareholders owning no less than 5% of the firm's issued share capital may submit proposals to be voted upon at a general meeting. Alternatively, a group of at least 100 shareholders, each with no less than GBP 100 invested, may also put forward a proposal. To call an extraordinary meeting, the support of at least 10% of the voting capital is required.

– *Insert Table 1 here* –

France is somewhat more lenient than the UK in that shareholders owning 5% of the voting capital may both submit proposals and call extraordinary meetings. This ownership requirement is gradually reduced with the increase of capital, to 4% between EUR 750,000-4.5 million, 3% between EUR 4.5 million-7.5 million, 2% between EUR 7.5 million-15 million, and 1% over EUR 15 million. A noteworthy provision of the French Commercial Code is that even though a meeting can only deliberate on items on its agenda, “*it may nevertheless remove one or more directors or supervisory board members from office and replace them, in any circumstances*”<sup>2</sup>. Shareholders entitled to change the agenda of a meeting may also demand that a representative appointed by the court convene the meeting<sup>3</sup>.

The German Stock Corporation Act (Aktiengesetz) provides that new agenda items and extraordinary meetings can be set by shareholders owning a minimum 5% of the voting capital. However, any shareholder may add a proposal to the existing items of a meeting’s agenda, thus the proposal sponsors often include even university professors<sup>4</sup>. The similar Austrian Aktiengesetz also provides that general meetings can be called by shareholders owning at least 5% of the voting capital, but proposals can be submitted by those owning 1% or EUR 70,000 of capital<sup>5</sup>.

The Norwegian Code of Practice for Corporate Governance requires firms to inform all shareholders in the notice of the general meeting about their right “*to propose resolutions in respect of matters to be dealt with by the general meeting*”. Shareholders owning at least 5% of the issued share capital have the right to convene an extraordinary meeting.

In the Netherlands, 10% or more of the voting capital is needed to requisition an extraordinary meeting. Proposals may be submitted by shareholders with a stake of at least 1% or EUR 50 million of the firm’s shares and certificates<sup>6</sup>. However, only management or the supervisory board may propose resolutions on certain topics including amendments to the articles

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<sup>2</sup> Commercial Code/Book II title II chapter V section III Article L225-105 and L225-120.

<sup>3</sup> Commercial Code/Book II title II chapter V section III Article L225-103; 2001 May.

<sup>4</sup> Ekkehard Wenger and Leonhard Knoll, both from the Julius-Maximilians Universität Würzburg. Knoll sponsored 54 of the sample proposals, either alone or jointly with Wenger.

<sup>5</sup> The Austrian Aktiengesetz also provides that when a meeting is convened by a shareholder, whether the costs are to be borne by the firm or the shareholder will be decided at the meeting.

<sup>6</sup> Dutch certificates are tradable depository receipts, issued at the initiative of the supervisory board, that carry cash flow rights but no voting rights. They are designed to replace ordinary shares, which are then deposited with the issuer, the administration office. The administration office takes over all voting rights on the retired shares, thus typically taking a voting majority in the firm. It is always friendly to the management board, and is run by members of the supervisory and/or management boards as well as outside individuals.



of association, share issues and subscription rights, asset sales, and the dissolution of the firm itself. Furthermore, provisions of the articles of association that limit the general meeting's power to amend the articles may only be altered by a unanimous decision of a general meeting where 100% of the share capital is represented.

In Switzerland, shareholders must own CHF 1 million of the issued share capital to place a resolution on the meeting agenda, unless the articles of association specify otherwise. In line with the recommendations of the Swiss Corporate Governance Code, large firms such as UBS and Novartis have lowered this threshold, with the minimum ownership requirement often less than 0.1%. To convene an extraordinary meeting, a petition submitted by shareholders owning no less than 10% of the share capital is required.

Finally, while governance standards in Russia are gradually improving, the resolution of disputes between management and minority shareholders is complicated by institutional loopholes and weaknesses in the protection of shareholder rights. Nonetheless, shareholders with 2% or more of the voting stock can propose items for the agenda of a general meeting, while 10% of the voting stock is required to convene an extraordinary meeting.

### *3.2. Proxy solicitation and corporate ownership*

An important consideration likely to affect proposal submissions is that the sponsoring activist must seek the support of other shareholders. The European Commission (2006) points out that the rules and formalities for proxy solicitation vary considerably within Europe. In the UK, the solicitation request would be included in the proxy documents and distributed to all shareholders at no major cost to the activist. In other countries, the solicitation of proxies at the firm's expense is prohibited, so the production and distribution costs of the solicitation request are borne by the activist (European Commission, 2006).

Manifest (2008) find that for large firms, shareholder participation at annual meetings is fairly consistent across European countries, at 55.5% of the voting capital in France, 54.8% in Germany, and 61.8% in the UK. However, the European Commission (2006) adds that the attendance rate of the free float tends to be low in Continental Europe, at 10.1% in Germany and 17.5% in France compared with 53.2% in the UK. There are many reasons why shareholders would be prevented or discouraged from voting in Continental Europe in particular. First, meeting attendance is often hindered by the late availability or incompleteness of meeting-related

information, resolutions in summary form, and overly short notice periods. Second, national regulations in some countries make proxy voting unduly cumbersome and prohibitively costly, with stringent restrictions on who and how may be appointed as a proxy. And third, many jurisdictions maintain the practice of share blocking, whereby shareholders must deposit their shares for a few days before general meetings to be able to vote. Share blocking exists to ensure that those who show up to vote are actually shareholders on the day of the vote. However, it is very costly for shareholders, as it prevents them from negotiating shares up to weeks in advance of general meetings<sup>7</sup>.

In terms of proxy solicitation, it is an important fact that while large US firms tend to have widely dispersed ownership structures, ownership is slightly more concentrated in the UK and considerably more concentrated in Continental Europe. Goergen and Renneboog (2001) find that in the average UK firm, eight or more shareholders must join forces to attain a majority vote, which renders it fairly difficult to forge voting coalitions. Nonetheless, Becht and Mayer (2001) find that at 10%, the typical voting block in the UK is twice the size of that in the US.

The largest voting blocks in Continental Europe tend to be even larger, ranging from 20% on average in France to 44% in the Netherlands and 57% in Germany.<sup>8</sup> These are often accumulated through pyramidal ownership structures, with approximately 40% of the largest firms held through pyramids in Austria, France, and Germany. Continental European firms also often deviate from the one share-one vote rule by issuing multiple classes of stock, granting multiple voting rights, and introducing voting right ceilings. In France, for example, it is possible to establish a double voting right for registered shares that have been held for two years. DSW (2008) finds that such structures are allowed across Continental Europe except a few countries such as Austria, Germany and Norway, while they are virtually absent in the US and the UK.

Becht (2001) finds that the blockholders of US firms tend to be managers or directors, followed by institutional investors. Institutional investors are likely to support shareholder-initiated proposal submissions, although they are often passive or simply tend to vote with their feet. Insider blockholdings should clearly reduce the probability that a proposal is submitted or later passes the shareholder vote. On one hand, managers and directors are unlikely to cast their votes in favor of a shareholder proposal. On the other, insider ownership should help realign insider and shareholder interests, thereby mitigating the expropriation concerns of minority shareholders.

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<sup>7</sup> See European Commission (2006), DSW (2008), and Manifest (2008) for detailed discussions.

<sup>8</sup> The average market capitalization of the top ten nonfinancial firms is considerably lower in Europe compared to the US. Within Europe, the top firms are twice as large in UK than in Continental Europe (La Porta *et al.*, 1998).

In the UK, institutional investors are the most important corporate owners, and they tend to be as passive as their US counterparts. Goergen and Renneboog (2001) point out that this often lends considerable power to the board of directors. On one hand, the proxy votes not exercised by shareholders are controlled by the board. On the other, directors themselves are the second largest blockholders in UK firms.

Faccio and Lang (2002) find that while 63% of UK firms can be regarded as being widely held, 50-60% of Continental European firms are effectively owned by families. In addition, many large firms are controlled by banks and holding companies. While banks tend not to hold significant equity in US and UK firms, they control 15% of the largest firms in Germany and Portugal, and 5% in France and Switzerland (La Porta et al., 1999). Goergen and Renneboog (2001) point out that in Germany, the effective voting power of banks extends well beyond their ownership stakes, because they tend to engage in proxy voting such that they exercise the voting rights on the shares deposited with them. Nibler (1998) reports that in German listed firms, Deutsche Bank, Dresdner Bank and Commerzbank have an overall equity stake of 6.8% on average, but control another 14.4% of the votes through proxies.

#### **4. Sample description and univariate analysis of proposal objectives, voting outcomes, and stock price effects**

We investigate the corporate governance role of shareholder proposals in Europe using submissions reported by the Manifest database. The database contains a total of 720 proposals. However, the voting outcomes are only reported for 290 proposals in Manifest, articles compiled by the Factiva database, and corporate filings<sup>9</sup>. Of these, 195 were submitted in the UK at a total of 62 general meetings of 40 firms between 1998 and 2008. The remaining 95 proposals were submitted between 2005 and 2008 at 28 general meetings of 23 firms in Austria, France, Germany, the Netherlands, Norway, Portugal, Russia and Switzerland.

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<sup>9</sup> The dissemination of the voting results is not compulsory in many European countries including Belgium, France, Ireland, the Netherlands, Poland, and the UK. Manifest (2008) reports that it has been best practice historically in the UK, with the disclosure rate at 96% among the FTSE 250 firms. In Continental Europe, it has only recently become common practice even for the largest firms, with the disclosure rate increasing between 2005 and 2007 from 51% to 100% for the CAC 100 firms in France, and from 68% to 88% for the AEX 25 firms in the Netherlands.

We collect accounting and stock price data for the target firms from Compustat and Datastream. Ownership information is gathered from Manifest and Bureau van Dijk. We use the Manifest Governance database and Thomson OneBanker to obtain information on governance structures including board composition and CEO ownership and remuneration.

– *Insert Table 2 here* –

Preliminary analysis of the 720 submissions reported by Manifest shows that shareholder proposals are submitted less frequently in the UK and Continental Europe than in the US. Table 2 compares the frequency of proposal submissions using the US data reported by Renneboog and Szilagyi (2009) for the period between 1996 and 2005. We find that normalized by the size of the stock markets as reported by the World Bank, the number of proposals is 3-4 times as high in the US per publicly listed firm, and approximately twice as high per traded stock value and market capitalization. This implies that on the whole, shareholder proposals play a lesser role in European corporate governance.

#### *4.1. Proposal objectives*

Table 3 provides an overview of the 290 proposals for which the voting outcomes are available by the issue addressed, the year of submission, and whether the target firm was from the UK or Continental Europe. We classify the proposal objectives into nine mutually exclusive categories: (i) election or removal of directors; (ii) corporate governance issues; (iii) pro-management loosening of corporate governance; (iv) asset restructuring; (v) capital structure; (vi) payout policy; (vii) corporate social responsibility; (viii) routine issues related to the general meeting; and (ix) other miscellaneous issues.

– *Insert Table 3 here* –

Table 3 shows that 139 out of the 290 sample proposals related to a proxy contest seeking the election or removal of board members in order to trigger corporate changes. The number of proposals targeting directors was particularly high in the UK in the latter half of the sample period, with 24 submissions up to 2003, and 105 thereafter. Buchanan et al. (2010) point out that this is unsurprising, because UK shareholders can replace the board with their own nominees by a simple majority vote.

While two thirds of the UK proposals targeted the board directly, 65 of the 95 proposals submitted in Continental Europe were directed at corporate governance issues. Several of these

related to board quality and shareholder rights. However, 27 of the proposals sought to exert discipline retrospectively by calling for a special audit on past matters. In the UK, governance issues were targeted by a total of 21 proposals.

It is notable that five of the Continental European submissions favored management or the board rather than shareholders, and therefore sought to reinforce rather than discipline corporate insiders. These included three proposals (including a resubmission) to limit the number of mandates for directors representing shareholders, one to waive claims against directors, and a counterproposal on calling a special audit.

Of the remaining proposals, 21 related to corporate social responsibility issues such as employee rights, contacts with customers, and environmental matters. These were submitted almost exclusively in the UK, with only three submissions made in Continental Europe. There were a total of 11 proposals seeking asset restructuring, 15 called for payout policy changes, seven proposals submitted in the UK targeted capital structure issues, and five were directed at routine issues associated with the time and location of general meetings.

#### *4.2. Voting outcomes*

Table 4 provides an overview of the voting outcomes and the number of proposals that actually passed the shareholder vote, by the issue addressed, the year of submission, and whether the target firm was from the UK or Continental Europe

*– Insert Table 4 here –*

Table 4 shows that the proposals submitted in the UK achieved 30.3% of the votes cast on average. The voting outcomes improved substantially after 2003, coinciding with the results reported for the US by Renneboog and Szilagyi (2009). Continental European proposals drew less voting support, with an average 21.1% of the votes.

In the UK, the proposals seeking the election or removal of directors were by far the most successful, with 38.6% of the votes on average. In the period after 2003 many of these actually received a majority vote, with as many as 30 out of 37 proposals passing in 2004. Although less widely used, similar proposals submitted against Continental European firms also fared well, with an average 46.5% of the votes in 2007 and 2008. This indicates that the voting shareholders view proposals related to a proxy contest as a strong signal of governance concerns.

The proposals seeking asset restructuring won a similarly high 36.3% of the votes on average. These submissions were also more successful in the latter half of the sample period, with the majority passing the shareholder vote after 2006 in both the UK and Continental Europe.

The voting outcomes on the remaining proposal objectives were significantly weaker. The governance-related proposals won only 15.5% and 19.7% of the votes in the UK and Continental Europe, respectively. The five Continental European submissions that favored management or the board rather than shareholders drew an average 21.2% voting support. The proposals targeting payout policy attracted 16.3% of the votes in the UK, and had little success in all but one case in Continental Europe. Consistent with the findings of Gillan and Starks (2007) for the US, the proposals related corporate social responsibility received even less support, at an average 7.3% of the votes cast. Finally, the proposals targeted at routine and capital structure issues achieved 4.6% and 4.3% of the votes, respectively.

– *Insert Table 5 here* –

While management should contest shareholder proposals to the extent that they are used as disciplinary tool by the outside shareholders, this was not always the case with the sample proposals. Table 5 partitions the voting outcomes by the voting recommendations issued by management on the individual submissions. The results show two major differences between the UK and Continental Europe. First, while management recommended a no vote on 186 out of 195 UK submissions, they opposed only 68 of the 95 proposals submitted in Continental Europe. Second, we find evidence that the management-supported proposals mostly passed the shareholder vote in Continental Europe but were unsuccessful in the UK. These results again suggest that in Continental Europe, proposals often reinforce the incumbent leadership rather than serve shareholder interests, whereas in the UK any such attempts are likely to fail.

#### *4.3. Stock price effects*

To examine the stock price effects of the sample proposals, we analyze the cumulative abnormal returns (CARs) around the general meeting dates. The prior US literature examines stock price changes around the dates the proposals are first announced in the proxy statements (Bhagat, 1983; Bhagat and Brickley, 1984). However, our cross-country study does not permit this type of analysis. On one hand, the content, timing and dissemination methods of the materials related to a general meeting show huge variations across countries, with no minimum standards even within the

European Union. On the other, several countries allow proposals to be placed on the meeting's agenda with a very short notice period. For example, Germany allows proposals up to a week after the publication of the meeting's notice, while France has no provision at all governing the deadline for submitting proposals, such that shareholders may do so until the meeting is called to order<sup>10</sup>.

By analyzing the CARs around the general meeting dates, we effectively measure the stock price reaction to the shareholder vote on the sample proposals, with some probability that the market is informed of the submission itself on the day of the meeting. The market response to the proposal outcome is difficult to ascertain, which is likely to lead to a downward bias in the size and significance of the results. On one hand, even if the market is aware of the proposal, it should have reasonable expectations on whether it actually passes, thus the voting results only reveal new information if they differ from this projection. On the other, shareholders receive a great deal of new information during the meeting as well as vote on multiple agenda items, such as director elections, dividend payout, the annual accounts, as well as any other proposals submitted by shareholders and management.

We calculate the CARs using the market model methodology. The model parameters are estimated over the 200-day period ending 21 days before the general meeting dates, using representative national indices to calculate market returns<sup>11</sup>. The significance of the CARs is tested using the standardized cross-sectional Z-test of Boehmer et al. (1991) and Cowan's (1992) nonparametric generalized sign test. For robustness, we compute bootstrapped versions of the parametric test with 3000 repetitions.

– *Insert Table 6 here* –

Table 6 reports the CARs for the full sample across a number of event windows. The results indicate a strong negative market reaction to the general meetings at which the sample proposals were voted upon. In the three-day [-1,+1] window around the meeting dates, the average and median CAR were -1.20% and -0.71%, respectively, with all tests significant at least at the 5% level. We find similar results for all other event windows. These findings imply that the market associates proposals with a negative signal rather than attribute them control benefits as a disciplinary device. As Prevost and Rao (2000) argue, the market may view proposals as being disruptive from a corporate governance perspective. However, it is likely that the stock price effects

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<sup>10</sup> We try to analyze stock price changes around the date information on the sample proposals first became available on Manifest, but the results are inconsistent.

<sup>11</sup> The market indices used are FTSE All Share, DAX30, PSI20, CAC40, AEX, Swiss Market Index [SMI], ATX, RTS, Oslo BMI.

are driven by the negative signal of both governance concerns as well as the failure to address them, because most proposal submissions tend to fail the shareholder vote.

– *Insert Table 7 here* –

Table 7 classifies the CARs by the issues addressed by the proposal submissions. For the general meetings where multiple proposals were presented, the CARs are assigned to each of the corresponding proposal objectives. While the results are mostly insignificant due to sample size issues, the average CARs were negative for each objective across almost all event windows. Nonetheless, there is some evidence that the market responds least favorably to proposals that seek governance improvements or personal changes on the board, with the negative CARs significant in five and two of the eight event windows, respectively. This corresponds to the strong governance implications of these proposal objectives, and thus supports the assertion that the market assesses proposals, irrespective of their voting success, on the severity of the governance problems they signal.

## **5. Multivariate analysis of target selection, voting outcomes, and stock price effects**

To gain further insight into the governance role of shareholder proposals in Europe, we use sample selection models to determine (i) how activists decide which firm to target with a proxy proposal, and (ii) conditional on the firm being targeted, what drives proposal success in terms of the voting results and the stock price effects. The use of the sample selection models is motivated by the fact that target selection and proposal success are likely to be endogenous. On one hand, the activist is likely to consider the potential outcome before deciding whether or not to submit the proposal, given the nontrivial costs involved. On the other, the market and the voting shareholders may respond to the act of the submission beyond the objective of the proposal itself, to the extent that this reveals a negative signal of governance concerns, or in fact a positive signal of close monitoring by the activist.

To identify the firm characteristics that drive target selection and proposal success, we use a comprehensive set of accounting, stock market, ownership and governance data collected from the AMADEUS, Bankscope, Compustat, Datastream, Manifest, and Thomson OneBanker databases, as well as corporate filings. The analysis of target selection is performed through a matching process, such that for each target we select a peer within its industry that is comparable in size. While this



process does not cover the entire universe of publicly listed European firms, it decreases the likelihood of a systematic bias due to missing or inaccurate data.

### *5.1. Descriptive statistics on target and non-target firms*

Table 8 compares the descriptive statistics on the target firms and their nontarget peers. The variable descriptions are provided in Appendix A. The differences in means and medians are tested using paired t-tests and Wilcoxon ranksum tests, respectively.

*– Insert Table 8 here –*

Panel A of Table 8 shows how the targets and nontargets compared in terms of their financial characteristics, market performance, and institutional ownership. Fama and French's (2001) agency proxies show little evidence that governance concerns in the targets were exacerbated, with no discernible difference in the debt-to-equity and market-to-book ratios of the targets and the nontargets. The performance data show some evidence that the targets underperformed relative to the nontargets in the year up to two months before the general meeting dates. Their stocks delivered an average raw return of 5.5%, and underperformed their respective market indices by 0.8%. The raw return on the nontarget stocks was 12.2%, and these actually outperformed their respective indices by 7.6%. Turnover was considerably higher in the target stocks, at 2.6 versus 1.0, which is likely to be symptomatic of shareholders voting with their feet.

Finally, Panel A confirms that there were significant differences in the ownership structures of the targets and the nontargets. First, institutional ownership was higher in the targets at 33.0% and 21.6%, respectively. Using the classification provided by Pound (1988) and Brickley, et al. (1988), we also observe that both pressure-sensitive and pressure-insensitive institutions own a larger percentage of target firms' stock. Taken together, these results suggest that activist shareholders count on voting support from institutions and that this plays a role in their selection of target firms. Second, there is evidence that ownership in the targets was more concentrated. We measure shareholder concentration using the independence indicator of Bureau van Dijk, and find that the mean concentration in the targets was significantly higher, at 1.9 versus 1.6<sup>12,13</sup>. This result

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<sup>12</sup> The independence indicator reported by Bureau van Dijk takes values of A, B, C, and D. We transform these values into a scale from 1 to 4, with D=4 representing the highest level of ownership concentration.

<sup>13</sup> This variable is used as an exclusion restriction, and it is therefore omitted from the outcome equations in our regression analysis.

on ownership concentration is further evidence that activist shareholders study the ownership structure of potential targets, because more concentrated ownership means that activists have to convince fewer shareholders to ensure voting support.

Panel B of Table 8 compares the governance quality of the targets and the nontargets in terms of board effectiveness and the exposure of CEO wealth to firm performance. We measure board effectiveness by (i) size, (ii) the proportion of executive directors, (iii) the average age of nonexecutive directors, and (iv) the independence of the board chairman. The data show mixed evidence on how the two groups compared in terms of board quality. The targets had 12.8 directors on average, significantly more than the 11.4 directors nontargets had and the optimal board size of six to eight directors (Jensen, 1993; Yermack, 1996). However, there is no evidence that the targets had fewer independent directors, with executives constituting 36.4% of the board in the targets and 38.0% in the nontargets. We also find no discernible difference between the age and thus experience of the nonexecutive directors, at 59.3 and 59.9 years, respectively. The posts of CEO and board chairman were separated in 12% of the targets and 17% of the nontargets, but the difference is again insignificant.

The exposure of CEO wealth to firm performance, which Jensen and Murphy (1990) view as a remedy to agency concerns, is measured by (i) the CEO's equity ownership and (ii) the proportion of stock-based compensation in the CEO's total pay. Panel B of Table 8 shows that the target CEOs held smaller equity stakes in their firm, at 0.7% versus 2.5%. However, there is no evidence that CEO compensation was less high-powered in the targets, with options and restricted shares comprising an average 30.8% and 27.6% of total pay, respectively.

## 5.2. Methodology

We perform the multivariate analysis of target selection and proposal success using Heckman's (1979) sample selection model, often referred to as a type-2 tobit model. The model is specified as follows:

$$y_{it}^* = X'_{it}\beta_1 + \varepsilon_{it} \quad , \quad (1)$$

$$y_{it} = \begin{cases} 1 & \text{if } y_{it}^* > 0 \\ 0 & \text{if } y_{it}^* \leq 0 \end{cases} \quad ,$$

$$y_{2it}^* = X_{2it}'\beta_2 + \varepsilon_{2it} \quad , \quad (2)$$

$$y_{2it} = \begin{cases} y_{2it}^* & \text{if } y_{1it}^* > 0 \\ 0 & \text{if } y_{1it}^* \leq 0 \end{cases} \quad ,$$

where  $\{\varepsilon_{1it}, \varepsilon_{2it}\}$  are drawn from a normal distribution with mean 0, variances  $\sigma_1^2$  and  $\sigma_2^2$ , and correlation  $\rho_{12}$  (Amemiya, 1984). The variable  $y_{1it}^*$  is a dummy variable showing whether firm  $i$  is targeted in year  $t$ , while the variable  $y_{2it}^*$  is the outcome of interest i.e. (i) the voting outcome observed at the proposal level, or (ii) the CAR observed at the firm level around the general meeting date. We observe the sign of  $y_{1it}^*$ , i.e. whether a particular firm was a proposal target or not, and we observe  $y_{2it}^*$  (the voting outcome or the CAR) only when  $y_{1it}^* > 0$ . The  $X$  variables correspond to the explanatory variables.  $X_{1it}$  is observed for all  $i$ , and includes firm-level variables (leverage, market-to-book, prior stock price performance and institutional ownership).  $X_{2it}$  additionally includes proposal-related variables (such as the issue addressed and the number of times the proposal has been submitted) but does not contain ownership concentration to ensure identification.  $\beta_1$  and  $\beta_2$  are vectors of the model coefficients.

In a standard setting, the error terms are assumed to be i.i.d. drawings. We relax this assumption across  $t$  and allow for the clustering of observations corresponding to a given firm  $i$ , i.e. we assume the error terms to be i.i.d. across firms but not necessarily for different observations within the same firm. This procedure enhances the robustness of our findings and allows us to take the structure of our sample explicitly into account.

Throughout the paper we call Equation (1) the selection equation and Equation (2) the outcome equation. As has been discussed, estimating the outcome equation independently would not be a valid alternative, because the OLS estimator of  $\beta_2$  is biased when the selection of the outcome sample is endogenous i.e.  $\rho_{12} \neq 0$ . The sample selection model addresses the endogeneity of selection, and thus renders reliable parameter estimates for the outcome equation.

### 5.3. Target selection

The sample selection models analyzing the voting outcomes and the stock price effects are depicted in Tables 9 and 10, respectively. The selection equations, shown in Panel A, are configured identically in the two tables. However, the voting outcomes are observed at the proposal rather than the firm level, thus the selection equations of Table 9 overweight the targets with multiple proposals in a given year<sup>14</sup>. As the CARs are observed at the firm level, the corresponding selection equations are unbiased. Therefore, the remainder of this section discusses the selection equations shown in Panel A of Table 10.

– Insert Tables 9 and 10 here –

The selection equations control for the firm characteristics discussed in Section 5.1 and described in Appendix A. Fama and French's (2001) agency argument dictates that the probability of a proposal submission is related negatively to the debt-to-equity and market-to-book ratios. However, market-to-book also serves as a proxy for informational asymmetries, thus the sign on this variable can be positive to the extent that proposal submissions have signaling effects. Proposal probability should be related negatively to prior stock performance and positively to prior stock turnover. We control separately for ownership by pressure-sensitive and pressure-insensitive institutional investors. Proposal probability should increase in both, but less so in the former due to the threat of conflicted voting by pressure-sensitive institutions. Finally, we expect proposal probability to be positively related to shareholder concentration. On one hand, voting coalitions should be easier to build when firm ownership is concentrated. On the other, activists may actually be wary of expropriation by powerful large shareholders, and use proposal submissions to protect minority shareholder interests.

The selection equations include seven variables capturing governance quality. Board effectiveness is proxied by (i) size, (ii) the square of size, (iii) the proportion of executive directors, (iv) the age of nonexecutive directors, and (v) a dummy equal to one if the chairman is independent and zero otherwise. We expect the sign on size to be negative and on squared size to be positive, to the extent that boards should be neither too small nor too large. The sign should be positive on the proportion of executive directors, and negative on director age and chairman independence. As

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<sup>14</sup> Firm-level specifications would yield unbiased results for the selection equations but lead to considerable loss of information on the individual proposals. For robustness, we performed the analysis at the firm level by excluding firms targeted by multiple proposals in a given year, as well as by using the average voting outcomes. The results of the outcome equations were similar to those presented in Section 4.3, but the information loss was significant.

before, the variables pertaining to CEO wealth and compensation are (i) ownership and (ii) stock-based to total pay. We conjecture that the signs are negative on both variables, due to the incentive effects of the CEO's exposure to firm performance.

Panel A of Table 10 shows that these selection equations are quite effective in explaining why firms get targeted with shareholder proposals. Apart from the role the equation plays in the selection model, it also delivers several results in its own right and confirms that target firms systematically differ from their nontarget peers. First, we confirm that proposal probability decreases in the prior market performance and increases in the prior stock turnover. Second, we find that highly levered firms are less likely to be targeted, consistent with the role of leverage in mitigating free cash flow problems. And third, there is evidence that activists consider the ownership structure of the firm before deciding whether or not to submit proxy proposals. In Model 5, proposal probability increases by 3.3% and 2.3% for every 1% stock held by pressure-sensitive and pressure-insensitive institutions, respectively. While this shows little indication of conflicted voting by pressure-sensitive investors, the statistical relation is considerably more significant for pressure-insensitive institutions. We find no statistical evidence that proposal probability is affected by the additional proxies for governance quality; the variables capturing board effectiveness and the exposure of CEO wealth to firm performance are insignificant in the models.

#### 5.4. Voting outcomes

The outcome equations analyzing voting success are depicted in Panel B of Table 9 and summarized in Appendix B. The models incorporate a similar set of firm-level variables included in the selection equations. While the voting outcomes are conditional on the target selection process, we conjecture that the variables affect proposal probability and voting success in the same way. We additionally control for firm size in the outcome equations using the log of assets, and exclude shareholder concentration to avoid endogeneity problems. We expect that voting success is related negatively to firm size, because while Fama and French (2001) find agency concerns to be more severe in large firms with dispersed ownership, voting coalitions should be much more difficult to build.

In addition to the firm-level variables, the outcome equations include 11 variables capturing the characteristics of the proposals themselves. *Times submitted* is the number of times a proposal has been submitted in consecutive years. We conjecture that consecutive resubmissions of

unimplemented proposals improve the voting outcomes, consistent with the earlier findings of Gillan and Starks (2000) and Renneboog and Szilagyi (2009) for the US. *Number of proposals at meeting* captures the number of proposals presented at the same general meeting. While it is not immediate how this should affect voting success, we expect that the more proposals submitted, the greater the support from the voting shareholders due to the stronger signal conveyed over governance concerns. Finally, we use nine dummy variables to control for the proposal objectives. All proposals are uniquely allocated to an issue type, such that the intercept represents proposals addressing routine issues. Corresponding to our univariate results, we expect that proposals seeking personal changes on the board attract the most voting support.

The model statistics in Table 9 confirm that target selection and voting success are endogenous, with  $\rho$  sensitive to the model specification but significant in all but one case. Results not reported here show that independent analysis of the voting outcomes produces somewhat different parameter estimates and has lower explanatory power overall. These findings confirm that the voting success of shareholder proposals needs to be analyzed in a sample selection framework.

The results in Panel B of Table 9 confirm that the voting outcomes are largely driven by the proposal objectives. In Model 5, the intercept shows that routine proposals receive 9.2% of the votes cast. In comparison, proposals seeking to elect or remove directors win 21.8% and 20.6% more voting support, respectively, which is consistent with the strong signaling implications of outright proxy contests. We find no evidence that routine proposals are outperformed by other submissions, including those calling for asset restructuring, with the exception of the single miscellaneous proposal seeking to assert damage claims. The results also show no indication that consecutive resubmissions of the same proposal or multiple submissions at the same general meeting affect the voting outcomes.<sup>15</sup>

Despite the careful target selection process we documented earlier, the firm-level variables add significant explanatory power to the outcome equations. Beyond its impact on the selection decision, institutional ownership has no discernible effect on the voting outcomes. Surprisingly, however, we find that voting success conditional on target selection increases rather than decreases in the target's prior market performance and debt-to-equity and market-to-book ratios. This implies that the voting shareholders view submissions against less likely targets as a negative signal of governance problems. Of the governance-related variables, only the CEO's pay-performance sensitivity affects the voting outcomes. The relation between the two is negative, which shows that

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<sup>15</sup> The results on company- and proposal-specific covariates are largely robust to the inclusion of country fixed effects.

the CEO's exposure to firm performance mitigates shareholder concerns over the agency and signaling implications of proposal submissions.

### 5.5. Stock price effects

The outcome equations analyzing the stock price effects in the days [-1,+1] around the general meeting dates are shown in Panel B of Table 10 and summarized in Appendix B. We control for the same firm characteristics included in the outcome equations pertaining to the voting results, and conjecture that the variables affect the CARs in a similar way. The only exception is firm size, which should be related positively rather than negatively to the CARs. This conjecture assumes that while submissions against large firms are likely to win less voting support, their control benefits are greater due to agency considerations.

As the CARs are observed at the firm rather than the proposal level, the dummies controlling for the proposal objectives are now equal to one if a corresponding proposal was presented at the general meeting and zero otherwise. We conjecture that in line with their signaling effects, proposals seeking personal changes on the board generate more negative stock price changes. We similarly expect that the CARs are related negatively to the *Number of proposals at meeting* variable, to the extent that multiple submissions signal greater governance concerns.

The model statistics in Table 10 show that the outcome equations have considerable explanatory power, even though we measure the response to the general meetings rather than the individual proposals. Similar to Renneboog and Szilagyi (2009), we find no evidence that the CARs are endogenous to target selection, but as with the voting outcomes, independent regressions are less powerful and produce slightly different parameter estimates.

The outcome equations in Panel B of Table 10 show only limited evidence that the negative market reaction to general meetings is driven by the objectives of the proposals presented. The intercept representing routine proposals is insignificantly negative across all model specifications. In Model 5, the dummy capturing proposals to loosen governance quality is significantly positive. This implies that *ceteris paribus*, the market responds well to submissions that attempt and fail to relax governance standards, and thereby indicate considerable shareholder dissent vis-à-vis management. The remaining dummies, including those pertaining to proposals that seek governance improvements or personal changes on the board, are statistically insignificant. However, we

confirm that the CARs are related negatively to the number of proposals presented, in line with the signaling effects of multiple submissions.

The model statistics show that the stock price effects are most fundamentally driven by Fama and French's (2001) agency proxies and the target's prior market performance. The CARs are less negative for large firms with low leverage, indicating that the market attributes at least some control benefits to the public vote on shareholder proposals in the presence of agency concerns. However, they increase rather than decrease in both the market-to-book ratio and the prior stock price performance. This is inconsistent with the role of shareholder proposals as a disciplinary device, because it shows that the proposal outcomes only intensify the market's concerns over firms that have previously underperformed.<sup>16</sup>

The results in Panel B of Table 10 provide some support for the relevance of the target's governance structures in explaining the stock price effects. There is evidence that the CARs show the expected nonlinear relation with the number of directors, with board size significantly positive and the square of board size insignificantly negative in the final Model 5. It is notable, however, that the relation between the CARs and the CEO's pay-performance sensitivity is positive rather than negative. This again is inconsistent with the control function of shareholder proposals, in that it indicates that governance concerns over firms with ill-incentivized CEOs are only exacerbated.

## 6. Conclusion

While the control function of shareholder proposals as a disciplinary mechanism has been subject to much debate in the US academic literature, their role in European corporate governance is rarely discussed. There is evidence for the US that shareholder access to the proxy has nontrivial control benefits, and shareholder proposals should be regarded as a useful disciplinary tool and the proposal sponsors as valuable monitoring agents. In Europe, the empirical investigation of this issue has been complicated by data availability, as well as the fact that European countries are very diverse in terms of their legal provisions governing shareholder access to the proxy, corporate ownership structures, as well as the monitoring incentives and costs borne by proposal sponsors.

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<sup>16</sup> Similarly to the model explaining voting support, the results on company- and proposal-specific covariates are largely robust to the inclusion of country fixed effects. Moreover, none of the coefficients on country fixed effects are significantly different from zero.



This paper has contributed to the shareholder activism literature by examining shareholder proposals across nine European countries for the first time. The results have shown that relative to the US, proposal submissions remain less frequent in Continental Europe in particular. The different use of shareholder proposals on the two continents can be attributed to differences in the costs of activism as well as disparities in legislation concerning shareholder proposals, which are nonbinding in the US but binding in most of Europe. The importance of regulation is shown by the fact that while UK activists conveniently use proposals in relation to a proxy contest to replace the board, the proposal objectives remain largely limited to specific governance issues in Continental Europe.

Despite these country-level differences, proposal success in terms of the voting results and the stock price effects remain limited across Europe irrespective of the issues addressed. In fact, proposals are met with significantly negative market reactions when they are put to vote at general meetings. This implies that rather than attribute proposals meaningful control benefits, the market often interprets the shareholder vote as a negative signal of governance concerns. Indeed, although voting success and the stock price effects are both affected by agency considerations, the market responds particularly negatively to proposals submitted against firms that have already underperformed.

Overall, we have shown that proposal submissions are preceded by a careful selection process, whereby activists target firms that both underperform and are subject to governance concerns. We conclude that shareholder proposals are only rarely used (relative to the US). Still, we provide compelling evidence that – when they are used – proposals submitted at European firms serve an emergency brake rather than a steering wheel: they signal dissent to the market but come short of providing a reassuring solution.

**Appendix A.** Variable descriptions.

Variable name	Description and source
<b>Panel A: Financial, performance and ownership characteristics</b>	
Assets (\$ millions)	The book value of total assets. Source: <i>Compustat</i> .
Sales (\$ millions)	The value of total net sales. Source: <i>Compustat</i> .
Debt-to-equity ratio	Total debt divided by the book value of equity. Source: <i>Compustat</i> .
Market-to-book ratio	Market capitalization of equity divided by the book value of equity. Source: <i>Compustat</i> .
Prior one-year raw stock return	The dividend-adjusted stock price return in the year up to two months before the general meeting date. Source: <i>Datastream</i> .
Prior one-year abnormal stock return	The dividend-adjusted stock price return minus the return on the appropriate national stock exchange index, in the year up to two months before the general meeting date. Source: <i>Datastream</i> .
Prior one-year stock turnover	The total number of shares sold during the year up to two months before the general meeting date, divided by the total number of shares outstanding. Source: <i>Datastream and Compustat</i> .
Institutional ownership	The number of shares held by institutions, divided by the total number of shares outstanding. Source: <i>Manifest, Bureau van Dijk and annual reports</i> .
Institutional ownership – pressure sensitive	The number of shares held by banks and insurance companies, divided by the total number of shares outstanding. Source: <i>Manifest, Bureau van Dijk and annual reports</i> .
Institutional ownership – pressure insensitive	The number of shares held by pension and labor union funds, investment funds and their managers, independent investment advisors, and university endowments, divided by the total number of shares outstanding. Source: <i>Manifest, Bureau van Dijk and annual reports</i> .
Shareholder concentration	An independence index indicating ownership concentration. 1: no shareholder with ownership over 25% (direct or total). 2: no shareholder with ownership over 50% (direct or total), but one or more shareholders with ownership over 25%. 3: shareholder is ultimate owner with ownership over 50% (direct or total). 4: shareholder is ultimate owner with direct ownership over 50%. Source: <i>Bureau van Dijk</i> .
<b>Panel B: Corporate governance characteristics</b>	
Board size	The number of directors on the board of directors. Source: <i>Manifest, Thomson OneBanker and annual reports</i> .
Executive directors	The number of directors employed by the firm, divided by total board size. Source: <i>Manifest, Thomson OneBanker and annual reports</i> .
Average age of nonexecutive directors	The average age of directors not employed by the firm. Source: <i>Manifest, Thomson OneBanker and annual reports</i> .
Separate chair and CEO	A dummy variable equal to one if the chairman of the board and the CEO are different persons, and 0 otherwise. Source: <i>Manifest and annual reports</i> .
CEO ownership	The number of shares held by the CEO divided by total shares outstanding. Source: <i>Manifest and annual reports</i> .
Stock-based to total CEO compensation	The value of stock options and restricted stock grants, divided by total CEO compensation for the individual year. Source: <i>Manifest and annual reports</i> .

## Appendix B. Economic effects.

This table summarizes the economic effects of proposal and firm characteristics on the voting outcomes as shown in Model 5 of Table 9, and on the probability of proposal submissions and the cumulative abnormal returns as shown in Model 5 of Table 10. The variables are described in Appendix A. \*, \*\* and \*\*\* denote significance at the 10, 5 and 1% level, respectively.

	Proposal probability		Voting outcomes		Cumulative abnormal returns	
	<i>Exp. Sign</i>	<i>Economic effect</i>	<i>Exp. Sign</i>	<i>Economic effect</i>	<i>Exp. Sign</i>	<i>Economic effect</i>
<i>Panel A: Proposal characteristics</i>						
Times submitted			+	nss		
Number of proposals at meeting			+	nss	-	-0.004*
Elect director				0.218***		nss
Remove director				0.206***		nss
Corporate governance				nss		nss
Corporate governance - loosening				nss		nss
Asset restructuring				nss		0.565*
Capital structure				nss		nss
Payout policy				nss		nss
Corporate social responsibility				nss		nss
Other				0.674***		nss
<i>Panel B: Financial, performance and ownership characteristics</i>						
Log of assets			-	nss	+	0.005**
Debt-to-equity	-	-0.069**	-	0.018***	-	-0.003***
Market-to-book		nss		0.025*	-	0.004**
Prior one-year abnormal stock return	-	-0.379**	-	0.250***	-	0.029**
Prior one-year stock turnover	+	0.494***	+	nss	+	nss
Institutional ownership – pressure sensitive		3.331**		nss		nss
Institutional ownership – pressure insensitive	+	2.298***	+	nss	+	nss
Shareholder concentration	+	0.310**				
<i>Panel C: Governance characteristics</i>						
Board size		nss	-	nss	-	-0.005*
Board size squared		nss	+	nss	+	nss
Executive directors		nss	+	nss	+	nss
Average age of nonexecutive directors		nss	-	nss	-	nss
Separate chair and CEO		nss	-	nss	-	nss
CEO ownership		nss	-	nss	-	nss
Stock-based to total CEO compensation		nss	-	-0.223***	-	0.039**

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**Table 1.** Statutory requirements on requisitioning an extraordinary general meeting (EGM) and putting forward a proposal (placing an item on the agenda) at a general meeting (GM)

This table presents the regulatory requirements for extraordinary general meetings and shareholder proposals for the countries in our sample. *LLSV origin* is the legal origin of the country according to La Porta *et al.* (1998). *EGM* lists the percentage ownership needed to requisition an extraordinary general meeting. *Proposal* is the percentage ownership required to place a proposal on the agenda of a general meeting. *Call GM* shows the deadline for the firm to announce a general meeting. *Submit proposal* contains the deadline for shareholders to put forward a proposal for a general meeting.

Country	LLSV origin	EGM	Remark	Proposal	Remark	Call GM	Submit proposal
Austria	German	5%		5%		at least 14 days before the GM	at least 7 days before GM
France	French	0.5-5%	this fraction can demand the appointment of a court representative to convene an EGM	0.5-5%	decreasing in company size	A "notice of the GM" at least 30 days before the GM. A "notice of call" at least 15 days before the GM, with same information as the "notice of the GM" and any modifications to the agenda and/or the proposals.	at least 25 days before the GM
Germany	German	5%		5% or share ownership of 500000 EUR in nominal value any shareholder if related to already existing agenda items		20 full days before	1 week after publication of notice
Netherlands	French	10%		1% or share ownership of 50 million EUR in market value		at least 15 days before	in writing, at least 60 days before GM
Norway	Scandinavian	5%		any shareholder		at least 14 days before, but the articles may set a longer/shorter period	
Portugal	French	5%		5%		at least 30 days, or 21 if notification is by registered mail	within 5 days of the convocation of the GM
Russia	other	10%		2%	<i>specific to sample firm</i>		within 30 days after the end of the fiscal year



**Table 1.** Statutory requirements on requisitioning an extraordinary general meeting (EGM) and putting forward a proposal (placing an item on the agenda) at a general meeting (GM) (*continued*).

Country	LLSV origin	EGM	Remark	Proposal	Remark	Call GM	Submit proposal
Switzerland	German	10%		share ownership of 1 million CHF in market value	firm-specific information also available for our sample	two notices, the first at least 20 days before	at least 60 days before GM
UK	English	10%		5% or a group of at least 100 shareholders with shares on which at least 100 GBP has been paid up, on average	automatically if it was the shareholder who convened the GM	21 days for an AGM or 14 days if an extraordinary resolution is voted upon	6 weeks before the GM or, if later, the time at which notice of the meeting is given

**Table 2.** Shareholder proposals by geographic location and stock market size.

This table shows the absolute and the relative number of shareholder proposals submitted in the UK, Continental Europe, and the US. Information on the number of listed companies, traded stock value and market capitalization is obtained from the World Bank's World Development Indices. Data on US proposals are from Renneboog and Szilagyi (2009).

Region	Year	Number of proposals	Proposals per year	Proposals per year		
				per listed company	per USD trillion of traded stock value	per USD trillion of market capitalization
UK	1998-2008	362	32.9	0.0140	8.39	11.40
Continental Europe	2005-2008	358	89.5	0.0117	5.80	7.19
US*	1996-2005	2,792	279.2	0.0407	14.56	20.31

**Table 3. Shareholder proposals by issue addressed, geographic location, and year of submission.**  
This table shows the number of shareholder proposals in the UK and in Continental Europe by the year of submission and the issue addressed.

	UK												Continental Europe				Total by issue	
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total by issue	2005	2006	2007	2008		
Elect/remove	-	11	-	1	10	2	37	16	19	27	6	129	Elect/remove	-	-	5	5	10
Elect director	-	4	-	1	4	1	10	6	14	15	3	58	Elect director	-	-	3	2	5
Remove director	-	7	-	-	6	1	27	10	5	12	3	71	Remove director	-	-	2	3	5
Corporate governance	2	2	3	2	3	1	2	1	-	2	3	21	Corporate governance	1	5	31	34	65
Reduce director power	-	-	-	-	-	-	-	-	-	1	2	3	Reduce director power	-	-	1	-	1
Director independence	-	1	-	-	-	-	-	-	-	-	-	1	Board size	-	-	2	-	2
Director ownership	-	-	-	-	-	-	1	-	-	-	-	1	Board liability	-	-	3	-	3
Board liability	-	-	-	-	-	-	1	-	-	-	-	1	Age limit for directors	-	-	2	-	2
Board representation	-	-	-	1	-	-	-	-	-	-	-	1	Elect committee/special representative	-	2	-	6	8
Enfranchise non-voting shares	-	1	1	-	1	-	-	-	-	-	-	3	Shareholder right to comment	-	-	2	-	2
Reincorporation in US	-	-	-	-	-	1	-	-	-	-	-	1	Special audit	-	1	12	14	27
Convene EGM	1	-	-	1	-	-	-	-	-	-	-	2	Verbatim minutes	-	-	2	2	4
Remove auditor	-	-	-	-	-	-	-	-	-	1	-	1	Voting issues	1	-	3	1	5
Other	1	1	1	-	2	-	-	1	-	-	1	7	Other	-	2	4	5	11
Corporate governance - loosening	-	-	-	-	-	-	-	-	-	-	-	-	Corporate governance - loosening	-	-	2	3	5
	-	-	-	-	-	-	-	-	-	-	-	-	Waive board liability	-	-	-	1	1
	-	-	-	-	-	-	-	-	-	-	-	-	Limit shareholder representation	-	-	2	1	3
	-	-	-	-	-	-	-	-	-	-	-	-	Counterproposal - special audit	-	-	-	1	1
Asset restructuring	-	1	3	1	-	-	-	-	1	-	1	7	Asset restructuring	-	-	3	1	4
Capital structure	4	-	-	-	-	-	-	-	-	3	-	7	Capital structure	-	-	-	-	-
Payout policy	-	2	1	4	4	-	-	-	-	-	-	11	Payout policy	-	1	2	1	4
Corporate social responsibility	-	1	2	2	1	1	4	2	2	2	1	18	Corporate social responsibility	-	-	3	-	3
Routine	-	-	-	1	1	-	-	-	-	-	-	2	Routine	-	-	3	-	3
Other	-	-	-	-	-	-	-	-	-	-	-	-	Other	-	-	1	-	1
Total by year	6	16	7	13	20	4	43	19	22	34	11	195	Total by year	1	6	50	38	95

**Table 4.** Percentage of votes FOR shareholder proposals and the number of passed proposals

This table shows the mean percentage of votes cast in favor of shareholder proposals grouped by the issue addressed, year of submission and geographic region. The first number in parentheses indicates the number of passed proposals. The second number in parentheses stands for the total number of proposals submitted.

Year	UK										Continental Europe				Total by issue	
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2005	2006	2007		2008
Elect/remove	-	29.3	-	18.9	23.3	19.5	54.2	38.6	42.1	25.2	30.6	-	-	44.8	48.2	46.5
	-	(0/11)	-	(0/1)	(0/10)	(0/2)	(30/37)	(4/16)	(8/19)	(3/27)	(0/6)	-	-	(2/5)	(1/5)	(3/10)
<i>Elect director</i>	-	29.1	-	18.9	21.2	35.3	60.9	34.3	38.8	28.8	29.1	-	-	72.7	69.6	71.5
	-	(0/4)	-	(0/1)	(0/4)	(0/1)	(10/10)	(1/6)	(4/14)	(3/15)	(0/3)	-	-	(2/3)	(1/2)	(0/5)
<i>Remove director</i>	-	29.4	-	-	24.7	3.7	51.6	41.2	51.4	20.8	32	-	-	3	33.9	21.5
	-	(0/7)	-	-	(0/6)	(0/1)	(20/26)	(3/10)	(4/5)	(0/12)	(0/3)	-	-	(0/2)	(0/3)	(0/5)
Corporate governance	14.5	17	22.1	9.1	14.6	10.8	3	1.9	-	3.1	66	7.3	39.4	8.9	18.8	15.5
	(0/2)	(0/2)	(0/3)	(0/2)	(0/3)	(0/1)	(0/2)	(0/1)	-	(0/2)	(3/3)	(0/1)	(2/5)	(2/31)	(3/28)	(7/65)
Corporate governance – loosening	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7	33.5	21.2
Asset restructuring	-	-	15	10.2	7.7	-	-	-	95.2	-	66	-	-	(0/2)	(1/3)	(1/5)
	-	-	(0/1)	(0/3)	(0/1)	-	-	-	(1/1)	-	(1/1)	-	-	60.1	5.3	46.4
Capital structure	4	-	-	-	-	-	-	-	-	4.6	-	-	-	(2/3)	(0/1)	(2/4)
	(0/4)	-	-	-	-	-	-	-	-	(0/3)	-	-	-	-	-	-
Payout policy	-	17.9	23.2	17.3	12.8	-	-	-	-	-	-	-	0.3	19	99.5	34.4
	-	(0/2)	(0/1)	(0/4)	(0/4)	-	-	-	-	-	-	-	(0/1)	(0/2)	(1/1)	(1/4)
Corporate social responsibility	-	19.1	15.2	3.2	10.3	5.9	8.4	4.2	6	5.8	8.9	-	-	2	-	2
	-	(0/1)	(0/2)	(0/2)	(0/1)	(0/1)	(0/4)	(0/2)	(0/2)	(0/2)	(0/1)	-	-	(0/3)	-	(0/3)
Routine	-	-	-	3.5	14.1	-	-	-	-	-	-	-	-	1.8	-	1.8
	-	-	-	(0/1)	(0/1)	-	-	-	-	-	-	-	-	(0/3)	-	(0/3)
Other	-	-	-	-	-	-	-	-	-	-	-	-	-	93.3	-	93.3
	-	-	-	-	-	-	-	-	-	-	-	-	-	(1/1)	-	(1/1)
Total by year	7.5	25.7	19.3	11.3	18	13.9	47.5	33.1	41.3	21	41.5	7.3	32.9	16.5	25.6	21.1
	(0/6)	(0/16)	(0/7)	(0/13)	(0/20)	(0/4)	(30/43)	(4/19)	(9/22)	(3/34)	(4/11)	(0/1)	(2/6)	(7/50)	(6/38)	(15/95)

**Table 5. Percentage of votes for shareholder proposals by issue addressed, geographic location, and management recommendation.**

This table shows the mean percentage of votes cast in favor of shareholder proposals partitioned according to proposal issue and management recommendation. Data span 1998-2008 for the UK and 2005-2008 for Continental Europe.

Management recommendation	UK						Continental Europe					
	Against Mean (N)	Case-by-case Mean (N)	For Mean (N)	Total by issue Mean (N)	Against Mean (N)	Case-by-case Mean (N)	For Mean (N)	Total by issue Mean (N)				
Elect/remove	38.4 (125)	32.0 (3)	2.9 (1)	38.0 (129)	26.0 (4)	3.7 (1)	71.5 (5)	46.5 (10)				
<i>Elect director</i>	36.8 (58)	-	-	36.8 (58)	-	-	71.5 (5)	71.5 (5)				
<i>Remove director</i>	39.8 (67)	32.0 (3)	2.9 (1)	39.0 (71)	26.0 (4)	3.7 (1)	-	21.5 (5)				
Corporate governance	21.5 (19)	-	3.0 (2)	19.7 (21)	6.7 (49)	8.7 (4)	53.7 (12)	15.5 (65)				
Corporate governance - loosening	-	-	-	-	3.3 (3)	-	48.1 (2)	21.2 (5)				
Asset restructuring	19.8 (6)	-	95.2 (1)	30.6 (7)	46.4 (4)	-	-	46.4 (4)				
Capital structure	4.3 (7)	-	-	4.3 (7)	-	-	-	-				
Payout policy	16.3 (11)	-	-	16.3 (11)	19.0 (2)	-	49.9 (2)	34.4 (4)				
Corporate social responsibility	8.5 (16)	-	5.4 (2)	8.1 (18)	2.0 (3)	-	-	2.0 (3)				
Routine	8.8 (2)	-	-	8.8 (2)	1.8 (3)	-	-	1.8 (3)				
Other	-	-	-	-	93.3 (1)	-	-	93.3 (1)				
Total by recommendation	30.6 (186)	32.0 (3)	19.2 (6)	30.3 (195)	9.9 (68)	22.0 (6)	57.0 (21)	21.1 (95)				

**Table 6.** Cumulative abnormal returns around general meeting dates.

This table shows percent cumulative abnormal returns around general meeting dates. Market model parameters are estimated over the 200-day period ending 21 days before the date of the general meeting, using the appropriate national stock exchange index. The significance of means is tested using a cross-sectional t-test, Boehmer, Musumeci, and Poulsen's (1991) standardized cross-sectional Z-test, as well as bootstrapped versions of both. Bootstrap simulations are performed with 3000 repetitions. The significance of medians is tested using Cowan's (1992) generalized sign test. \*, \*\* and \*\*\* denote significance at the 10, 5 and 1% level, respectively. Data span 1998-2008 for the UK and 2005-2008 for Continental Europe.

Event window	N	Mean	Median	Positive: negative	Z test	Bootstrapped Z test	Sign test (p*=47%)
[-1,+1]	90	-1.227	-0.713	34:56	-2.81***	-2.81***	-1.79**
[-1,0]	90	-0.906	-0.418	36:54	-1.87*	-1.87**	-1.36*
[0,+1]	90	-0.761	-0.103	41:49	-2.14**	-2.14**	-0.31
[-2,+2]	90	-1.142	-0.628	34:56	-2.65***	-2.65***	-1.79**
[-1,+5]	90	-1.323	-1.256	34:56	-2.65***	-2.65***	-1.79**
[-1,+7]	90	-1.584	-1.326	38:52	-2.64***	-2.64***	-0.95
[-5,+5]	90	-1.603	-1.016	36:54	-2.53**	-2.53***	-1.36*
[-10,+10]	90	-2.002	-0.794	38:52	-2.60**	-2.60***	-0.95

**Table 7.** Cumulative abnormal returns by issue addressed.

This table shows percent cumulative abnormal returns around general meeting dates. Market model parameters are estimated over the 200-day period ending 21 days before the date of the general meeting, using the appropriate national stock exchange index. The significance of means is tested using Boehmer, Musumeci and Poulsen's (1991) standardized cross-sectional Z-test. \*, \*\* and \*\*\* denote significance at the 10, 5 and 1% level. Data span 1998-2008 for the UK and 2005-2008 for Continental Europe.

	N	[-1,+1]	[-1,0]	[0,+1]	[-2,+2]	[-1,+5]	[-1,+7]	[-5,+5]	[-10,+10]
Elect/remove	42	-1.28	-1.25	-0.68	-0.92	-2.20*	-2.78**	-2.60	-3.51
Corporate governance	33	-1.09	-0.59	-0.61	-1.81**	-0.80*	-0.96**	-0.71*	-1.23**
Corporate governance - loosening	5	-2.52	-0.12	-2.29	-4.53*	-2.87	-4.14	-2.62	-2.90
Asset restructuring	8	-1.73	-1.39	-1.40	-3.14	4.16	3.97	3.83	5.93
Capital structure	2	-0.43	-0.75	-0.12	-1.97	-3.54	-0.81	-3.05	-2.16
Payout policy	12	-0.57	-1.03	-1.34	-0.28	-1.99	0.82	1.04	-0.23
Corporate social responsibility	18	-0.32	-0.06	-0.07	-0.57	-0.95	-0.34	-1.13	0.30
Routine	4	-2.12	-1.08	-1.21	-2.89	-5.75	-5.98	-5.80	-3.28
Other	1	-0.11	-0.37	-0.72	-1.09	-1.08	-0.16	-0.11	-1.07

**Table 8.** Descriptive statistics of target and nontarget firms.

This table reports financial, performance and ownership information as well as governance characteristics for European firms in our sample. Targets are defined as firms at which one or more shareholder proposal was submitted to and voted on at the general meeting. Nontargets are size- and industry-matched peers of targets. Banks and insurance companies are classified as pressure-sensitive, whereas other institutional investors are categorized as pressure-insensitive. Shareholder concentration is measured by the Bureau van Dijk Independence Indicator, with the scale transformed from A, B, C and D to 1, 2, 3 and 4.

	Targets			Nontargets			<i>Difference in means</i>	<i>Difference in medians</i>		
	N	Mean	Median	St. dev.	N	Mean			Median	St. dev.
<i>Panel A: Financial, performance and ownership characteristics</i>										
Assets (GBP millions)	90	53,581	1,390	142,689	89	94,881	3,593	265,195	-41,301*	-2,202
Sales (GBP millions)	90	16,204	392	47,590	89	12,820	2,075	22,041	3,384	-1,683*
Debt-to-equity ratio	90	2.41	0.64	5.18	89	2.48	0.78	4.28	-0.07	-0.13
Market-to-book ratio	90	2.44	1.65	2.28	89	2.14	1.62	1.80	0.30	0.03
Prior one-year raw stock return (%)	90	5.46	4.80	38.34	89	12.24	10.95	55.14	-6.78	-6.15
Prior one-year abnormal stock return (%)	90	-0.77	-1.84	34.27	89	7.55	0.98	50.05	-8.32	-2.82
Prior one-year stock turnover	90	2.62	1.37	8.43	89	0.98	0.73	0.94	1.64*	0.64***
Institutional ownership (%)	90	32.98	25.24	24.72	89	21.60	19.90	17.68	11.37***	5.34***
Institutional ownership - pressure sensitive (%)	90	6.34	0.00	15.12	89	3.35	0.00	5.22	2.99*	0.00
Institutional ownership - pressure insensitive (%)	90	26.70	19.00	23.10	89	18.25	10.76	17.97	8.45**	8.24**
Shareholder concentration	90	1.88	1.00	1.27	89	1.55	1.00	0.93	0.33*	0.00
<i>Panel B: Governance characteristics</i>										
Board size	90	12.83	12.00	6.98	89	11.43	10.00	5.92	1.40***	2.00**
Executive directors (%)	90	36.39	37.50	18.45	89	38.00	36.08	0.17	36.01	37.14
Average age of nonexecutive directors	90	59.35	58.88	4.69	89	59.91	59.98	5.40	-0.56	-1.10
Separate chair and CEO (binary)	90	0.88	1.00	0.33	89	0.83	1.00	0.38	0.04	0.00
CEO ownership (%)	90	0.74	0.01	3.28	89	2.50	0.04	8.05	-1.76*	-0.04***
Stock-based to total CEO compensation (%)	90	30.83	27.46	30.31	89	27.61	24.45	28.63	3.22	3.01

**Table 9.** Sample selection models explaining proposal probability and voting outcomes.

Panel A shows selection equations where the dependent variable is a dummy equal to one if a shareholder proposal was submitted and zero otherwise. In the outcome equations of Panel B, the dependent variable is the percentage of votes cast in favor of the proposal. The firm-level independent variables included in both Panels A and B are described in Appendix A. The proposal-level independent variables in Panel B are dummies equal to one if the variable description holds and zero otherwise. Log of assets is the natural logarithm of the book value of assets. Wald  $\chi^2$  tests the joint significance of the selection and outcome equations.  $\rho = 0$  tests the independence of the selection and outcome equations using a Wald  $\chi^2$  test. T-statistics use standard errors with White (1980) correction for heteroskedasticity and adjusted for clustering of observations on each firm. \*, \*\* and \*\*\* denote significance at the 10, 5 and 1% level, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
<i>Panel A: Selection equations</i>										
Intercept	0.857	1.63	1.950	1.55	2.516*	1.95	2.619	1.54	2.640**	2.15
Debt-to-equity	-0.003	-0.14	-0.051	-1.64	-0.077**	-2.48	-0.077**	-2.13	-0.079***	-2.74
Market-to-book	-0.107**	-2.43	-0.097**	-2.20	-0.103**	-2.01	-0.131*	-1.72	-0.129***	-2.56
Prior one-year abnormal stock return	0.029	0.13	-0.216	-1.10	-0.506***	-3.03	-0.500*	-1.89	-0.482***	-2.78
Prior one-year stock turnover	0.317**	2.48	0.685***	6.77	0.653***	6.38	0.684***	4.33	0.669***	7.06
Institutional ownership – pressure sensitive	2.258	1.56	3.579**	2.25	3.365*	1.88	3.166	1.43	3.568**	2.17
Institutional ownership – pressure insensitive	0.822*	1.71	1.814***	3.83	1.714***	3.27	1.793**	2.33	1.811***	3.44
Shareholder concentration			0.174*	1.95	0.174*	1.64	0.166	1.34	0.166*	1.68
Board size			0.005	0.06	-0.030	-0.38	0.040	0.30	0.027	0.32
Board size squared			0.004*	1.68	0.006**	2.27	0.004	0.94	0.004	1.64
Executive directors			1.260**	2.13	1.305*	1.93	1.024	1.25	1.017	1.39
Average age of nonexecutive directors			-0.029*	-1.92	-0.031*	-1.94	-0.034	-1.14	-0.033**	-1.99
Separate chair and CEO			0.506**	2.22	0.435*	1.75	0.377	1.07	0.380*	1.65
CEO ownership			-1.123	-0.56	-1.480	-0.69	-1.152	-0.42	-1.112	-0.52
Stock-based to total CEO compensation			-0.099	-0.25	0.042	0.10	0.311	0.67	0.315	0.96



**Table 9.** Sample selection models explaining proposal probability and voting outcomes (*continued*).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Intercept	0.176*	1.82	0.170	1.52	0.142	0.78	0.324	1.31	0.092	0.28
Times submitted	0.006	0.23	0.003	0.09	-0.016	-0.89			-0.021	-1.28
Number of proposals at meeting	-0.005	-0.66	-0.008	-1.05	-0.007	-1.46			-0.007	-1.04
Elect director	0.278***	4.23	0.305***	4.14	0.290***	4.72			0.218***	2.63
Remove director	0.271***	3.73	0.297***	3.64	0.280***	4.53			0.206***	2.57
Corporate governance	0.094	1.52	0.110	1.60	0.051	0.98			0.081	1.37
Corporate governance - loosening	0.165	0.95	0.170	0.95	0.118	0.67			0.183	1.02
Asset restructuring	0.234**	2.08	0.255**	2.10	0.098	1.08			0.105	1.16
Capital structure	-0.087*	-1.75	-0.050	-0.97	-0.043	-0.90			0.008	0.12
Payout policy	0.086	1.09	0.102	1.31	0.060	0.88			0.055	0.70
Corporate social responsibility	-0.029	-0.60	-0.007	-0.12	-0.016	-0.37			0.007	0.11
Other	0.769***	11.25	0.784***	10.80	0.713***	3.82			0.675***	3.06
Log of assets			-0.002	-0.19			0.010	0.95	0.011	1.03
Debt-to-equity			0.018***	2.79	0.018***	2.79	0.018***	4.20	0.018***	4.02
Market-to-book			0.003	0.29	0.003	0.29	0.036***	3.08	0.025*	1.90
Prior one-year abnormal stock return			0.239***	3.57	0.239***	3.57	0.250***	5.54	0.250***	4.78
Prior one-year stock turnover			-0.002	-0.92	-0.002	-0.92	-0.002	-1.59	-0.002	-1.63
Institutional ownership – pressure sensitive			-0.006	-0.03	-0.006	-0.03	0.318**	2.12	0.094	0.43
Institutional ownership – pressure insensitive			0.161	1.59	0.161	1.59	0.069	0.63	0.028	0.34
Board size					-0.029	-1.36			-0.032	-1.15
Board size squared					0.000	0.64			0.001	0.75
Executive directors					-0.045	-0.33			0.077	0.52
Average age of nonexecutive directors					0.000	0.03			0.002	0.51
Separate chair and CEO					0.061	1.45			0.051	0.96
CEO ownership					0.664	1.54			0.092	0.17
Stock-based to total CEO compensation					-0.306***	-4.27			-0.223***	-2.66
Number of observations	380		380		380		380		380	
Number of uncensored observations	290		290		290		290		290	
Number of proposals	290		290		290		290		290	
Wald $\chi^2$	5170.69***		2248.52***		4540.54***		189.28***		7065.09***	
Log-likelihood	-153.014		-105.014		-66.403		-57.136		-38.137	
P	-0.597***		-0.641**		-0.457		-0.521**		-0.495	

**Table 10.** Sample selection models explaining proposal probability and cumulative abnormal returns.

Panel A shows selection equations where the dependent variable is a dummy equal to one if a shareholder proposal was submitted and zero otherwise. In the outcome equations of Panel B, the dependent variable is the cumulative abnormal return in the days [-1,+1] surrounding the date of the general meeting where the proposal was presented. Market model parameters are estimated over the 200-day period ending 20 days before the date of the general meeting, using country-specific stock market indices. The firm-level independent variables included in both Panels A and B are described in Appendix A. The proposal-level independent variables in Panel B are dummies equal to one if the variable description holds and zero otherwise. Log of assets is the natural logarithm of the book value of assets. Wald  $\chi^2$  tests the joint significance of the selection and outcome equations.  $\rho = 0$  tests the independence of the selection and outcome equations using a Wald  $\chi^2$  test. T-statistics use standard errors with White (1980) correction for heteroskedasticity and adjusted for clustering of observations on each firm. \*, \*\*, and \*\*\* denote significance at the 10, 5 and 1% level, respectively.

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Intercept	-0.569	-0.96	0.219	0.16	-0.232	-0.20	-0.146	-0.08	-0.162	-0.13
Debt-to-equity	-0.042*	-1.86	-0.045	-0.37	-0.038	-0.83	-0.066	-1.08	-0.069**	-2.02
Market-to-book	0.008	0.17	-0.054	-0.57	-0.024	-0.40	-0.039	-0.64	-0.036	-0.89
Prior one-year abnormal stock return	-0.229	-1.20	-0.481**	-2.40	-0.385**	-2.22	-0.302	-0.50	-0.379**	-2.02
Prior one-year stock turnover	0.346***	3.20	0.438	1.21	0.316**	2.32	0.4572	1.21	0.494***	4.10
Institutional ownership – pressure sensitive	2.116	1.45	2.911	1.70	2.697**	2.48	3.588	1.16	3.331**	2.18
Institutional ownership – pressure insensitive	1.290***	2.75	2.113**	2.25	1.387***	3.04	2.3745***	2.64	2.298***	5.63
Shareholder concentration			0.301***	2.79	0.178	1.11	0.347	0.98	0.310***	2.41
Board size			0.077	1.01	omitted to attain convergence		0.056	0.38	0.063	0.76
Board size squared			0.001	0.54	omitted to attain convergence		0.002	0.49	0.002	0.75
Executive directors			0.664	0.47	0.239	0.27	0.994	0.98	0.989	1.21
Average age of nonexecutive directors			-0.016	-0.66	-0.007	-0.42	-0.021	-0.72	-0.019	-1.18
Separate chair and CEO			0.277	0.73	0.138	0.56	0.282	0.64	0.256	0.93
CEO ownership			-1.548	-0.76	-2.010	-0.69	-0.659	-0.25	-0.787	-0.36
Stock-based to total CEO compensation			0.413	1.24	0.253	0.49	0.686	0.55	0.565	1.51

Panel A: Selection equations

**Table 10.** Sample selection models explaining proposal probability and cumulative abnormal returns (*continued*).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
<i>Panel B: Outcome equations</i>										
Intercept	-0.000	-0.12	-0.030	-0.9	-0.087*	-1.73	-0.049	-0.62	-0.019	-0.27
Number of proposals at meeting	-0.005*	-1.78	-0.005*	-1.73	-0.005**	-2.29			-0.004*	-1.85
Elect director	0.003	0.18	0.007	0.27	0.003	0.12			-0.006	-0.41
Remove director	0.026*	1.77	0.027	1.39	0.038**	2.14			0.020	1.21
Corporate governance	0.019	1.51	0.012	0.43	0.020	1.39			0.018	1.21
Corporate governance - loosening	0.023	1.25	0.019	1.00	0.023	1.22			0.042***	2.73
Asset restructuring	0.001	0.03	0.006	0.27	0.025	1.41			0.012	0.74
Capital structure	0.015	0.72	0.030*	1.84	0.020	0.98			0.015	0.64
Payout policy	0.017	0.94	0.012	0.30	0.017	1.12			0.017	1.03
Corporate social responsibility	0.024*	1.72	0.019	0.59	0.015	0.96			0.000	0.01
Other	0.003	0.16	0.033	0.66	-0.000	-0.02			-0.025	-1.07
Log of assets					0.004**	2.40	0.003	1.08	0.005**	2.49
Debt-to-equity					-0.003**	-2.33	-0.002	-0.96	-0.003**	-2.65
Market-to-book					0.004*	1.83	0.004	0.82	0.004**	2.15
Prior one-year abnormal stock return					0.020	1.29	0.027	0.67	0.029**	2.11
Prior one-year stock turnover					-0.001	-0.25	0.001	0.38	0.000	0.59
Institutional ownership – pressure sensitive					-0.002	-0.03	0.039	0.65	0.036	1.14
Institutional ownership – pressure insensitive					0.009	0.25	0.056	0.88	0.033	1.37
Board size							-0.000	-0.06	-0.005*	-1.8
Board size squared							0.000	-0.06	0.000	1.34
Executive directors							0.038	0.66	0.029	1.34
Average age of nonexecutive directors							-0.001	-0.53	-0.001	-1.17
Separate chair and CEO							-0.002	-0.18	0.008	0.64
CEO ownership							0.221	0.61	0.173	0.98
Stock-based to total CEO compensation							0.037*	1.75	0.039**	2.07
Number of observations	180		180		180		180		180	
Number of uncensored observations	90		90		90		90		90	
Number of firms	124		124		124		124		124	
Wald $\chi^2$	10.23		14.88		44.67***		50.17***		77.00***	
Log-likelihood	57.163		74.152		71.373		85.334		93.311	
p	-0.615		0.539		-0.265		0.568		0.207	

## Chapter 2

### Corporate Governance Rules and Insider Trading Profits

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**Abstract:** We investigate patterns of abnormal stock performance around insider trades on the Dutch market. Listed firms in the Netherlands have a long tradition of limiting shareholders rights. Using a change in corporate governance regulations as a natural experiment we show that governance rules have a causal effect on insider trading profits. Our results imply that insider transactions are more profitable at firms where shareholder rights are not restricted by anti-shareholder mechanisms. These findings are inconsistent with internal monitoring of insider trading. Rather, we explain this empirical pattern by imperfect substitution between insider trading profits and other private benefits of control.

#### 1. Introduction

In addition to their attractive compensation packages, executives and other insiders of public firms appear to reap further benefits through their position, at the expense of dispersed shareholders. Studies of legal insider trading suggest that insiders use private information to increase profits from their transactions (Seyhun, 1986; Lakonishok and Lee, 2001; Piotroski and Roulstone, 2005).<sup>1</sup> Still, proper corporate governance can restrain selfish managerial decisions that are detrimental to the firm: shareholders can prevent abusive actions by monitoring or disciplining managers, or even by firing them. This paper investigates the relation between insider trading and corporate governance using insiders' transactions in the Netherlands, a market where firms have had a long history of oppressing shareholder rights. We contribute to the existent literature on insider trading and corporate governance by alleviating concerns of endogeneity and addressing the causal relationship between governance rules and insider trading profits. In 2004, there were significant modifications

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<sup>1</sup> Although the focus of this study is on legal insider trading, there are several papers to suggest that insiders also cross the line between legal and illegal when trading in the company stock (Meulbroek, 1992; Bhattacharya and Marshall, 2009), or backdating their option packages for financial gains (Lie, 2005; Heron and Lie, 2007; Narayanan et al., 2007).

in Dutch corporate governance regulations, which we use as a quasi-natural experiment. We take a differences-in-differences (DD) approach to examine whether profits to insider trading changed as a new corporate governance code and legislation strengthening shareholder rights came into effect. Our study is the first to examine simultaneously the impact of both blockholder structure and governance rules on insider trading. Our unique, hand-collected dataset contains information on blockholder ownership, as well as anti-shareholder devices employed by firms.

We motivate an alternative hypothesis to the monitoring argument which has been the only idea to date underpinning the interrelationship between insider trading and corporate governance. We conjecture that if private benefits owed to managerial entrenchment outweigh the profits from insider trading, insider transactions will be a substitute mechanism that insiders resort to if they are barred from exploiting other private benefits. Our findings provide strong empirical support for the substitution hypothesis. This result is valid for insider purchases and sales, depends on the use of anti-shareholder mechanisms, and is robust to the inclusion of several controls previously shown to affect abnormal returns around insider transactions. Lastly, we use this substitution effect to measure private benefits of control enjoyed by insiders.

Our results indicate that insiders earn an average abnormal return of 3.5% over the 40-day window following their purchases. However, this is not because they purchase in response to strong stock price performance. Our findings on the relationship between corporate governance and insider trading suggest that the government and nonfinancial blockholders do not monitor insider trading activity. The latter are likely to trade on the same signal, thereby amplifying abnormal returns. Concerning the governance mechanisms of the firm, we find strong evidence for the substitution hypothesis. The returns insiders earn on their transactions are higher at firms that do not limit shareholder power through anti-shareholder mechanisms. This can be explained in a framework where insiders dedicate increased attention to their trades once they are unable to reap private benefits of control. Relying on the 2004 corporate governance changes, our DD estimates suggest that it is indeed corporate governance rules that impact insider trading profits. This is further corroborated by regressions with firm fixed effects. Exploiting the substitution effect uncovered in the data, we estimate the lower bound of entrenchment benefits provided by one anti-shareholder mechanism at approximately €15,000 per year. When placing these estimates in the context of our sample, we find that insiders of the average firm enjoy private benefits that are worth at least €245,000. This value is predicated on the assumption of perfect substitution, and, as it is quite moderate, suggests that insider trading profits and other private benefits of control are imperfect substitutes.

The remainder of the paper is structured as follows. In Section 2 we offer a synthesis of prior literature on insider trading and insider option exercises, based on which we then develop our research hypotheses. Section 3 describes the measures used to suppress shareholder rights in the Netherlands. Section 4 presents the data and methodology and in Section 5 we detail our findings and examine alternative explanations for our results. In Section 6 we estimate the value of private benefits in monetary terms. Section 7 concludes the paper.

## 2. Literature review and hypothesis development

It has long been recognized that insiders are able to trade on private information and hence earn abnormal returns on their trades (Lorie and Niederhoffer, 1968; Jaffe, 1974). Despite the transformation and modernization of financial markets, over time, insiders' ability to trade on private information appears to persist (Seyhun, 1998; Ravina and Sapienza, 2010; Cohen et al., 2011). The main results of Seyhun (1986, 1998) show that abnormal returns peak around insider sales and depict a valley pattern around purchases. However, the documented abnormal stock price patterns could also be explained by contrarian investing: selling after periods of stock price appreciation and buying after periods of stock price decline. Notwithstanding, the large body of literature concerned with this question shows that insiders earn higher returns on their trades than a naïve contrarian strategy would yield, implying that they indeed possess private information.<sup>2</sup> In line with prior literature, we hypothesize that *cumulative abnormal returns (CARs) are positive (negative) in the days following the purchase (sale)*. We furthermore expect that *the absolute magnitude of the market reaction will be larger to purchases than to sales*, for sales can be triggered by reasons other than private information, e.g. liquidity needs or diversification concerns. This argument is supported by the results of Jeng et al. (2003) and Lakonishok and Lee (2001) for

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<sup>2</sup> Lakonishok and Lee (2001) attempt to disentangle contrarian investment strategies and inside information and show that even though insiders are in general contrarian investors, their transactions are more informative in predicting future stock performance than are simple contrarian strategies. Jenter (2005) argues that managers have contrarian views concerning the stock of their own company and perceive the book-to-market effect as a mispricing. Piotroski and Roulstone (2005) document that insider trades are based both on contrarian beliefs and on superior (inside) information on future cash flows. Ravina and Sapienza (2010) show insiders have excellent timing abilities and are not merely purchasing after periods of stock price decline and selling after the stock price has gone up. The results of Fidrmuc et al. (2006) also suggest that insider trades are based on private information.

US firms, and Friederich et al. (2002) and Fidrmuc et al. (2006) for UK firms. The empirical approach of our paper is different from Rozeff and Zaman (1998), Lakonishok and Lee (2001), Jenter (2005), and Piotroski and Roulstone (2005) in that we focus on individual trades rather than aggregate insider trading, as do Fidrmuc et al. (2006) and Ravina and Sapienza (2010).

An ample body of literature shows that firms ultimately benefit from shareholder-oriented corporate governance (Gompers et al., 2003; Cremers and Nair, 2005; Shleifer and Vishny, 1997; Bhagat and Bolton, 2008). Recent empirical studies suggest that strong corporate governance curtails insider trading profits (Fidrmuc et al., 2006; Ravina and Sapienza, 2010). Fidrmuc et al. (2006) introduced the notion of blockholder monitoring of insider trading. As large shareholders have a greater stake in the company which gives them both stronger incentives to monitor and larger voting power to effectively intervene, these shareholders will monitor the firm more closely. However, major shareholders are not homogenous in terms of their monitoring quality: their ability and incentives to monitor hinges on their type (Holderness and Sheehan, 1988; Franks et al., 2001).

Regarding blockholder monitoring of insider trades, Fidrmuc et al. (2006) find that the price reaction after purchases is smaller in the presence of blockholders who are likely to monitor management, i.e. unrelated individuals, families or corporations. Hence, insider trades are less informative at firms with intensive monitoring. Similarly, the empirical findings of Betzer and Theissen (2009) indicate that major block ownership by a nonfinancial firm attenuates the absolute magnitude of abnormal returns both after purchases and sales. Fidrmuc et al. (2006) also document for the UK that the positive price reaction to sales is greater in the presence of institutional blockholders who do not monitor management, but trade on their signals instead. Finally, the market reaction (positive for purchases and negative for sales) is mitigated if the director already owns a considerable stake in the company, since in this case outside investors also consider the effect of the transaction on director entrenchment. With the above results in mind, we conjecture that *blockholder monitoring by individuals, families and nonfinancial companies impedes profitable insider trading and therefore attenuates abnormal return patterns around insider purchases, sales and option exercises.*

Ravina and Sapienza (2010) provide evidence that governance rules also impact the profitability of insider trades. They show that profits on insider trades are larger at firms with weak governance standards as expressed by the Governance Index of Gompers et al. (2003). Moreover, their findings indicate that the gap between returns on trades of executives and trades of independent directors is wider at firms with poor corporate governance rules. In this paper we examine the impact of corporate governance on the profitability of insider trades and option

exercises. The two hypotheses underlying our analysis are what we call the *monitoring hypothesis* and the *substitution hypothesis*. Although theoretically these hypotheses are not mutually exclusive, their testable implications are distinct such that the data allow us to verify them separately.

The *monitoring hypothesis* asserts that strong corporate governance curtails profitable insider trading, as evidenced by the results of Fidrmuc et al. (2006) and Betzer and Theissen (2009). While strong corporate governance has been shown to decrease agency costs, there is no clear-cut explanation as to how it would mitigate profitable insider trading. We scrutinize two channels through which good corporate governance impacts insider trading: increased shareholder awareness in the absence of anti-shareholder mechanisms and blockholder monitoring. Thus, based on the monitoring hypothesis we would find less profitable insider transactions occurring at firms with stronger corporate governance standards, i.e. fewer anti-shareholder devices. To capture the effect of monitoring by blockholders we control for the identity of the largest blockholder of the firm.

The *substitution hypothesis*, in contrast, postulates that gains from insider trading are larger at firms with strong corporate governance as insiders will substitute insider trading with more attractive private benefits at firms where shareholder power is limited, hence corporate governance is weak. Under private benefits of control we intend e.g. the use of company resources for private purposes (Yermack, 2006) or increasing their remuneration by setting low performance targets (Bertrand and Mullainathan, 2001). Liu and Yermack (2007) show that excessive CEO real estate purchases are often preceded by large insider sales and option exercises. Meanwhile, the firm underperforms the market, suggesting that the grandiose CEO home purchases are a sign of CEO entrenchment. We posit that these private benefits can outweigh potential gains from insider trading and insiders will therefore seek private benefits at firms with weak corporate governance. The results of Roulstone (2003) and Banerjee and Eckard (2001) support this idea. Roulstone (2003) shows that executive compensation rises significantly after firms impose restrictions on insider trading. The difference is between 4-13% of total compensation. Thus, the paper establishes that insiders substitute private benefits (insider trading profits) with contractual benefits (compensation). We contribute to this strand of the literature by showing that insiders can also substitute one form of private benefits (a higher degree of control over corporate decisions) with another (insider trading profits). Banerjee and Eckard (2001) analyze stock price patterns associated with mergers during the Great Merger Wave of 1897-1903. During this period there were no restrictions at all on insider trading. Surprisingly however, the authors find that for mergers with disclosures similar to today's information dissemination, stock price run-ups relative to the total value gain are not higher than the values observed in the modern merger literature. This result suggests that, despite the complete



absence of insider trading regulations, the extent of trading on private information was not higher circa 1900 than is today. A plausible explanation is that insiders enjoyed many *other* sources of private benefits, and thus did not trade extensively on private information.

Empirically, insider trading profits and private benefits of control are likely to be imperfect substitutes. This means that in companies with poor corporate governance, insiders can extract private benefits of control and perform insider trading. Insiders may choose to enjoy private benefits because, for the same amount of gains, these are less risky. Trading on private information does not automatically guarantee a gain. The stock price can decline during an unforeseen industry-wide shock even if the firm's prospects are otherwise encouraging. Moreover, the exact magnitude of gains is uncertain, unlike with consuming private benefits of control. We explore the degree of substitution between insider trading profits and private benefits of control in Section 6 of the paper, and infer that the two are indeed imperfect substitutes.

### **3. Institutional background: insider trading regulation and corporate governance in the Netherlands**

#### *3.1. Insider trading legislation and its enforcement*

The essential principles underlying insider trading legislation in the Netherlands hold that market participants are barred from trading on private information and price-sensitive information. The former refers to information that is not publicly available, while the latter refers to information that is likely to move the firm's stock price.<sup>3</sup> In addition to this prohibition, corporate insiders are required to report their trades in the company's stock and derivative instruments whose value is tied to the firm's share price (e.g. stock options). Insiders, their family up to the second degree, large shareholders, and the company itself have an obligation to disclose their transactions. This obligation was introduced in April 1999 and required all of the above parties to report their transactions no later than 10 days after the end of the month in which they took place. Transactions are disclosed to the Netherlands Authority for the Financial Markets (Autoriteit Financiële Markten, AFM) which subsequently publishes this information on its website and in the financial daily

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<sup>3</sup> The Dutch legislation is essentially the adoption of two European Union directives, the Insider Dealing Directive 89/592/EEC and its successor, the Market Abuse Directive 2003/6/EC.

*Financieel Dagblad*. As we analyze individual insider trades, the introduction of the insider trading registry marks the start of our sample period.<sup>4</sup>

In October 2002, regulations were tightened: executive board members and supervisory board members were obliged to report their trades without delay. Finally, rules were changed through the 2005 ratification of the European Market Abuse Directive. From October 2005 onwards, all insiders are required to disclose transactions at most 5 days after their trade. The only exception is if the total value of the insider's transactions in that calendar year does not reach 5,000 EUR. In these cases, the insider can defer disclosure until the cumulative transaction value surpasses the 5,000 EUR threshold.<sup>5</sup> Degryse et al. (2009) analyze the information content of insider trades in the different reporting regimes. Our data suggest that prior to the 2005 regulatory change, insiders other than the management board and supervisory board members disclosed their trades typically 4-7 days after the transaction. Thus, the regulations did not go much further than formalizing the *status quo*. The enforcement of insider trading regulation is the task of the AFM. If, based on the analysis of the stock price, the AFM suspects that an insider has traded on private information, it launches an investigation. If there is sufficient evidence to corroborate the initial suspicion, the AFM reports the case to the public prosecution, after which the insider is indicted. In some cases, the AFM imposes a fine on the company for insider trading. During our sample period the AFM started an annual average of 42 inspections leading to 9 reports to public prosecution and 1 administrative fine per year.<sup>6</sup> This means that neither the unconditional probability of an investigation taking place, nor the probability of an indictment conditional on being inspected is negligible.

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<sup>4</sup> Therefore, we do not discuss insider trading regulations prior to this period. Fernandes and Ferreira (2009) document that Dutch insider trading regulations were altered in 1994 as well, which precedes our sample period.

<sup>5</sup> This also implies that there is no disclosure requirement if the overall value of transactions initiated by the insider does not reach €5,000 in a calendar year. However, in our sample, we find several transactions that insiders reported even though the value stayed below this threshold.

<sup>6</sup> We obtain these figures from the annual reports of the AFM. Both the number of investigations and the number of indictments depict a "U" shape during our sample period. Both figures peaked in 1999 (72 inspections and 13 indictments). Investigations dropped during 2002-2004, reaching the minimum (20) in 2004. The pattern is repeated with a lag of one year (showing that gathering evidence is time-consuming) for the number of indictments, which decrease sharply during 2003-2005. We observe the minimum (2) in 2004. Numbers rise again from 2005 (2006 for indictments) to reach 58 (7) during 2007.

### 3.2. Corporate governance regulation and anti-shareholder mechanisms in the Netherlands

Relating the informativeness of insider trades to elements of corporate governance is of particular interest on the Dutch stock market. In contrast with the US or the UK and similar to most countries in continental Europe, the Dutch model of corporate governance is stakeholder-oriented. It essentially aims at establishing a consensus among the company's stakeholders, in particular, employers and employees. Franks and Mayer's (2001) definition of an insider system fully fits the Dutch model: share ownership is highly concentrated, there are relatively few listed firms while takeover activity is rather limited (Cools and van Praag, 2007, McCahery et al. 2009).

We focus on the four most widely-used protective measures on the Dutch market: protective preference shares, priority shares, certificates and the structured regime<sup>7</sup>. It is common for Dutch firms to institute these anti-shareholder devices, all of which explicitly violate the one-share-one-vote principle. Protective *preference shares* – akin to poison pills – are the most widespread antitakeover device. Upon a takeover threat, management issues these securities to a friendly trust office or outside investor. The shares carry full voting rights and are sold at nominal value; however, the purchaser is only to pay 25% of the amount upfront. The size of the issue may reach up to 50%, or depending on the amendments in place, even 100% of the company's outstanding nominal capital. *Priority shares*, customarily sold to a friendly foundation, grant the bearer special voting privileges over matters such as merger approval, public offerings, the appointment of board members, charter amendments, and liquidation. These instruments are comparable to French or British “golden shares”. Certificates are tradable *depository receipts* carrying full cash flow rights but stripped of voting rights. They are issued in exchange for ordinary voting shares – the supervisory board has the authority to request such a transaction –, which are then deposited with the issuer of the certificates, the administration office. Through this process the legal ownership of the shares is transferred to the trust office which thus assumes all voting rights on the shares withdrawn and usually obtains the majority of the votes as a consequence. The regulations of Euronext Amsterdam

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<sup>7</sup> The original Dutch expression *structuurregime* had several English translations. In legal texts and annual reports we have found the following: “statutory two-tier status”, “structured regime”, “structure regime”, “two-tier structure”, “dual-board structure”, “structural regulations for large companies”, “structural regime applicable to dual-board entities”. The Tabaksblat Code uses “statutory two-tier status” and “statutory two-tier rules”. In our study, we call this anti-shareholder provision structured regime as it is more than a two-tier structure, which is commonly used in Continental Europe, but does not include a substantial reallocation of shareholder powers to the supervisory board.

permit companies to install at most two of the above security types. This constraint was lifted in 2007, after the end of our sample period.

The final anti-shareholder mechanism considered is an institutionalized restriction imposed on shareholder control by law, called a *structured regime*. Limited liability companies are legally obliged to adopt this scheme if their subscribed capital is in excess of 11.4 million EUR, they employ at least 100 employees and have a legally installed workers' council. The structured regime deprives shareholders of the majority of their tasks and powers, and reallocates them to the supervisory board. As a consequence, the powers of the supervisory board are extensive. Although the name suggests that supervisory board members act as outside directors and hence represent the best interest of shareholders and challenge management decisions, this has not been the case historically. Relations between the management board and the supervisory board tend to be quite cordial, also because members of the latter are often elected from main financiers, customers or business partners. A notable example of the absence of checks and balances between the management board and the supervisory board is the Ahold case, a total breakdown of corporate governance. (De Jong et al., 2007). In a full structured regime, the following powers are transferred to the supervisory board: establishing the approval of annual accounts, election of management, and even election of the supervisory board itself (through co-optation). Moreover, the supervisory board may also overrule major decisions taken by the executive board.<sup>8</sup>

Prior empirical research has shown that the powerful anti-shareholder provisions in place at most Dutch firms have far-reaching effects on their financial value and policy. These effects are exacerbated even further as most Dutch companies use these devices cumulatively, thereby restricting shareholder control severely (Renneboog and Szilagyi, 2007). Empirical evidence suggests that anti-shareholder devices impact corporate policies and performance. De Jong, et al. (2005) find that shareholder control restrictions have considerable valuation effects. Specifically, both the full and the voluntary form of the structured regime are associated with lower firm values – measured by the market-to-book ratio – as are other anti-shareholder devices. Renneboog and Szilagyi (2007) provide empirical evidence that firms with a full structured regime in place pay lower dividends and do not smooth payments over time.

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<sup>8</sup> The current law also specifies some exemptions from this two-tier scheme, most notably for firms with foreign ownership or international operations. In particular, companies which are majority-owned by foreign entities may adopt only a mitigated form of the regime. Most exempt companies choose to retain a weaker version of the regime, because its full abolition requires a statute amendment which the supervisory board can readily block (De Jong, et al. (2005)).

Given that (i) Dutch companies are reluctant to shift their governance practices, despite the proven adverse effect of structured regime and other anti-shareholder mechanisms on company value (De Jong et al., 2005) and (ii) corporate governance mechanisms have been shown to impact firm value and financial policy, we conjecture that corporate governance devices have an impact also on abnormal return patterns around the events analyzed in this paper – i.e. insider trades and option exercises by insiders. The number of anti-shareholder mechanisms is an inverse proxy for shareholder power. It follows that, under the *monitoring hypothesis*, we would expect to see more profitable insider transactions at firms with a high number of anti-shareholder mechanisms. The *substitution hypothesis* yields the opposite prediction: profits on insider transactions should be higher at firms with few or no anti-shareholder devices.

### 3.3. Corporate governance changes in 2004

In 2004, there were two important modifications in corporate governance practices in the Netherlands (Groenewald, 2005). First, on January 1, the new Dutch Corporate Governance Code (Tabaksblat Code) came into effect.<sup>9</sup> The Code attempted to defuse one of the most commonly used anti-shareholder mechanisms by requiring that depositary receipt holders be granted voting rights at all times. It further encouraged shareholder participation by advising companies to enable proxy voting and facilitate shareholder communication. It also called for a more active role of institutional investors in the general meetings. Furthermore, the Code set caps on the number of supervisory board memberships assumed at other companies by executive board members and supervisory board members. The Code was enforced using a “comply of explain” approach.

The second change in corporate governance regulation came through the Structured Regime Reform Act, effective September 1, 2004. The Act primarily cut back on the authority of the supervisory board, but also increased shareholder power in other respects. It allowed shareholders and the workers’ council to recommend candidates for supervisory board membership, prior to the nomination made by the supervisory board. Also the firm’s annual accounts and the remuneration of the members of the two boards now had to be approved by the general meeting. Moreover, the Act specified that a general meeting of shareholders representing at least one-third of the issued

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<sup>9</sup> The “Tabaksblat” committee that drew up the Code was chaired by and named after the former Unilever CEO Morris Tabaksblat.

capital may reject nominations for supervisory board members and dismiss the entire supervisory board with a majority vote. It also required prior shareholder approval for the transfer of the company's business to a third party, the initiation of a sustainable cooperation (e.g. a joint venture) with other firms and proposed transactions in the shares of companies if the transaction value is greater than or equal to one-third of the firm's own assets. Furthermore, the law explicitly stated the right of both shareholders and holders of depositary receipts to place resolutions on the agenda of general meetings, provided that they hold a stake of at least 1% or 50 million EUR in the company's shares. The Act obliged companies to give depositary receipt holders voting rights, except in the event of a hostile takeover bid.<sup>10</sup>

As both of these corporate governance changes are aimed at strengthening shareholder rights and reducing the impact of anti-shareholder mechanisms, we use the 2004 modifications as a quasi-natural experiment. Since the corporate governance changes increased shareholder power, they arguably diminished the ability of insiders to enjoy private benefits. Hence, if profitable insider trading and reaping private benefits of control are substitutes, we should observe an increase in the profitability of insider trading at firms that reduced the number of anti-shareholder mechanisms as required by the regulation. The next section lays out the empirical strategy and the data we use to capture this effect.

## **4. Data sources, descriptive statistics and methodology**

### *4.1. Sample description*

The primary information source for our sample is the public register of the Netherlands Authority for the Financial Markets (Autoriteit Financiële Markten, AFM). The sample comprises purchases, sales and stock option exercises from April 1999 to April 2007 of all insiders that have a reporting obligation, as defined in subsection 3.1. The register contains disclosed trades in stocks, options and warrants. For insider transactions, AFM publishes information on the company names, insiders' names, transaction dates, number of instruments traded, prices, security type, and transaction type.

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<sup>10</sup> Thus, the Structured Regime Reform Act is not as radical as the Corporate Governance Code. The latter, however, is not legally enforceable.

In the case of option exercises, if stocks are immediately sold after the exercise, the database also includes the sale price and the number of stocks sold.

The number of AFM disclosures in our initial database totals 15,527 for 134 companies. All trades in convertible securities, restricted share awards, stock appreciation right awards and warrant-related transactions are erased from the sample. We aggregate multiple insider purchases and sales of one insider taking place on the same day into a single transaction and, in a similar fashion, aggregate option exercises by the same person on the same day into one observation. We drop entries containing typographical errors which could not be validated after searching through the firm's annual report and/or retrieving information from Datastream. We also delete transactions that took place within 40 days of the first quotation of the firm on Euronext Amsterdam as abnormal returns cannot be calculated.

We search the companies' annual reports to gather information on the role of the insider at the firm, various accounting data and anti-shareholder mechanisms in place. Information on companies' ownership structure has been gathered using publicly available information disclosed on the AFM website and companies' annual reports. We use Bureau van Dijk's AMADEUS database, to complement any missing data. Information on the characteristics of the exercised options, i.e. the grant date, vesting period, and expiration date are obtained from the annual reports.<sup>11</sup>

#### *4.2. Descriptive statistics*

Table 1 reports the summary statistics on all AFM-disclosed insider purchases, sales and option exercises performed by between April 1999 and April 2007. We separate option exercises and related sales from all other stock sales that are not linked to option exercises. Our intention is to isolate transactions that are less likely to be driven by liquidity motives, similarly to Cohen et al. (2011). Instead of using prior trading patterns, however, we utilize the information on the immediate sale versus partial or full retention of stocks acquired through option exercises in the AFM registry to identify sales that are more likely liquidity-motivated. In the remainder of the

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<sup>11</sup> Any exercise that occurs within 30 days of the expiration (vesting) date is considered as an exercise performed at expiration (vesting). For part of the sample, the exact dates are unavailable and only the year of expiration (vesting) is known. In these cases, an exercise at expiration (vesting) is defined as any exercise that occurs in the year of expiration (vesting).

paper, we refer to option exercises *and related stock sales* as “option exercises”, and *stock sales unrelated to option exercises* as “sales”. We tabulate option exercises in Table 1 to show their overall magnitude and prevalence relative to sales. In the rest of the paper, however, we focus on purchases and sales only.

– *Insert Table 1 here* –

Panel A shows statistics on the full sample, whereas Panel B partitions transactions by year and by insider type. Insider purchases have the highest mean value, in contrast, they also have the lowest median value, suggesting considerable skewness of the distribution. The majority of the exercises occur between the vesting date and the expiration date (725 exercises or 62%). For this category the percentage of stocks sold after exercise is also the highest (90.74%). The mean (median) value of insider purchases peaked in 2004 (1999), while the largest mean (median) value for sales was calculated in 2000 (2006). For option exercises, we observe the highest mean (median) in 2000 (2007). Most transactions are performed by insiders who are neither members of the executive board nor of the supervisory board. Whereas the proportion of transactions for purchases and sales is approximately equal among the remaining three categories, the second-largest group for option exercises are, by far, members of the executive board (11%).

Table 2 provides an overview of the anti-shareholder mechanisms used by firms in our sample. The structured regime and preference shares are the most commonly-used in our sample, and a substantial number of firms employs three anti-shareholder mechanisms.

– *Insert Table 2 here* –

### 4.3. Methodology

We use event study methodology to identify the gains on insider purchases, sales, and option exercises. To define expected returns, we use the CAPM as a benchmark. The market return is defined as the Amsterdam Exchanges All-Share index. Since the transactions in the sample not only refer to companies listed in the AEX, but also to mid-cap and small-cap companies, this index is the best proxy for measuring market returns. Risk-free returns are based on the daily rolling interest rates on Dutch three-month zero discount bonds. The betas are monthly rolling betas with a 5-year moving average. To determine the significance of the AARs and CAARs, we use a simple t-test, as defined in e.g. Barber and Lyon (1997). Since the parametric test may be sensitive to extreme observations, we also compute the nonparametric Wilcoxon rank-sum test. Furthermore,



given that we group the data in our univariate analysis according to some firm or insider characteristics and the resulting groups often contain quite few observations we also choose to use a bootstrap method to provide further validation for our t-tests. Under certain conditions, bootstrapped estimators attain a faster convergence to the true value than first-order asymptotic approximations and therefore provide refinements to hypothesis testing in small samples (Horowitz, 2001). Because power loss may be severe for tests at low significance levels, we follow the recommendations of Davidson and MacKinnon (2000) and run the bootstrap simulations with 3000 repetitions. To account for the correlation between CARs following trades by different insiders of the same firm we compute heteroskedasticity-robust standard errors clustered at the firm and the year level. Furthermore, we run regressions with firm fixed effects.

To identify the direction of causality between the profitability of insider transactions and the number of anti-shareholder devices employed by the firm, we use the 2004 changes in Dutch corporate governance regulations as a quasi-natural experiment. As described in subsection 3.3., Dutch legislators and the Committee on Corporate Governance pushed to mitigate the impact of anti-shareholder devices. Thus, sample firms with many anti-shareholder devices were forced to cancel some of them (mostly depositary receipts and the structured regime). This led to a decrease in the differences between firms in the level of shareholder-orientation and hence also in the level of private benefits enjoyed by insiders.

To investigate this, we adopt a differences-in-differences (DD) strategy. The goal is to compare the difference between the profitability of insider trading in firms that were forced to change their governance rules, i.e. decrease the number of anti-shareholder mechanisms, (changers, treatment group) to those that were not (non-changers, control group), before versus after 2004. Because firms may endogenously and heterogeneously react to the change in legislation, the definition of the treatment group should not use any information on how firms' governance *actually* changed post-2004. Rather, we use an *ex-ante* assessment of which firms looked likely to be in conflict with the new rules. We call these firms, which form our treatment group, "ex-ante changers". To this group we allocate firms that either had three anti-shareholder mechanisms (the maximum number), or employed depositary certificates in 2004. The former type of firms were likely to comply with the spirit of the law (that governance structures should be more shareholder-friendly), whereas the latter type had to comply with the letter of the law (prohibiting the use of depositary receipts). All other firms are in the control group, the group of "ex-ante non-changers".

We construct a dummy variable for transactions that took place after 2004 and include it, as well as its interaction with the group dummy, in the regressions of Tables 6 and 7.<sup>12,13</sup>

We report three types of regressions. Our baseline OLS specification can be written as

$$CAR_{ist}[0,40] = \beta_0 + \beta_1 ASI_{st} + \beta_2 BH_{st} + X'_{ist} \gamma + \varepsilon_{ist}, \quad (1)$$

where *ASI* is the anti-shareholder index, a count variable of the number of anti-shareholder provisions in place, *BH* contains binary variables indicating the type of the largest blockholder and *X* contains our control variables. The controls we use are size (Seyhun, 1986), profitability, leverage, and the role of the insider at the firm (Seyhun, 1986; 1998; Lin and Howe, 1990). To exploit the regulatory change in 2004, we also employ specifications with firm fixed effects, formulated as

$$CAR_{ist}[0,40] = \alpha_s + \beta_0 + \beta_1 ASI_{st} + \varepsilon_{ist}. \quad (2)$$

This has two advantages over the OLS setup. First, in these regressions with firm FE,  $\beta_1$  is identified only by transactions at firms that alter their governance structures. Second, although we employ numerous control variables, firm FE capture effects beyond size, profitability, leverage or blockholder structure.

Finally, the differences-in-differences regressions take the form

$$CAR_{ist}[0,40] = \beta_0 + \beta_1 CHG_{st} + \beta_2 BH_{st} + \beta_3 POST2004 + \beta_4 CHG_{st} \times POST2004 + X'_{is} \gamma + \varepsilon_{ist}. \quad (3)$$

*POST2004* indicates any level effect, (i.e. common time trends) that influenced the profitability of insider trading at all firms following 2004. It captures, for instance, the regulatory change concerning the disclosure of insider trades, analyzed in detail by Degryse et al. (2009). *CHG* × *POST2004* is our key dependent variable: it shows the effect of anti-shareholder mechanisms on the profitability of insider trading in the period following the 2004 corporate governance

<sup>12</sup> In these specifications, we exclude the economic trend dummies to avoid multicollinearity.

<sup>13</sup> Repeating the estimation process using 2005 as the intervention year does not produce significant results. We conclude that firms did not deliberately delay changing their governance structures after the law became effective in 2004.

changes. If the number of anti-shareholder mechanisms indeed influences insider trading profits, then we should observe a positive (negative) coefficient on the interaction term in the regression of CARs following purchases (sales). Thus, if corporate governance rules have a causal effect on insider trading profits,  $\beta_4$  should be significantly different from zero.

To justify our empirical setup, we proceed by describing how the anti-shareholder index evolved over time in our two groups. Figure 1 shows the number of anti-shareholder mechanisms in the two groups over time, using the equally weighted averages from the purchase subsample. There is a marked difference between the averages of ex-ante changers and non-changers at the beginning of the sample period. However, as expected, the wedge between the two groups is reduced significantly by 2005. In Table 3 we present the average number of anti-shareholder mechanisms in the two groups over time in the two subsamples based on transaction type (purchases and sales). Since in the regressions our observations are transactions, we tabulate both equally-weighted averages and averages weighted by the number of transactions, to account for the higher number of some firms' transactions in the sample. Furthermore, we tabulate the number of anti-shareholder mechanisms for firms that *actually* changed their governance structures in 2004 (termed "actual changers" and "actual non-changers"), to show that our ex-ante definition is highly correlated with the actual outcome. For example, the yearly average values of the anti-shareholder index in the purchase subsample for ex-ante changers (shown in Figure 1) and actual changers have a correlation coefficient in excess of 95%. The fluctuation in the averages is due to firms' attrition and re-appearance: not all firms have transactions in all our sample years. During our sample period, no single firm increased the number of anti-shareholder mechanisms in place. They either retained the existing anti-shareholder devices or abolished some of them from one year to the next.

- *Insert Table 3 here* -

- *Insert Figure 1 here* -

A possible source of bias to our empirical strategy is if firms that would have had to alter their governance structures chose instead to delist from the stock exchange. We obtain data on delistings from Euronext Amsterdam. The average number of delistings during 2003-2005 is lower (not higher) than the average taken over our entire sample period of 1999-2007. Furthermore, during 2003-2005 none of our sample firms initiated a voluntary delisting and more than 89% of delistings occurred due to M&A or bankruptcy. We conclude that our sample firms did not attempt to sidestep the imposed changes in governance rules by delisting from the stock exchange.

## 5. Results

We first conduct tests on the full sample of insider purchases and sales, to analyze whether and to what extent insiders are able to gain from their transactions. The results are exhibited in Table 4.

– *Insert Table 4 here* –

Purchases are followed by a significant abnormal stock price appreciation of approximately 3.5%, whereas the stock price depreciates only 0.44% abnormally after a stock sale. Calculating the abnormal returns following the supposed announcement date (day 5), we find significant CARs of 2.67% and -1.14% for purchases and sales, respectively. As expected, purchases have higher information content than sales. Similarly to Ravina and Sapienza (2010), we check that these abnormal returns are not an artifact of insiders purchasing during periods of stock price appreciation or selling during stock price declines. Purchases are preceded by a significant share price decline of -4.55% (not annualized) over 40 days, whereas we discern a notable price run-up of 5.53% over the same period before sales. The significance of the reported results is confirmed by bootstrapped t-statistics. The results on abnormal stock performance prior to insider transactions are also consistent with portfolio rebalancing decisions after portfolio proportions get too far away from optimal levels. Thus, in the remainder of the paper we focus solely on abnormal returns following insider transactions.

We scrutinize how anti-shareholder mechanisms influence the CARs following insider purchases and sales. Table 5 presents CARs following purchases grouped by the presence of the four main anti-shareholder mechanisms. A maximum of three measures may be present because firms are forbidden to employ preference shares, priority shares, and depositary receipts simultaneously.

– *Insert Table 5 here* –

Panel A of Table 5 examines the impact of anti-shareholder mechanisms following purchases. Results on the disparity between firms with and without preference shares suggest that purchases are followed by larger positive abnormal returns at firms with preference shares. When we split our sample based on the use of priority shares, we find considerably smaller abnormal movements in the share price at companies which use these defensive securities. Following purchases, CARs over a period of two months subsequent to the transaction (day 0) or announcement (day 5) are approximately two times larger at firms with no priority shares, providing further evidence of more accurate timing by insiders. As post-transaction share price movements are more pronounced at firms with no priority shares, the data support the substitution

hypothesis. Purchases are followed by higher abnormal returns at firms where insiders are unable to curtail shareholder rights as there are no priority shares which would allow them to decide on e.g. the composition of the supervisory board and the executive board by themselves. Conversely, CARs following purchases are lower at firms where insiders can effectively bypass shareholders in numerous decisions and can thus use the company's assets for goals other than maximizing shareholder value.

Partitioning the observations according to the presence of the structured regime yields similar results: post-event abnormal share price movements are substantially larger in absolute value if shareholder power is not diminished by the adoption of the structured regime. During the 40 days following the date of the purchase, the abnormal rise in the stock price is in excess of 7% for firms without the structured regime as opposed to 2.77% at firms that apply this anti-shareholder mechanism. CARs following the event as well as the announcement are similar in magnitude for the subsamples of firms with and without depositary receipts, therefore, based on the univariate analysis, we cannot clearly support any of the hypotheses regarding the impact of corporate governance.<sup>14</sup> Finally, we examine the disparities between trades at firms employing three anti-shareholder mechanisms (the regulatory maximum) and at those that have no such measures in place. These tests show that CARs for the [0,1] and [0,5] windows are higher at firms employing three anti-shareholder mechanisms, and not significantly different across groups for the other event windows.

The results thus far suggest that the absence of anti-shareholder mechanisms usually magnifies the absolute values of CARs following insider purchases. This pattern of CARs, albeit mixed, provides more support substitution hypothesis, and less for the monitoring hypothesis. We now perform identical tests on sales (Table 5, Panel B).

The first part of Panel B shows CARs around insider sales at firms with and without preference shares. The share price decline following sales is substantially higher, irrespective of whether the CARs are measured from the transaction date [0,40] or the supposed reporting date [5,40]. The difference is significant at the 1% level for the [0,40] event window. Moreover, in economic terms, it amounts to a (non-annualized) abnormal return of 5%. We observe similar patterns for the structured regime and priority shares. For both categories, we see that CARs following sales are again distinct in the two subgroups: they are negative for companies that employ

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<sup>14</sup> Nonetheless, we note that the reaction appears to be delayed as significantly positive abnormal returns are realized over the 5 days after the purchase at companies without depositary receipts, whereas a CAR of similar magnitude is observed only after the announcement of the trade at firms that have this defense mechanism in place.

no priority shares but positive for their peers that do.<sup>15</sup> Partitioning the sample based on the structured regime produces largely similar results. Lastly, when splitting the sample based on the presence of depositary receipts, we find that CARs after sales are more negative at companies that do not use this instrument to lessen shareholder rights. The difference is economically meaningful, and significant at the 1% level. Hence, these univariate results for the subsample of stock sales are in favor of the substitution hypothesis.

Finally, we investigate the CARs at firms with an intensive use of anti-shareholder mechanisms and those without. Consistent with results on the individual anti-shareholder mechanisms, the abnormal share price depreciation subsequent to (the announcement of) sales differs statistically significantly across groups: while CARs are positive following sales at firms with all possible anti-shareholder mechanisms, they are negative at their counterparts that refrain from installing such devices. The economic magnitude of the difference is approximately 4%.

Taken together, these results suggest that the lack of anti-shareholder mechanisms is, in most cases, associated with a higher absolute magnitude of CARs following insiders' transactions, rather than a lower one. Even though these patterns appear fairly robust in a univariate setting, given the correlation between anti-shareholder mechanisms and other firm characteristics such as size, profitability or ownership structure, as well as the association amongst the anti-shareholder mechanisms themselves, we further analyze the role of anti-shareholder mechanisms in a multivariate framework. We use the post-transaction CARs a dependent variable. We consider event windows of forty days. In Tables 6 and 7 we regress the CAR[0,40] for insider purchases and sales, respectively, on an index counting the number of anti-shareholder devices at the firm (ranging from 0 to 3) and numerous controls. The first column shows a regression with firm fixed effects (FE), so that the coefficient on the anti-shareholder index is identified only by firms that change the number of anti-shareholder mechanisms. In the second column we regress the CAR following purchases on an extensive set of controls. These include company size, profitability, leverage (all three measured in the business year prior to the transaction), the firm's age, the position of the insider at the firm, the type of the largest blockholder, and dummy variables capturing the macroeconomic trend. The third column contains a specification where we keep the controls and add firm FE. The fourth column exhibits differences-in-differences estimates, using the 2004 changes in corporate governance as an exogenous shock to the number of anti-shareholder

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<sup>15</sup> The positive CARs following purchases observed in some subsamples may occur because insiders sell stock for reasons related to liquidity or diversification, hence only a subset of insider sales is based on private information (Cohen et al., 2011).

mechanisms. Instead of the anti-shareholder index, we add a dummy for ex-ante switchers, one for trades taking place after 2004, and their interaction term to the regressions.

– *Insert Table 6 here* –

Departing from the full sample average CAR[0,40] of 3.46%, our within-firm specifications show that when the number of anti-shareholder mechanisms was reduced at a firm, the CAR becomes significantly higher, on average by 2.21% for each anti-shareholder mechanism. Although the interpretation is different, the OLS regression with controls produces a similar estimate both qualitatively and quantitatively (-2.39%). When including both controls and firm FE, both the statistical and the economic significance of the coefficient increases (-3.55%,  $p < 0.01$ ). From these regressions we infer that a high number of anti-shareholder mechanisms leads to less profitable insider purchasing, both in the cross-section and in the time-series. DD estimates in column 4 buttress this finding: insiders of firms that ex ante were likely to alter their governance structures in 2004 traded significantly more profitably after 2004. The effect is 5.29%, considerably higher than the full sample average. Thus, the number of anti-shareholder mechanisms is not merely correlated with the returns to insider trading, but we also have suggestive evidence to argue the direction of causality. From our regression estimates, we infer that changes to corporate governance rules affected the profitability of insider purchases. DD estimates and the use of firm FE suggest that the direction of causality was not the opposite, nor are the correlations due simply to unobserved heterogeneity of firms. Despite using CARs as a dependent variable, the coefficients in all four regressions are significant at least at the 5% level.

Coefficients on other covariates indicate that insider type has no significant effect on the extent to which the share price movements favor the insider. Regarding blockholder monitoring, as our base category contains widely-held firms (with no entity owning 5% or more), we also conclude that CARs following purchases are significantly higher if either the government or an industrial or commercial company holds a substantial stake in the firm. The latter finding is difficult to square with the idea of blockholder monitoring, hence it goes against the monitoring hypothesis. Firm age shows no significant relation with the CARs. We can therefore reject the conjecture that the difference in governance structures is due solely to firm age, or to the renown on the Dutch or the international market. Abnormal share price patterns after insider purchases are not influenced by the overall trend in the economy.<sup>16,17</sup>

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<sup>16</sup> Results are unaffected by exchanging the economic trend variables with year fixed effects.

Table 7 shows results from the same four regression specifications on the 40-day CAR following insider sales. The simple OLS regression in column 2 suggests that following insider sales, CAR[0,40] is positively related to the number of anti-shareholder mechanisms at the firm, but this result is devoid of statistical significance. In the specification with firm FE (column 1), however, the relation becomes statistically significant at the 1% level. After including control variables the relation is still significant at the 1% level with an even higher coefficient (5.86). These results suggest that whenever a firm reduced the number of anti-shareholder mechanisms, CARs following insider sales become more negative. Estimates from the DD regression suggest that sales by insiders of firms with a high ex-ante likelihood of being affected by the 2004 governance reforms were more profitable following the 2004 changes. Hence, the (ex-ante likely) reduction in the number of anti-shareholder mechanisms led to an increase in the profitability of insider sales, providing further corroboration that the direction of causality goes from governance rules to insider trading profits. In sum, the regression results on the subsample of sales provide further support for the substitution hypothesis.

– *Insert Table 7 here* –

Our results on the abnormal returns following sales are mostly significant even though the smaller size of post-sales CARs renders it more difficult to accurately identify drivers of cross-sectional or time-series variation. The lower accuracy is reflected also in the substantially lower goodness-of-fit values. Further empirical evidence of this pattern is provided by the coefficients on the control variables, of which only three appear to be significant. Firstly, CARs are more negative after stock sales by CEOs, which suggests that chief executives have superior information about the firm's prospects. Secondly, CARs are less negative for insider sales at large firms, and thirdly, they are also less negative at firms with high leverage. Although Tables 6 and 7 report only conventional t-statistics, our results are virtually unaltered when using t-statistics based on bootstrapped standard errors.

Overall, the regression models qualify the results of our univariate analysis and suggest that at firms with a lower number of anti-shareholder mechanisms insider purchases entail more positive CARs, whereas sales and option exercises at such firms entail more negative CARs. Moreover, we

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<sup>17</sup> We infer that the overall situation of the economy is irrelevant to the abnormal returns after insider trades. An alternative explanation could be that since 2003 the effectiveness of timing by insiders declined. Most notably, changes to insider trading regulations and disclosure rules in 2002 and 2006, respectively, may have had an impact on timing. However, when using year fixed effects, as discussed in footnote 14, we find no evidence of this, furthermore, a priori, we would expect these changes to have had an impact also on sales.



reveal that the presence of blockholders is associated with higher abnormal returns following insider trades, not lower. In line with our expectations and previous literature, results are marked for stock purchases, which are most likely to be based on private information, and somewhat less pronounced for sales. Hence, the findings of our multivariate analysis substantiate the substitution hypothesis and go against the monitoring hypothesis.

### 5.1. *Alternative explanations*

To eliminate alternative explanations underlying our results, we consider four possible sources of spurious correlation. First, we examine whether the detected relationship between insider trading and corporate governance is driven by transactions in *months of frequent trading*, i.e. when the majority of insiders was purchasing or selling the stock. We define a high net purchase month as any month in which purchases outnumbered sales by ten or more. High net sale months are defined similarly. We then re-estimate the regressions shown in Tables 6 and 7, and add the corresponding binary variable for high net purchase months or high net sale months to the regressions that feature control variables. Compared to the baseline results reported in the fourth and fifth columns of Tables 6 and 7 this procedure yields quantitatively similar coefficient estimates and identical significance levels (these results are untabulated). Therefore, we are reassured that that our main results hold equally in periods of intensive insider purchasing and selling.

Second, our results indicate that legal insider trading and option exercising is less profitable at firms with a higher number of anti-shareholder mechanisms. However, insiders at firms with weak shareholder orientation may choose a different approach and trade more *frequently*, thereby making up for the lower of profitability of the individual trades. We explicitly test for this explanation by examining the average number of trades executed per year. We then compare the averages for all three types of transactions across different levels of the anti-shareholder index. For all three transaction types we find that the number of transactions per year does not differ significantly in the groups created based on the anti-shareholder index. An inherent problem with this approach is that firms that changed their governance structures have a different number of anti-shareholder mechanisms, and thus belong to two different groups in different sample years. To address this problem, we repeat the analysis for ex-ante switchers and non-switchers. Again, there is no evidence of differences in trading frequencies across groups.

Third, a possible mechanism that may explain the difference between the CARs following insider transactions is that firms with strong corporate governance are more *transparent*, their stock prices are more informative (Ferreira and Laux, 2007). Thus, shareholders have more information based on which they can adjust their valuation of the stock price. It follows that insider transactions do not carry much additional information. By contrast, firms with weak governance are informationally opaque, therefore insider transactions should be more informative. If this were the case, we would expect to see more sizable CARs after insider purchases at firms with weak corporate governance (high number of anti-shareholder mechanisms) than at firms with strong governance (few or no anti-shareholder mechanisms). However, we observe exactly the opposite in our data: the number of anti-shareholder mechanisms is *negatively* related to CARs following purchases, not positively (and positively, not negatively to the CARs following sales).

Fourth, *liquidity* of the firm's stock may be a further concern regarding the interpretation of our results. Investors may be reluctant to hold and trade in stocks of firms with a high number of anti-shareholder mechanisms. If this were the case, the anti-shareholder index used in our regressions would not only proxy for the strength of corporate governance at the firm level, but also for the liquidity of the stock. To distinguish between our explanation and one based on liquidity, we consider the turnover of the stock over the one-year period preceding the insider transaction, expressed in percentage terms. We include this variable in the regressions in the fourth (OLS with controls) and fifth (DD with controls) columns of Tables 6 and 7. Our results (untabulated) indicate that although turnover is significantly correlated with post-event CARs in the case of purchases, coefficient estimates and significance levels for the anti-shareholder index are unchanged by the inclusion of this control variable.

## 6. Estimating the value of private benefits

In Section 5, we have shown that CARs are higher after insider purchases and lower following sales at firms that employ fewer anti-shareholder mechanisms or employ none at all. We argue in our substitution hypothesis that the reason underlying this pattern is that insiders of firms protected by anti-shareholder mechanisms enjoy substantial private benefits of control. The empirical support this hypothesis receives in our dataset suggests that these benefits of entrenchment, both monetary and nonmonetary, may outweigh the prospective gains from insider trading. Therefore, CARs following insider transactions will favor the insider to a lesser extent at firms where they are

ensured a powerful position owing to anti-shareholder mechanisms. However, at corporations where shareholder rights are not suppressed and the degree of entrenchment is thus small, they may resort to legal insider trading to still exploit their position. In line with previous literature, we have established that CARs have the largest absolute value following insider purchases as sales may take place for liquidity and other reasons.

Hence, the value of an anti-shareholder mechanism can be approximated by the coefficient estimates on the anti-shareholder index in our regressions of CAR[0,40] following insider purchases, as these express the average incremental gains to insider trading at companies that have one anti-shareholder mechanism fewer.<sup>18</sup> We base our estimates on the coefficient in the column 2 of Table 6, although point estimates are similar across specifications. The hypothetical increment in profits due to the change in CARs is calculated as  $|\beta|pq$ , where  $p$  is the observed market price of the shares on the day the transaction took place,  $q$  is the number of shares purchased and  $\beta$  is the regression coefficient on the anti-shareholder index in the regression of CAR[0,40]. Because abolishing one anti-shareholder mechanism at a firm would, on average, lead to an increment in insider trading profits, we interpret these profits as the *value* of the anti-shareholder mechanism. Alternatively, if the firm had one anti-shareholder mechanism more, insiders would be able to consume *more* private benefits of control and would therefore devote *less* attention to their trades in the company's stock. Our regressions predict that this would shrink their profits from insider trading by  $|\beta|pq$ . Finally, we take the average of the estimates for the individual transactions. When performing the estimation for the subsample of stock purchases, this procedure yields an annual average value of €15,511, adjusted for inflation, expressed in 2007 Euros. We interpret this as the average value of entrenchment that is due to one anti-shareholder mechanism.

We underline that this is a rather conservative estimate and that it refers to the value of one anti-shareholder mechanism. As seen in Table 2 the majority of our sample firms employs two or more anti-shareholder mechanisms. This creates a greater degree of entrenchment which, according to our estimation procedure, would double or treble the value of private benefits. Moreover, our estimate is based on *single* transactions of *individual* insiders. Insiders can repeatedly trade in the firm's stock, which suggests that the longer the anti-shareholder mechanisms remain installed, the

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<sup>18</sup> By using the number of anti-shareholder mechanisms, we proxy for the value of the private benefits as there is no one-to-one relation between the consumption of private benefits and the reduction of insider trading. As we have argued before, they are not perfect substitutes. If they were, in fact, imperfect substitutes, our estimation procedure would understate the true value of entrenchment.

more valuable they are. Furthermore, an insider may purchase (and sell company) stock frequently within the span of one (business) year. Lastly, insiders of the same firm collectively enjoy benefits of control stemming from entrenchment, therefore one could also value these benefits as the sum of incremental gains from insider trading realized by all insiders of a firm, or, at the very least the CEO and the board of directors. These considerations underscore that the approximation of the value of entrenchment presented in this paper renders a conservative estimate, which is a lower bound for the value of entrenchment.

We therefore repeat the estimation using data on the actual transactions and number of anti-shareholder mechanisms for each firm-year. Thereafter, we sum up the estimated entrenchment values during our sample period for each firm, explicitly taking into account that not every firm had each transaction type each year (i.e. for some years the value is zero), as mentioned on p.18. The average of the firm-level estimates, using the subsample of purchase transactions is €244,975.<sup>19</sup> As this value is moderate, we confirm that insider trading profits and other private benefits are indeed *imperfect* substitutes.

There are two caveats to this interpretation. The first is that these results are predicated on the assumption that the relationship between the number of anti-shareholder mechanisms and the CARs following insider purchases is linear. As our dependent variable is essentially a residual, including higher-order terms may be demanding of the data, or lead us to overfit the regressions in-sample. The second caveat is that if substitution between profitable insider trading and private benefits of control ceased after the 2004 corporate governance changes, then we should not use data from 2005 onwards to estimate the magnitude of private benefits. The DD specification in the fourth column of Table 6 confirms that regression coefficients were higher for the period 1999-2004, therefore, our estimates on the value of an anti-shareholder mechanism to one insider would also be higher. Once again, these results underline the conservative nature of our estimation procedure and that our calculations are a lower bound on the value of anti-shareholder mechanisms.

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<sup>19</sup> This figure is calculated as  $\sum_{i=1}^n \frac{1}{n} \sum_{t=1999}^{2007} \sum_{j=1}^m |\beta| p_{i,t,j} q_{i,t,j} a_{i,t}$ , where  $\beta$  is the regression coefficient of the anti-

shareholder index in the regression of the CAR[0,40] following insider purchases, from Table 6, column 4,  $p$  is the actual price at which the transaction was executed,  $q$  is the number of securities involved in the transaction,  $a$  is the number of anti-shareholder devices employed by the firm in that year,  $i$  indexes the firm,  $t$  indexes the year and  $j$  indexes the transaction in a given firm-year. The total number of firms in a subsample (in this case, purchases) is denoted by  $n$ , and the number of transactions (purchases) at a firm in a year is  $m$ .

## 7. Conclusion

Insiders of publicly listed firms possess more information about the company than outside shareholders. This informational advantage can be converted into profits through insider trading, illegal or legal. This paper studies insider trading, and establishes its connection to two aspects of corporate governance: governance rules (as measured by anti-shareholder mechanisms) and blockholder concentration. We examine a sample of insider trades at listed firms in the Netherlands, a financial market where shareholder rights are significantly restrained through several anti-shareholder mechanisms. The most widely used anti-shareholder devices are the structured regime, priority shares, preference shares, and depositary receipts. The paper contributes to the existent literature on insider trading and corporate governance by alleviating concerns of endogeneity and addressing the causal relationship between governance rules and insider trading profits. To accomplish this, we adopt a differences-in-differences approach which uses the 2004 changes in Dutch corporate governance regulations as quasi-natural experiment which shifts corporate governance rules.

We shed new light on the interrelationship between insider trading and corporate governance by assessing how anti-shareholder mechanisms such as preference shares, priority shares, depositary receipts, and the structured regime influence abnormal stock price patterns following insider trading. We test two hypotheses, firstly, the monitoring hypothesis, which asserts that the absence of anti-shareholder devices leads to greater shareholder awareness, which curtails insider trading. Based on this argument, insider trading should be more profitable at companies employing many anti-shareholder mechanisms. The alternative, the substitution hypothesis posits that private benefits of control owed to anti-shareholder mechanisms are larger than potential profits to insider trading. Therefore, insiders are likely to seek trading profits if they cannot exploit private benefits, implying larger profits to insider trading at firms with fewer anti-shareholder devices.

Our results show that insiders, on average, earn a cumulative abnormal return of 3.46% following purchases, however, the price does not decline significantly following stock sales. We provide compelling evidence that the absolute value of abnormal returns following insider transactions is higher at firms that do not limit shareholder rights by employing anti-shareholder mechanisms. The findings are somewhat stronger for insider purchases, consistent with the notion supported by previous empirical work that sales may be motivated by liquidity or diversification motives. Furthermore, we establish the direction of causality using a DD framework. As firms did away with shareholder-unfriendly governance structures in 2004, profits to insider purchases, as

well as sales, at these firms did indeed increase. These results are in the favor of our substitution hypothesis and suggest that corporate insiders are more inclined to make profits on trades in the shares of their company if they do not (or to a lesser extent) enjoy private benefits stemming from weak shareholder rights. From this, we infer that private benefits of control outweigh the returns to insider trading and option exercising if management is heavily entrenched. However, if anti-shareholder devices do not impede shareholder participation in company decisions, it is more difficult for insiders to attain private benefits, and will substitute them with profitable insider trading. The most likely reason our results differ from those of previous studies is that the variation in shareholder rights during our sample period, especially until 2004, is much larger in the Netherlands than in the US or the UK, simply because the range extends much further at the end of low shareholder rights. Indeed, even in the early '90s some US shareholders were shocked to discover that they are completely powerless at their Dutch investee firms, with voting with their feet being their only option.

Finally, the substitution effect uncovered in this paper allows for the measurement of the monetary value of entrenchment provided by anti-shareholder mechanisms. Using an extensive set of control variables we find that the relationship between anti-shareholder devices and profits to insider purchases remains significant both statistically and economically. Based on our regression analysis, our conservative estimate for the lower bound of private benefits is approximately €15,000 for share purchases per year, per anti-shareholder mechanism. Considering the number of insider purchases and anti-shareholder mechanisms at our sample firms, the average company's insiders enjoy private benefits worth approximately €245,000. As these figures, calculated based on the assumption of perfect substitution, are moderate, we conclude that insider trading profits and private benefits of control are imperfect substitutes.

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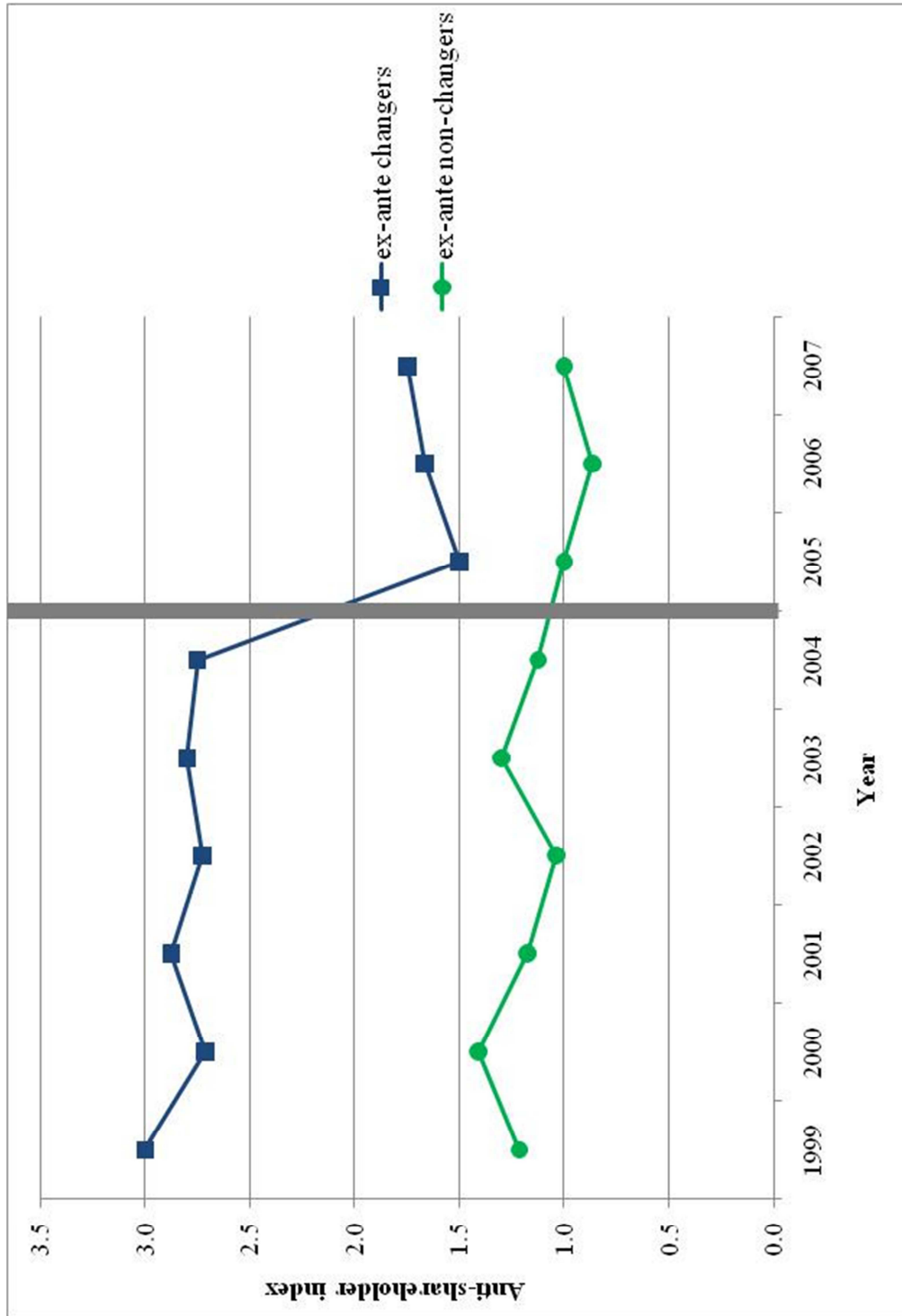
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**Figure 1: Average number of anti-shareholder mechanisms employed by changers and non-changers in the purchase subsample**

This figure shows the number of anti-shareholder mechanisms at ex-ante changers and non-changers. *Ex-ante changers* are firms that, ex ante, looked likely to change their governance structures, because they either had 3 anti-shareholder mechanisms in place or employed depository receipts in 2004. *Ex-ante non-changers* are firms for which neither of these conditions is satisfied. Numbers shown are equally weighted averages. Data run from 1999 to 2007 and are based on our purchase subsample, so that a firm's anti-shareholder index is considered in the average in a given year if a legal insider purchase took place at that firm in that year. The thick gray line represents the event of the regulatory change.



**Table 1: Descriptive statistics**

*Panel A* reports statistics for the full sample. The sample of option exercises is partitioned according to whether the exercise occurred early or at expiration and according to whether the exercise occurred on or after the vesting date. An early exercise is defined as an exercise with more than 30 days to expiration, if the exact expiration date is known. If the exact date is unknown and only the year of expiration (vesting) is available, an exercise at expiration (vesting) is defined as any exercise that occurs in the year of expiration (vesting). Of the 1,392 option exercises, 211 (226) do not report an exact expiration (vesting) date. In Panel A the word "transaction" refers to option exercises, insider sales and insider purchases. Mean value of options exercised is measured as number of options exercised times the stock's closing price on the exercise date. Transaction values are quoted in Euros. *Panel B* reports statistics for the sample partitioned by the type of insider performing the transaction. The 4 categories of insiders are CEOs, executive board members excluding the CEO, supervisory board and other insiders. Other insiders include large shareholders, the management board and supervisory board of companies in which the company has an interest of at least 10%, partners and first degree relatives of CEOs, executive board members and supervisory board members that live in the same household, first degree relatives of CEOs, executive board members and supervisory board members that do not live in the same household, but have an equity stake of at least 5% in the company and members of the workers' council. Data are from the period 1999-2007.

*Panel A: Summary statistics for the full sample of insider sales, purchases and option exercises*

	Number of transactions	Number of firms		Number of insiders	Transaction value		% of stocks sold		Years prior to expiration	
		mean	median		mean	median	mean	median		
<b>Insider purchases</b>	663	90	339	595,437	20,113					
<b>Insider sales</b>	739	86	349	438,618	63,000					
<b>Option exercises</b>	1,392	79	733	169,358	47,120	86.45	100	2.17	1.83	
Exercised on vesting date	228	35	156	196,276	100,561	87.91	100	3.88	3.75	
Exercised before expiration and after vesting date	725	59	448	175,320	47,412	90.74	100	2.22	1.83	
Exercised at expiration	220	27	143	110,609	24,547	84.55	100	-	-	

*Panel B: Summary statistics by calendar years and insider type*

	Number of purchases		Number of option exercises		Number of sales		Value of purchases		Value of sales		Value of options exercised		% of stocks sold		Years prior to expiration	
	mean	median	mean	median	mean	median	mean	median	mean	median	mean	median	mean	median	mean	median
CEOs	115	70	44	588,270	54,462	1,017,132	122,723	385,704	64,501	82.03	100	1.32	0.42			
Executive Board members	98	88	148	358,442	44,482	517,752	104,175	304,027	64,956	78.54	100	1.70	1.25			
Supervisory Board members	113	61	26	519,845	16,732	756,096	269,300	462,570	137,230	84.62	100	2.02	1.46			
Other insiders	337	520	1,174	692,148	13,954	310,106	53,768	135,663	44,487	87.64	100	2.25	1.83			

**Table 2: Descriptive statistics and correlations for anti-shareholder mechanisms**

This table shows transactions in the sample by the number of anti-shareholder mechanisms in place at the firm

	Number of purchases	Number of sales
None	95	92
Structured regime only	96	114
Preference shares only	79	145
Priority shares only	16	7
Depository receipts only	1	0
Structured regime and preference shares	122	75
Structured regime and priority shares	17	6
Structured regime and depository receipts	4	0
Preference shares and priority shares	22	46
Preference shares and depository receipts	30	49
Priority shares and depository receipts	24	1
Three anti-shareholder mechanisms	157	204

**Table 3: Average number of anti-shareholder mechanisms in shifting and non-shifting firms.**

This table shows the average number of anti-shareholder mechanisms in each year for different groups of firms. *Actual changers* are firms that changed their governance structures and abandoned some anti-shareholder mechanisms following the 2004 changes in legislation. *Actual non-changers* are firms that did not. *Ex-ante changers* are firms that, ex ante, looked likely to change their governance structures, because they either had 3 anti-shareholder mechanisms in place or employed depository receipts in 2004. *Ex-ante non-changers* are firms for which neither of these conditions is satisfied. The analysis is performed separately for insider sales and purchases. These categories are not exclusive. In Panel A we tabulate a simple average of the number of anti-shareholder mechanisms in each category-year. Panel B contains weighted averages with the number of transactions in the given year (purchases or sales) as weights.

Panel A: Equally weighted								
Year	Purchases				Sales			
	actual non-changers (n = 70)	actual changers (n = 19)	ex-ante non-changers (n = 62)	ex-ante changers (n = 27)	actual non-changers (n = 67)	actual changers (n = 19)	ex-ante non-changers (n = 61)	ex-ante changers (n = 25)
1999	1.40	2.60	1.21	3.00	1.55	2.60	1.28	3.14
2000	1.63	2.49	1.41	2.71	1.71	2.50	1.26	2.81
2001	1.60	2.67	1.17	2.88	1.48	2.45	1.06	2.86
2002	1.28	2.20	1.04	2.73	1.50	2.33	1.18	2.78
2003	1.67	2.33	1.30	2.80	1.39	3.00	0.93	3.00
2004	1.44	2.33	1.13	2.75	1.92	1.88	1.38	2.86
2005	1.17	1.20	1.00	1.50	1.57	1.71	1.30	2.17
2006	0.93	1.56	0.87	1.67	1.08	1.60	0.93	2.13
2007	2.50	1.00	1.00	1.75	1.62	0.91	1.19	1.50

**Table 3 – continued**

<b>Panel B: Weighted by the number of transactions in a given year</b>								
Year	Purchases				Sales			
	actual non-changers (n = 70)	actual changers (n = 19)	ex-ante non-changers (n = 62)	ex-ante changers (n = 27)	actual non-changers (n = 67)	actual changers (n = 19)	ex-ante non-changers (n = 61)	ex-ante changers (n = 25)
1999	1.41	2.72	1.33	3.00	1.74	2.50	1.34	3.05
2000	1.76	2.37	1.46	2.53	1.13	2.41	0.81	2.66
2001	1.67	2.67	1.29	2.83	1.40	2.67	0.97	2.97
2002	1.16	2.37	1.07	2.83	1.96	2.52	1.22	3.24
2003	1.29	2.18	1.21	2.67	1.85	3.00	0.86	3.00
2004	1.83	2.14	0.80	2.66	1.63	2.41	1.19	2.97
2005	0.91	1.00	0.69	1.50	1.82	1.75	1.23	2.55
2006	0.95	1.68	0.87	1.77	0.88	1.52	0.87	1.95
2007	2.33	1.06	1.00	1.53	1.71	0.93	1.35	1.39

**Table 4: Abnormal returns and cumulative abnormal returns around insider purchases and sales**

This table reports the average abnormal returns around insider purchases, insider sales and option exercises for the full sample of insider purchases and sales reported to the AFM between April 1999 and April 2007. Abnormal returns are estimated with the CAPM, using the Amsterdam Exchanges All-Share Index as market index. Panel A shows the daily average abnormal returns from day 0 (the day of the trade) to day 10. Panel B reports the cumulative average abnormal returns for 6 windows around the event date. Day 5 is assumed to be the announcement date and CAR [0,1] covers both the transaction date and the subsequent trading day. Bootstrapped t-statistics are calculated based on 3000 resamplings. \*\*\*, \*\*, \* represent two-tailed significance at the 1%, 5% and 10% level, respectively.

Purchases (n=663)				Sales (n=739)			
<i>Panel A: Abnormal returns</i>							
Event window	Mean %	t-statistic	bootstrapped t significance	Event window	Mean %	t-statistic	bootstrapped t significance
0	0.19	1.04		0	0.55	3.04***	
1	0.40	2.92***		1	0.21	1.86*	
2	0.41	3.43***		2	-0.09	-0.91	
3	-0.04	-0.12		3	0.01	0.12	
4	-0.08	-0.62		4	0.12	1.15	
5	0.07	0.60		5	0.10	1.10	
6	0.19	1.47		6	-0.12	-1.12	
7	-0.09	-0.15		7	-0.08	-0.76	
8	-0.15	-1.29		8	0.11	1.06	
9	0.14	1.19		9	-0.15	-1.66*	
10	-0.01	-0.08		10	-0.10	-1.33	
<i>Panel B: Cumulative Average Abnormal Returns</i>							
[-40, -1]	-4.55	-5.33***	***	[-40, -1]	5.53	7.08***	***
[0,1]	0.52	2.59***	***	[0,1]	0.66	2.74***	***
[0,5]	0.87	3.05***	***	[0,5]	0.81	2.82***	***
[0,40]	3.46	5.47***	***	[0,40]	-0.44	-0.63	
[5,8]	0.16	0.72		[5,8]	0.02	0.13	
[5,40]	2.67	4.48***	***	[5,40]	-1.14	-1.84*	**

**Table 5: Cumulative abnormal returns around insider transactions partitioned by anti-shareholder mechanisms in place**

This table reports cumulative average abnormal returns around insider transactions partitioned according to anti-shareholder mechanisms in place at the firm. Panel A shows results for share purchases, panel B for share sales and panel C for option exercises. Abnormal returns are estimated with the CAPM, using the Amsterdam Exchanges All-Share Index as market index. Firms may not employ preference shares, priority shares and depositary receipts at the same time, a maximum two of the three are allowed. Day 5 is assumed to be the announcement date. Bootstrapped t-statistics are calculated based on 3000 resamplings. \*\*\*, \*\*, \* represent two-tailed significance at the 1%, 5% and 10% level, respectively. Data are from the period 1999-2007.

Panel A: Share purchases									
Event window	CAAR %	t-statistic	bootstrapped t-statistic	CAAR %	t-statistic	bootstrapped t-statistic	t-statistic difference	bootstrapped t-statistic difference	Wilcoxon Z-statistic difference
<i>Preference shares (n=410)</i>			<i>No preference shares (n=253)</i>			<i>Difference</i>			
[0,1]	0.68	2.63***	***	1.43	2.78***	***	1.30	*	-0.30
[0,5]	1.17	3.03***	***	1.52	2.71***	***	0.51	.	0.07
[0,40]	4.93	5.40***	***	2.67	2.44**	***	-1.59	*	-1.53
[5,8]	0.37	1.17	.	-0.33	-0.79	.	-1.34	*	-0.61
[5,40]	3.95	4.54***	***	1.02	1.09	.	-2.28**	**	-1.69*
<i>Priority shares (n=194)</i>			<i>No priority shares (n=469)</i>			<i>Difference</i>			
[0,1]	1.31	3.58***	***	0.69	2.31**	**	-1.31	*	-2.03**
[0,5]	1.41	2.56**	***	1.20	3.06***	***	-0.31	.	0.10
[0,40]	2.75	2.60**	***	5.04	5.32***	***	1.61	*	1.12
[5,8]	-0.16	-0.39	.	0.34	1.05	.	0.95	.	1.36
[5,40]	1.22	1.16	.	4.04	4.64***	***	2.05**	**	2.08**
<i>Structured regime (n=396)</i>			<i>No structured regime (n=267)</i>			<i>Difference</i>			
[0,1]	0.76	3.28***	***	1.12	2.15**	**	0.64	.	-0.50
[0,5]	1.04	3.10***	***	1.71	2.52**	***	0.89	.	0.61
[0,40]	2.77	3.70***	***	7.28	4.69***	***	2.61***	***	2.03**
[5,8]	0.16	0.56	.	0.23	0.44	.	0.12	.	-0.17
[5,40]	2.03	2.78***	***	5.31	3.74***	***	2.06**	**	1.50
<i>Depositary receipts (n=105)</i>			<i>No depositary receipts (n=558)</i>			<i>Difference</i>			
[0,1]	-0.54	-0.93	.	0.67	3.07***	***	2.01**	**	1.00
[0,5]	0.43	0.61	.	0.93	3.02***	***	0.47	.	0.20
[0,40]	2.48	1.68	*	3.59	5.20***	***	0.63	.	-0.20
[5,8]	1.40	2.91***	***	-0.01	-0.03	.	-2.60***	***	-2.77
[5,40]	2.99	1.93*	*	2.63	4.08***	***	-0.21	.	-1.04
<i>Three anti-shareholder mechanisms (n=157)</i>			<i>No anti-shareholder mechanisms (n=95)</i>			<i>Difference</i>			
[0,1]	1.05	2.69***	***	0.27	0.58	.	-1.28	.	-3.69***
[0,5]	1.31	2.21**	**	0.35	0.57	.	-1.11	.	-2.05**
[0,40]	3.19	2.76***	***	1.47	1.27	*	-1.05	.	-1.27
[5,8]	-0.18	-0.49	.	-0.03	-0.09	.	0.27	.	0.01
[5,40]	2.09	1.76*	**	1.07	1.02	.	-0.64	.	0.10

Table 5 – continued

Panel B: Share sales									
Event window	CAAR %	t-statistic	bootstrapped t-statistic	CAAR %	t-statistic	bootstrapped t-statistic	t-statistic difference	bootstrapped t-statistic difference	Wilcoxon Z-statistic difference
	<i>Preference shares (n=519)</i>			<i>No preference shares (n=220)</i>			<i>Difference</i>		
[0,1]	0.45	2.60***	***	0.43	0.82	.	-0.04	.	-0.59
[0,5]	0.87	3.56***	***	-0.10	-0.14	.	-1.34	***	-2.73***
[0,40]	1.12	1.47	*	-4.43	-2.31**	**	-2.69***	***	-5.97***
[5,8]	0.06	0.28	.	0.40	0.87	.	0.66	.	-1.20
[5,40]	0.36	0.52	.	-4.06	-2.30**	**	-2.33**	***	-5.29***
	<i>Priority shares (n=194)</i>			<i>No priority shares (n=545)</i>			<i>Difference</i>		
[0,1]	0.38	1.83*	**	0.47	1.91*	*	0.28	.	-0.02
[0,5]	1.30	4.33***	***	0.34	1.04	.	-2.13**	**	-2.41**
[0,40]	1.92	2.35**	**	-1.19	-1.18	.	-2.40**	**	-2.43**
[5,8]	0.52	1.94*	*	-0.01	-0.03	.	-1.38	*	-1.94*
[5,40]	0.85	1.07	.	-1.41	-1.53	*	-1.86*	**	-2.05**
	<i>Structured regime (n=399)</i>			<i>No structured regime (n=340)</i>			<i>Difference</i>		
[0,1]	0.38	1.75*	**	0.54	1.68*	**	0.40	.	-0.64
[0,5]	0.91	3.16***	***	0.22	0.50	.	-1.30	**	-2.31**
[0,40]	0.57	0.76	.	-1.45	-0.99	.	-1.22	***	-2.69***
[5,8]	0.70	3.15***	***	-0.64	-1.65*	**	-3.00***	***	-3.33***
[5,40]	-0.11	-0.15	.	-1.63	-1.25	.	-1.02	**	-2.21**
	<i>Depositary receipts (n=142)</i>			<i>No depositary receipts (n=597)</i>			<i>Difference</i>		
[0,1]	0.76	3.18***	***	0.63	2.15**	***	-0.64	.	-1.54
[0,5]	1.89	4.83***	***	0.56	1.66*	**	-2.71***	***	-3.51***
[0,40]	3.97	4.30***	***	-0.14	-1.71*	**	-4.43***	***	-5.33***
[5,8]	0.73	2.62***	***	-0.13	-0.56	.	-2.30**	**	-2.55**
[5,40]	2.16	2.44**	***	-0.19	-2.55**	***	-3.50***	***	-4.04***
	<i>Three anti-shareholder mechanisms (n=157)</i>			<i>No anti-shareholder mechanisms (n=95)</i>			<i>Difference</i>		
[0,1]	0.70	3.35***	***	1.86	2.01**	**	1.22	.	-0.16
[0,5]	1.87	6.21***	***	1.51	1.48	.	-0.34	.	-2.85***
[0,40]	3.97	4.76***	***	-0.30	-0.15	.	-1.94*	*	-5.40***
[5,8]	1.05	4.60***	***	-0.28	-0.69	.	-2.85***	***	-4.15***
[5,40]	2.33	3.01***	***	-1.87	-1.18	.	-2.38**	**	-4.95***

**Table 6: Cross-sectional determinants of abnormal return patterns following insider purchases**

*Anti-shareholder index* is a count of the number of anti-shareholder mechanisms employed at the firm. *Ex-ante switcher* is a binary variable equal to 1 if the firm was likely to change the number of anti-shareholder mechanisms in response to the 2004 regulations. *After 2004* is a binary variable equal to 1 for trades placed after 2004. *Insider dummies* are binary variables that equal 1 if the insider placing the trade performs a function of the corresponding type at the time of the transaction. CEOs are excluded from the category Executive Board. The base category is other insiders, which includes large shareholders, the management board and supervisory board of companies in which the company has an interest of at least 10%, partners and first degree relatives of CEOs, executive board members and supervisory board members that live in the same household, first-degree relatives of CEOs, executive board members and supervisory board members that do not live in the same household, but have an equity stake of at least 5% in the company and members of the workers' council. *ROE* and *leverage* are the return on equity and debt-to-equity ratio at the end of the year, respectively. *Largest blockholder dummies* (directors, financial institutions, families or individuals, industrial or commercial companies and government) are set to one if shareholders belonging to the corresponding category have the largest stake as compared to the other categories. The base case is no blockholder of 5% or more. *Economic trend dummies*: the base category is the period from March 12 2003 until the end of the sample period in 2007. T-statistics are calculated based on Huber-White standard errors, and are clustered at the firm level in columns (1) and (3), and at the firm and the year level in columns (2) and (4). \*\*\*, \*\*, \* represent two-tailed significance at the 1%, 5% and 10% level, respectively. Data are from the period 1999-2007.

	Dependent variable: CAR[0,40]							
	OLS with firm FE		OLS		OLS with firm FE		DD	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	7.14***	4.30	-6.50	-0.38	3.23	0.16	-9.26	-0.61
Anti-shareholder index	-2.21**	-2.22	-2.39**	-2.20	-3.55***	-2.85	-4.07**	-2.42
Ex-ante switcher							-5.36***	-2.65
After 2004							5.29**	2.33
After 2004 × ex-ante switcher							0.93	0.33
Insider: CEO			1.39	0.55	4.22	1.39	-0.62	-0.19
Insider: executive board member			-0.57	-0.19	1.78	0.62	-1.83	-0.60
Insider: supervisory board member			-2.85	-1.31	2.62	0.96	-1.72	-0.65
Largest: directors			-2.98	-1.37	-23.6***	-4.39	3.59	1.17
Largest: financial institutions			3.28	1.60	-6.51***	-4.09	1.38	0.50
Largest: families or individuals			-0.68	-0.22	-6.76**	-2.03	16.30**	2.21
Largest: ind./com. companies			16.08**	2.15	-6.53**	-2.21	13.00**	2.58
Largest: government			13.91**	2.20			0.60	0.87
Firm size (ln market cap)			0.49	0.67	0.43	0.44	-0.07**	-2.19
ROE			-0.06**	-2.17	-0.08**	-2.14	0.91	0.22
Leverage			1.55	0.40	7.93	1.45	0.01	0.41
Firm age (in 1999)			0.01	0.73				
Economic growth 1-4-99 to 4-9-00			1.24	0.56	4.94	1.65		
Economic decline 5-9-00 to 12-03-03			1.32	0.53	3.45	1.07		
Number of observations	663	663	663	663	663	663	663	663
Adjusted R <sup>2</sup>	30.36%	11.02%	33.80%	11.30%				

**Table 7: Cross-sectional determinants of abnormal return patterns following insider sales**

*Anti-shareholder index* is a count of the number of anti-shareholder mechanisms employed at the firm. *Ex-ante switcher* is a binary variable equal to 1 if the firm was likely to change the number of anti-shareholder mechanisms in response to the 2004 regulations. *After 2004* is a binary variable equal to 1 for trades placed after 2004. *Insider dummies* are binary variables that equal 1 if the insider placing the trade performs a function of the corresponding type at the time of the transaction. CEOs are excluded from the category Executive Board. The base category is other insiders, which includes large shareholders, the management board and supervisory board of companies in which the company has an interest of at least 10%, partners and first degree relatives of CEOs, executive board members and supervisory board members that live in the same household, first-degree relatives of CEOs, executive board members and supervisory board members that do not live in the same household, but have an equity stake of at least 5% in the company and members of the workers' council. *ROE* and *Leverage* are the return on equity and debt-to-equity ratio at the end of the year, respectively. *Largest blockholder dummies* (directors, financial institutions, families or individuals, industrial or commercial companies and government) are set to one if shareholders belonging to the corresponding category have the largest stake as compared to the other categories. The base case is no blockholder of 5% or more. *Economic trend dummies*: the base category is the period from March 12 2003 until the end of the sample period in 2007. T-statistics are calculated based on Huber-White standard errors, and are clustered at the firm level in columns (1) and (3), and at the firm and the year level in columns (2) and (4). \*\*\*, \*\*, \* represent two-tailed significance at the 1%, 5% and 10% level, respectively. Data are from the period 1999-2007.

	Dependent variable: CAR[0,40]							
	OLS with firm FE		OLS		OLS with firm FE		DD	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-5.22***	-3.22	-19.28*	-1.87	-74.16	-1.35	-21.07**	-2.07
Anti-shareholder index	2.81***	2.95	1.82	1.43	5.86***	3.27		
Ex-ante switcher							5.13**	2.24
After 2004							0.77	0.27
After 2004 × ex-ante switcher							-3.78*	-1.81
Insider: CEO			-8.12**	-2.03	-1.25	-0.20	-7.60**	-2.43
Insider: executive board member			-0.47	-0.13	-1.46	-0.37	-1.07	-0.29
Insider: supervisory board member			-2.59	-0.95	-1.47	-0.30	-3.34	-1.32
Largest: directors			-4.01	-0.89	-38.16*	-1.95	-3.60	-1.01
Largest: financial institutions			0.42	0.11	-24.00***	-4.66	0.91	0.86
Largest: families or individuals			1.75	0.27			3.22	0.34
Largest: ind./com. companies			1.22	0.25	-15.17	-0.73	2.25	0.48
Largest: government			-9.61	-1.08	-23.94***	-5.43	-11.24	-1.26
Firm size (ln market cap)			0.92**	2.06	4.48	1.63	1.01*	1.92
ROE			-0.004	-0.34	0.05	1.57	-0.001	-0.05
Leverage			2.48	1.63	8.36**	2.63	2.46*	1.68
Firm age (in 1999)			-0.005	-0.29			0.000	0.05
Economic growth 1-4-99 to 4-9-00			0.84	0.23	-3.88	-0.82		
Economic decline 5-9-00 to 12-03-03			-2.47	-1.30	-4.74	-1.50		
Number of observations	739	739	739	739	739	739	739	739
Adjusted R <sup>2</sup>	16.80%	16.80%	5.80%	5.80%	19.20%	19.20%	5.90%	5.90%





## Chapter 3

### Trading by Bank Insiders before and during the Financial Crisis

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**Abstract:** This paper investigates whether bank executives took excessive risks in the run-up to the recent financial crisis by analyzing their trading in their own bank's stock. I examine whether insiders of banks with the highest exposure to subprime risk changed their insider trading before the onset of the crisis. Two main findings emerge. First, there are large differences in insider trading patterns between high- and low-exposure banks starting in mid-2006, when US housing prices first declined. The economic effect is sizeable: insiders of high-exposure banks sell 30% more equity than insiders of low-exposure banks. This increase in insider sales precedes the fall of bank stock prices and the surge in banks' CDS spreads by at least 12 months. Second, there is no difference in insider trading patterns between banks with high and low exposure in 2004-2005. I conclude that insiders of high-exposure banks revised their views on the profitability of their banks' investments following the reversal in the housing market.

#### 1. Introduction

There is considerable controversy about the extent to which bank executives consciously took excessive risks in the run-up to the recent financial crisis. Some argue that bank executives, acting in the interest of shareholders, took risks that they believed the market would reward, and had no foresight of the crisis (Fahlenbrach and Stulz (2011)). Others dispute that poor performance in the crisis was the result of an unforeseen shock, and argue that executive compensation arrangements induced excessive risk-taking (Cheng, Hong, and Scheinkman (2009), Bebchuk, Cohen, and Spamann (2010), Bhagat and Bolton (2011)). Understanding bank executives' thinking before the crisis is an important starting point for designing compensation contracts seeking to avert such failures in the future (John, Saunders, and Senbet (2000), Bolton, Scheinkman, and Xiong (2006), Bolton, Mehran, and Shapiro (2010), Jarque and Prescott (2010), Thanassoulis (2011)).

This paper sheds some light on bank executives' thinking by examining their insider trading decisions prior to the crisis.<sup>1</sup> Although the financial sector as a whole performed poorly during the crisis, the relative underperformance of banks showed large variation (Beltratti and Stulz (2011)). Using banks' performance during the crisis as an ex-post measure of risk exposure, this paper examines whether the bankers that took the most risk changed their insider trading before the onset of the crisis. The paper has two main findings: First, there are large differences in insider trading behavior between high- and low-exposure banks starting in 2006, when US housing prices indices first declined. During 2006, the number of insiders reducing their ownership increases by 12% in high-exposure banks, compared to low-exposure banks. Furthermore, insiders of high-exposure banks sell 5-7 million USD more of their bank's stock, on average, than insiders of low-exposure banks. In relative terms, this represents an increase of 30-40% in the total yearly value of stock sales. This increase in insider sales precedes the drop in banks' stock prices and the surge in banks' CDS spreads by at least 12 months. Second, there is no observable difference in insider trading behavior between high- and low-exposure banks in 2004-2005, before the US housing market weakened. The evidence offered in this paper suggests that while bank insiders regarded investments in mortgage-backed securities profitable given the housing price growth, they altered their views on the profitability of these investments following the reversal in the housing market.

The origins and the unfolding of the recent financial turmoil have received considerable attention in the academic literature (Gorton (2009)). Recent empirical evidence suggests that banks altered their policies and started taking more risk well before the onset of the crisis in 2007 (Landier, Sraer, and Thesmar (2010), von Liliendorf-Toal and Mookherjee (2011)). Much of the debate has focused on the role of bank executives' incentives in the financial meltdown. On the one hand, Fahlenbrach and Stulz (2011) do not find strong evidence to support the notion that incentive packages contributed to the crisis. Their results indicate that CEOs were holding sizeable equity stakes even as the crisis hit, and did not reduce their ownership in 2007 or during the peak of the crisis in 2008. They conclude that CEOs believed that the risks they took before the crisis would pay off, but that this turned out not to be the case. On the other hand, Bebchuk et al. (2010) criticize the incentive structures of bank managers. They point out that the top managers of Bear Stearns and Lehman Brothers cashed out a substantial amount of options in the period prior to the crisis. Bhagat and Bolton (2011) also dispute that managers had no awareness of the large risks they were facing.

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<sup>1</sup> Based on the definition of the Securities and Exchange Commission I refer to legal, reported trades of corporate insiders as "insider trading" (<http://www.sec.gov/answers/insider.htm>). Illegal transactions of insiders, albeit relevant in the context of the financial crisis, are not the focus of the paper.

They analyze the compensation structure and CEO payoffs of the 14 largest US banks and argue that managerial incentives led to excessive risk-taking. This view is supported also by Cheng et al. (2009), who find a positive relation between excess executive compensation and risk taking. Their evidence suggests that overpaying bank managers who take high risks is positively associated with the level of institutional ownership of the bank.

My paper examines the individual trades of a wide range of bank insiders, which allows for a refined analysis of the timing of bankers' trades, and possible changes in their trading behavior. Specifically, I link trading by bank insiders to the developments in the housing market, which played a crucial role in starting the crisis. Whereas Fahlenbrach and Stulz (2011) conclude that CEOs did not reduce their ownership in 2007 or during the peak of the crisis in 2008, my paper reveals that bank executives did sell large amounts of stock in 2006, when housing prices started to decline. Therefore, I contribute to the literature by providing evidence that bank executives understood the exposures of their bank to housing prices and reduced their stockholdings during 2006.

The results of my paper also suggest, however, that the prescience of bank executives regarding the consequences of their policies was limited. Assuming perfect foresight, executives of high-exposure banks should have increased their selling in anticipation, before housing prices started to fall. This prediction, however, is not borne out by the data. Thus, although my paper supports the argument put forward by Bebchuk et al. (2010) and Bhagat and Bolton (2011) that bank executives sold substantial amounts of stock preceding the crisis, it contrasts with their evidence regarding the timing of these sales. I find no evidence of abnormal selling activity prior to 2006. Hence, my findings are not supportive of the notion that bankers were perfectly aware of the risks implied by their policies right from the outset. Even so, they had more than 12 months to reduce their equity positions before the market gradually learned about the subprime risk exposures of their banks' portfolios. In sum, the empirical findings of the paper suggest that bank insiders' response to public information was influenced by their private information regarding the exposure of their bank to the subprime mortgage market. In this sense, bank insiders were able to exploit the lack of information on complex mortgage-backed securities.

Since different types of insiders have varying levels of information about the strategies of their firms (Seyhun (1986), Lin and Zhao (1990), Ravina and Sapienza (2011)), I first scrutinize transactions of all insiders of the bank, then disaggregate trades of executive officers, independent directors, and finally shift the focus to chief executive officers. The economic effects are sizeable for all insider groups, and largest for bank CEOs. In the case of CEOs, I directly measure the

percentage change in their total shareholdings. In 2006, CEOs of high-exposure banks sold 9 percentage points more of their holdings, which, expressed in relative terms, is a 200% increase in selling compared to all other years. The paper suggests that the timing of stock sales in 2006 coincided with the fall in housing prices. In the first two quarters of housing price declines, executive officers of high-exposure banks sold 1.02 and 1.34 million USD more stock in the open market, a relative increase of 33 and 44%, respectively. Independent directors, who are not obliged to hold company stock (Bhagat and Tookes (2011)), sold 0.49 and 0.68 million USD more during these quarters, an increase of 59% and 82% relative to the mean.

The results of this paper are not explained by contrarian trading, portfolio rebalancing following price increases, differences in the compensation structures of the banks, riskiness of the bank's stock, time-invariant bank heterogeneity, or differences in executive turnover. To circumvent the difficulty of drawing inferences based on differences in traded stock values across banks of different size and varying compensation structures, I construct a measure, insider trading duration, which focuses solely on the timing of the trades, and is insensitive to the total value traded over a period. The findings based on this measure are similar: insiders of high-exposure banks sold stock earlier during the 2006-2008 period, whereas insiders of low-exposure banks sold later.

The paper proceeds as follows. Section 2 describes the dataset used in the study. Section 3 presents the main results on bank risk-taking and insider trading prior to the crisis. Section 4 examines the role of the housing market in bank insiders' trading behavior. Section 5 presents a battery of additional tests to complement the main results. Section 6 discusses the interpretation of the results and the limitations of the analysis. Section 7 concludes the paper.

## **2. Data sources and sample selection**

The initial sample comprises all firms with SIC codes 6000–6299 in the CRSP-Compustat merged file.<sup>2</sup> For these firms, I collect insider trading information from the Thomson Reuters database. Prices and delisting information are from CRSP, accounting data are from Compustat. These data are then merged with ExecuComp, which contains information on executive compensation packages and holdings of company stock and options. The data span the years 1995-2009. There are

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<sup>2</sup> SIC codes 6000-6299 are assigned to “depository institutions”, “non-depository credit institutions”; and “security and commodity brokers, dealers, exchanges, and services”.

1702 firms with SIC codes 6000–6299 in the CRSP-Compustat merged dataset that have at least one insider trade during the sample period, and 282 of these are present in ExecuComp. Finally, I exclude firms that cannot be classified as large lending institutions, following Fahlenbrach and Stulz (2011).<sup>3</sup> I obtain information on asset write-downs from Bloomberg.

To understand whether insiders were in possession of information about their bank's prospects, I first construct an ex-post measure of risk exposure. In the baseline analysis, this measure is the excess return on the bank's stock during the period July 2007 – December 2008. I use the excess returns to classify banks into terciles (performance groups).<sup>4</sup> Furthermore, if a bank is delisted from the stock exchange during this period, depending on the delisting code, I also assign it to the lowest performance group. The CRSP delisting codes for which I relegate banks to the lowest group are 200-290 ("mergers") and 500-591 ("dropped"). When analyzing insider trading during 2007, I allocate banks to groups based on excess returns during 2008. If the return measurement period overlapped with the period for which I analyze insider trades, it would not be clear whether insiders were trading in anticipation of stock returns or were merely reacting to observed returns. Repeating the group allocation based on 2008 excess returns does not alter the groups dramatically, the correlation between the excess returns measured over the two periods is higher than 94%. Finally, once the groups are set, I only keep banks for which there are observations both before and after 2006, to limit the effect of sample attrition on the results. This procedure leaves 100 banks in the final sample, with 966 bank-year observations.

Panel A of Table 1 summarizes the number of observations and stock return characteristics in each of the three performance groups.<sup>5</sup> One potential concern is that creating groups based on excess returns would favor banks that were exposed to higher systematic risk. Therefore, I also calculate risk-adjusted returns as alphas from CAPM, Fama-French, and Carhart models estimated on daily data. Panel A shows that the top (bottom) performance group in terms of excess returns also had the highest (lowest) alpha, regardless of the asset pricing model used. Panel A also exhibits

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<sup>3</sup> To ensure that the exclusion of certain firms is not driving the results, I repeat the analysis on all (282) firms with available information. The findings of this supplementary analysis are similar to those presented in the paper and are not reported to conserve on space.

<sup>4</sup> Using CAPM alphas, alpha from a Fama-French three-factor model, or a Carhart four-factor model yields similar results.

<sup>5</sup> To be conservative, I assume delisting returns are 0 for banks in the bottom group. Doing so should lead me to understate the true loss of investing in the stocks of these banks, as the average delisting returns for mergers are in the range of 1.9-3.9%, whereas the average for delisting due to poor performance is between -16.3% and -41.7% (Shumway (1997), CRSP (2001)).

market betas from all three asset pricing models, which unsurprisingly suggest that banks in the bottom performance group were exposed to the highest level of systematic risk.

– *Insert Table 1 here* –

In Panel B I display information on announced asset write-downs for each of the three performance groups. The structure of subprime mortgage-backed securities is such that holders of the lowest tranche take the first losses. Therefore, if my ex-post measure captures banks' risk exposures accurately, banks in the bottom group should have the highest amount of total write-downs. Keeping the total write-down value constant, they should also write down assets the earliest. Panel B confirms that both the number of banks with write-downs and the total value of asset write-downs are strongly associated with the groups created based on stock price performance. The average ratio of write-downs to total assets is also lowest for the top performance group, while it is of similar magnitude in the middle and the bottom performance groups. This latter result hints that the banks in the bottom performance group are, on average, larger than those in the other two groups. The yearly breakdown of total write-down figures shows that banks in the bottom group announced write-downs the earliest, whereas the one bank with write-downs in the top performance group (Wells Fargo) announced later, mostly in 2009 and 2010. Figure 1 examines write-down dynamics across the three performance groups in greater detail. For each group, I plot the cumulative fraction of write-downs announced for every quarter between Q3 2007 and Q4 2010.<sup>6</sup> The graph reconfirms that banks in the bottom group announced a large fraction of their write-downs earlier than banks in the middle group, who in turn announced somewhat earlier than banks in the bottom group.

– *Insert Figure 1 here* –

The empirical analysis of the paper uses two measures of insider trading. The first measure is the number of insiders that increased their ownership in the bank, divided by the number of all insiders trading that year. In calculating this percentage, I take into account all ownership increases and decreases by the insider in a given year, whether they are open-market transactions or not. Consequently, this measure is not influenced by sales related to option exercises since the option exercise increases the insider's ownership, and the subsequent sale decreases it by the same amount.<sup>7</sup> This measure is also insensitive to the amount by which the insider increased or decreased

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<sup>6</sup> Write-downs occurring before or after this period are negligible, equaling 0.07% of total overall write-downs.

<sup>7</sup> Assuming a full sale of the stocks acquired through the option exercise. Full sales account for approximately 98% of all option-related sales in the sample. In the remaining 2% of option-related sale transactions the insider sells only part of the shares received through the option exercise.

their ownership. The second measure I use is the net dollar value of open market transactions, defined as positive if more stocks were bought than sold, and negative if the converse holds. Unlike the first variable, this measure takes into account the magnitude of transactions, and includes all open market sales, irrespective of whether they are related to option exercises or not. Blockholders are excluded from the analysis, because their information set may be quite different from that of board members and senior executives. The baseline analysis examines trading by non-blockholder insiders, to whom I refer as “insiders” in the remainder of the paper. Additional tests then focus on the trading of different types of insiders. Panel C provides a breakdown of the average value of insiders’ open market transactions, and the percentage of insiders increasing their ownership per bank-year. Insiders of the bottom group sold the most stock in 2006 in terms of stock value, coupled with a fairly low percentage of insiders increasing their ownership, suggesting that the high value of stock sales was not just due to a few large transactions. By contrast, insiders of the top group had the highest average value of sales two years later in 2008. The average value of sales declined, and the percentage of insiders increasing their ownership rose for both groups in 2009, particularly for the bottom performers.

A possible concern is that compensation structures in the two groups differ substantially, and that these differences in turn drive insider trading activity. If executives of banks that performed poorly during the crisis period received more stock-based incentives before 2008, they would sell more stock also for liquidity reasons (Jenter (2005)). Furthermore, Cheng, Hong, and Scheinkman (2011) underscore that total executive compensation is positively related to bank riskiness. Holding the proportion of stock-based compensation constant, higher total compensation would, on average, also imply higher amounts of liquidity-motivated stock sales. Therefore, I use several controls for compensation structure. I include total compensation (measured in millions of US dollars) and the percentage change in total compensation from the previous year, to account for increases in portfolio wealth that may prompt insiders to adjust their position. The ratio of stock-based to total compensation captures liquidity-motivated trading that arises because insiders receive some part of their compensation in stock. As insiders may exercise stock options or sell restricted stocks vesting from earlier grants, I also include the average stock-based compensation granted over the preceding three years. I control for total executive ownership to capture diversification motives. Finally, I include the intrinsic value of unexercised options, both exercisable and unexercisable, to further account for existing exposure to company stock. In the bank-level analysis, compensation variables are measured as bank-year averages over all executives whose compensation is disclosed in ExecuComp.



The set of controls also includes bank-specific variables. Size has been shown to have a negative correlation with insider trading activity (Seyhun (1986)). Book-to-market and the past-year stock return address the issue of contrarian trading by insiders (Rozeff and Zaman (1998), Jenter (2005)). Because book-to-market ratios of banks are difficult to interpret, in alternative specifications I replace book-to-market with earnings-to-price ratios. The results of these tests (unreported) are identical to the ones in the paper. Moreover, earnings-to-price ratios appear to explain less of the variation in insider trading than book-to-market ratios. Past-year stock return volatility is included to capture trading associated with the riskiness of the bank (Meulbroek (2000), Jenter (2005)). The change in return volatility from year  $t-2$  to year  $t-1$  (the past year) captures changes in holdings owing to shifts in bank riskiness (Aggarwal and Samwick (1999), Jin (1999), Jenter (2005)).

Panel D tabulates summary statistics for the insider trading measures and the covariates used in the regressions, separately for the top and the bottom performance group. Accounting and compensation data are measured at the end of the fiscal year preceding the insider trade. To reduce the impact of outliers, I winsorize the net value of open market trading at the 1<sup>st</sup> and 99<sup>th</sup> percentiles. A bank-year observation is included in the sample if it has data on all the explanatory variables.<sup>8</sup> The two rightmost columns of Panel D show significance values of two tests. First, I use a t-test to assess differences among the groups in the levels of the variables. Second, I test for differences in the time trends of each variable by estimating the regression

$$x_{i,t} = \alpha_1 + \alpha_2 \text{Grp} + \beta_1 t + \beta_2 t \text{Grp}, \quad (1)$$

using observations from the top and the bottom groups, with the omission of years 2008 and 2009. Data from these years are left out because the groups were chosen to be different during the crisis, so finding a difference owing to the divergence of the variables in 2008 and 2009 would be tautological. Grp is a binary variable equal to 1 if the observation is in the bottom group, whereas  $t$  is a linear time trend. The last column of Panel D shows the significance of the coefficient of the interaction term between the time trend and the ex-post performance group,  $\beta_2$ .

The average percentage of insiders increasing their ownership is 33.76 in the bottom group, approximately 6 percentage points lower than in the top group. Netting out purchases and sales, insiders of banks in the bottom group sold approximately 16.82 million USD worth of stock in the open market each year, significantly more than insiders of banks in the top group. This is unsurprising, as banks in the bottom group were also significantly larger, as reflected by the total

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<sup>8</sup> A few observations are dropped in the analysis of CEO trading because of missing compensation data.

value of their assets. Insider trading measures for the CEOs exhibit no significant difference between the two groups. On average, CEOs sold over 4% of their total stock stakes in the open market each year.

Turning to the covariates, the median bank in the top group had assets of approximately 6.2 billion USD, whereas the median size in the bottom group was approximately 26.0 billion USD, confirming that the institutions analyzed are indeed the largest lending institutions in the US. Total compensation had been rising during the sample period (Core and Guay (2010)), evidenced by the median year-on-year increase of 23.53% in the top group and 30.76% in the bottom group. The executives covered by ExecuComp owned on average 2.28% (top group) to 2.99% (bottom group) of their bank's stock, which closely matches the figure reported by Fahlenbrach and Stulz (2011). The tests of the difference in levels suggest that banks in the bottom group were on average larger and had lower market valuations, and more volatile stock returns. Proportionately to their size, they also granted larger compensation packages. Although the levels of the covariates differ across the two performance groups, the last column suggests that these differences were constant over time, as there are no significant differences between the time trends of the variables between the groups. Therefore, using group fixed effects in the insider trading regressions can account for most of the differences between the groups.

Of the explanatory variables, the proportion of stock-based compensation is scrutinized in further detail in Table 2. Understanding the dynamics of stock-based incentives in the different groups during the sample period is important for several reasons. First, if bank insiders receive a high proportion of their compensation in stock and options, they are also likely to sell more stock for pure liquidity considerations (Jenter (2005)). Second, if stock-based incentives were relatively low for the bottom performers before the crisis, the lack of incentives may have caused poor performance. While this prediction is suggested by the compensation literature (Murphy (1999)), recent papers on financial institutions cast doubt on its validity for banks. Mehran and Rosenberg (2008) show that although stock option grants induce CEOs to undertake riskier investments, they also lead them to take less borrowing and higher capital ratios. Keys, Mukherjee, Seru and Vig (2009) provide evidence that CEO compensation does not impact the quality of loans made. Table 2 shows that banks in all three performance groups exhibit growth in the percentage of stock-based incentives. Furthermore, banks that performed poorly during the crisis have a higher proportion of stock-based compensation, but the difference is not statistically significant, except for two years.

– *Insert Table 2 here* –

### 3. Insider trading prior to the crisis and bank risk-taking

The empirical analysis relates the insider trading patterns in the pre-crisis period to the ex-post measure of risk exposure, realized stock returns during the crisis. First, Subsection 3.1 illustrates the univariate relationship between risk-taking and pre-crisis insider trading. Subsection 3.2 then examines this relationship in a regression setting. Subsection 3.3 shows that the documented patterns are more strongly present in the trades of CEOs.

#### *3.1. Insider trading and bank risk-taking: Univariate analysis*

In the period before the crisis, during 2006, there was no sharp decline in the US stock or bond market in general. Moreover, banks in the bottom group were actually enjoying high stock returns. However, in 2006 the Case-Shiller home price index declined for the first time in several years. There was also geographic variation in housing prices: the Boston index had been stagnating since June 2005, while prices in Cleveland and Dallas started sinking in February 2006.<sup>9</sup> Amid the continued decline of these three local indices, in April 2006 San Diego, San Francisco, Washington DC, and Detroit also registered a decline, after several months of growth. In May, housing price growth in Las Vegas, Minneapolis, and Los Angeles also reversed, and the Case-Shiller 20-City Composite Index decreased for the first time since its start in 2000. Figure 2 shows the Case-Shiller seasonally adjusted 20-City Composite Index of housing prices (left vertical axis), and the number of index constituent cities in which housing prices were decreasing for each month since January 2000 (right vertical axis).

– *Insert Figure 2 here* –

These developments in the housing market during the spring of 2006 would have been a concern for institutions with large, uninsured subprime loan portfolios. To understand whether the decline in housing prices led to significant differences in insider trading between the top and the bottom group, I first examine monthly insider trading and the simultaneous movements of banks' stock returns and of housing prices for the period 2005-2009 in Figures 3 and 4. I disaggregate

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<sup>9</sup> The information on housing prices is taken from the seasonally adjusted housing indices, retrieved from: <http://www.standardandpoors.com/indices/sp-case-shiller-home-price-indices/en/us/?indexId=spusa-cashpidff-p-us---->

insider trading data by insider type: Figure 3 contains insider trading data for executive officers, while Figure 4 plots data on the trades of independent directors.

– *Insert Figures 3 and 4 here* –

Panel A exhibits equally-weighted stock returns of banks in the top and the bottom group. Panel B plots the 20-city, seasonally adjusted Case-Shiller Home Price Index, retrieved from Standard & Poor's.<sup>10</sup> Panel C graphs the cumulative dollar value of net open market insider trades. The first dotted vertical line indicates May 2006, the first month in which the index declined. The second dotted line indicates July 2007, when banks' CDS spreads increased dramatically for the first time. Because banks in the top group are smaller, their compensation packages and hence the option and restricted stock grants given to executives, are commensurately lower, on average. To enhance comparability of insider trading values across performance groups, I rescale the cumulative net insider trading values of the top performance group by the ratio of executive compensation between the top and the bottom group in 2006, 2.5. To ensure that my inference does not hinge on extreme observations, in Figure 4 I replace the data point in November 2006 (-766 million USD) with the 95<sup>th</sup> percentile of the distribution of monthly net open market trading values in the bottom group (-52 million USD).<sup>11</sup>

Stock returns of banks in the two groups did not differ markedly during 2005-2006. The return on an equally-weighted portfolio of banks in the bottom group was 6.5% higher in 2005 and 5% higher in 2006 than the return on banks in the top group, as shown in Panel A.<sup>12</sup> Panel C shows that insider trading patterns in the two groups started to diverge significantly in mid-2006, because insiders of banks in the bottom group sold more stock. As stock returns of banks did not differ substantially, it is unlikely that the observed large differences in traded values during 2006 and 2007 are due to contrarian trading or portfolio rebalancing. The graphs shown in Panel C of both Figure 3 and Figure 4 indicate that stock sales by insiders of ex-post poor performers increased

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<sup>10</sup> This indicator is more comprehensive than the 10-City Index, but has monthly data available, unlike the National Index, which is updated every quarter. As the indices are highly correlated, the findings presented are invariant to the choice of housing price index.

<sup>11</sup> Most of this value is due to a transaction by a Citigroup independent director, reportedly undertaken for "estate tax planning purposes". The trade involved selling Citigroup shares worth \$737,741,663 in the aggregate. It is beyond the scope of this work to assess the tax planning motives of insiders. Since the data are winsorized for the yearly regressions, this trade does not affect the regression results. Replacing it with a much smaller value from the distribution guarantees that the trade does not affect the inference drawn from the monthly data either.

<sup>12</sup> The return difference on a value-weighted basis (not shown) was -1% (i.e. banks in the top group performed better) in 2005, and 3% in 2006.

notably (the slope becomes steeper) after May 2006. This pattern suggests that both executive officers and independent directors disposed of sizeable stock holdings after housing prices started to decline. However, the effect appears to be more pronounced for independent directors, probably because they were not bound by contract clauses requiring them to own a specified amount of the bank's stock, and hence had been holding the shares voluntarily (Bhagat and Tookes (2011)). Independent directors may also be less worried about the signaling effect of their trades. The net value of sales was approximately zero, or slightly positive in the bottom group after March 2008. Subsection 5.3 investigates the origins of this pattern.

### 3.2. Insider trading and bank risk-taking: Regression results

I now shift to a multivariate framework, which allows for differences between the two groups of banks, acknowledging that institutions performing poorly during the downturn may be inherently different from other banks. I control for factors other than private information that have been shown to impact insider trading. To capture time-invariant unobserved heterogeneity at the bank level, I also estimate regressions with bank fixed effects (FE). For similar reasons, I estimate a third set of models with year FE. The group effects are omitted from the specifications with bank FE due to collinearity. The regression equation is:

$$Itr_{i,t} = \alpha + \beta_1 Grp_i + \beta_2 Yr_t + \delta Grp_i Yr_t + \varphi' \mathbf{Comp}_{i,t} + \gamma' \mathbf{Control}_{i,t} + \varepsilon_{i,t} \quad (2)$$

where the dependent variable,  $Itr_{i,t}$ , is one of the two insider trading proxies: the percentage of insiders increasing their ownership, or the value of net purchases. Both these variables are increasing in insiders' willingness to hold the bank's stock.  $Grp_i$  is the group effect,  $Yr_t$  is a year dummy,  $Comp$  is the vector of compensation variables and  $Control$  is the vector of other control variables. In regressions with bank or year FE, these FE replace the intercept,  $\alpha$ . Since the dependent variable is a fraction ranging between 0 and 1, I also run tobit regressions that account for two-sided censoring: from below at 0, and from above at 1. The panel tobit regression with bank fixed effects uses the estimator developed in Alan, Honoré, Hu, and Leth-Pedersen (2011).

– *Insert Table 3 here* –

Table 3 shows results from regressions of the percentage of insiders increasing their ownership in the bank in any given year on indicators for good and bad crisis performance, as well as their interaction with year 2006 (column 1) and year 2007 (column 6), and various controls. The coefficient estimates show that the difference in the decrease in insider ownership between banks

with poor and good crisis performance was significant in 2006, and 2007. Coefficient estimates for 2007 especially suggest large differences between the two groups. The results are robust to the inclusion of bank FE (columns 2, 5, 7, and 10) and year FE (columns 3 and 8). As the specifications with bank FE are the most successful in explaining trading motives other than private information, I consider the results of these regressions the most reliable. The percentage of insiders increasing their ownership is approximately 4 percentage points lower in the bottom performance group during 2006, representing a relative decrease of approximately 12% ( $4/33.76 = 11.8\%$ ) compared to the mean of the bottom group. The magnitude of the effect is larger during 2007, at 11.65-13.75 percentage points, or 34-40% in relative terms. The tobit specifications provide similar coefficient estimates, and the effect is larger in the fixed-effect tobit model. Coefficients of the control variables also have the expected sign. If insiders have contrarian views on firm value (Jenter (2005), Piotroski and Roulstone (2005)), then they should increase their ownership as the book-to-market ratio increases and decrease their ownership after periods of stock price appreciation. Also, fewer insiders are expected to increase their ownership if stock-based compensation was high in past years, as insiders already own large amounts of stock due to the grants. Accordingly, coefficient estimates are positive on the book-to-market ratio, negative on the past-year stock return, and negative on stock-based compensation. Finally, I repeat the same regressions for 2004 and 2005 and find no significant differences in insider trading between groups. These results are untabulated.

– *Insert Table 4 here* –

To examine the economic magnitudes behind the trades, Table 4 shows regressions with the aggregated net dollar values of open market insider transactions as dependent variable. Trade values are winsorized at the 1% level to reduce the impact of extreme observations. Coefficient estimates imply that insiders in the bottom performance group sold significantly more stock in the open market during 2006 than did insiders of banks in the top performance group. The differences in 2006 insider trading between the bottom and top performance groups are highly significant both statistically and economically. The economic magnitude of the effect is a difference of 4.79-6.98 million USD, which amounts to 30-40% of the mean value of net sales in the bottom group (16.82). Finally, for the year 2007, the difference between the two groups in the net dollar value of open market sales reverses, and is significant at the 10% level in one specification. I explore the origins of this latter finding in detail in Section IV. The control variables explain more than 40% of the variation in the dollar value of insider trading. Adding bank fixed effects improves the adjusted  $R^2$  by 10 percentage points. Additional regressions (untabulated) find no difference in traded values between groups during 2004 or 2005.

As information available to different insiders of the same firm may vary (Seyhun (1986), Lin and Zhao (1990)), I repeat the analysis for different insider categories. Tables 5 and 6 repeat the regressions of the percentage of insiders increasing their ownership, shown in Table 3, distinguishing executives and independent directors. This partitioning of the sample is motivated by two considerations. On the one hand, executives have been shown to have an informational advantage over independent directors (Ravina and Sapienza (2011)). On the other hand, independent directors are not subject to minimum ownership requirements set by the firm (Core and Larcker (2002), Bhagat and Tookes (2011)). The regressions for executive officers are shown in Table 5.

– *Insert Tables 5 and 6 here* –

The coefficient of the interaction term between bad crisis performance and the year 2006 is negative and strongly significant in all specifications. Moreover, the economic magnitude is larger than in the regression of all insiders: the 8-10 percentage point decrease in the percentage of insiders is a relative difference of 30-35% (the mean, 28%, is not shown in Table 1). Thus, in relative terms, the difference in the percentage of insiders increasing their ownership is three times larger for executive directors than for all insiders. Lastly, the difference between the performance groups is smaller in 2007, but remains statistically significant. Table 6 contains similar regressions for independent directors. The percentage of independent directors increasing their ownership is not different in 2006, but is significantly lower in high-exposure banks in 2007. Overall, the results indicate that many executives, but few independent directors of high-exposure banks were shunning the bank's stock in 2006. By 2007, however, a large number of independent directors also chose to decrease their exposure to the bank's stock. As an additional test, I also repeat the regressions of net open market values, shown in Table 4, separately for executives and independent directors (results not shown). The net value of stock sales by executive officers does not differ between the two groups. However, there is some evidence that independent directors of high-exposure banks sold more stock in 2006. A possible explanation for these results is that aggregating trade values at the year level renders it more difficult to accurately identify time trends. Section IV therefore offers a more refined analysis of this matter.

### 3.3. Trading patterns of chief executive officers

Next, I analyze the trades of chief executive officers. Fahlenbrach and Stulz (2011), Bhagat and Bolton (2010), and Bebchuk et al. (2010) all emphasize the role of CEO compensation in starting the crisis. I therefore seek to determine whether, and if so to what extent, CEOs also exhibited the trading patterns documented in the previous section. Focusing on CEOs also renders the relationship between insider trading and the compensation proxies more precise: in these regressions I use the compensation and ownership of the CEO, without having to average across insiders for each bank-year.

– *Insert Table 7 here* –

Table 7 presents regressions of a binary variable equal to 1 if the CEO increased her stock ownership during the year on the same covariates as before, with the compensation and ownership controls measured for the CEO. Not all CEOs had transactions in the insider trading dataset every year. In these cases, the dependent variable is set to zero. Columns 1-3 and 6-8 show linear probability models, whereas the other columns show panel logit regressions.<sup>13</sup> Results indicate that CEOs of banks in the bottom group were significantly less likely to increase their ownership during 2006 than CEOs of banks in the top group. The economic significance of the difference is higher compared to all insiders, and even slightly higher than for executive officers. The OLS specification of column 1 suggests that CEOs in the bottom group were 11 percentage points less likely to increase their ownership in 2006. This change is a decrease of 40% relative to the mean (27.93%), as opposed to a relative decrease of 30-35% for executives and 10% for all insiders. These differences are consistent with the notion that CEOs have better information about the prospects of their bank than insiders in general. They are also consistent with the empirical observation that CEOs have higher stakes in their bank, and thus stand to lose more if the stock price falls. For CEO trading in 2007, there is no consistent difference between high-exposure and low-exposure banks. Regressions of an indicator equal to 1 if the CEO is a net buyer of the bank's stock (untabulated) yield qualitatively similar results.

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<sup>13</sup> On the one hand, linear probability models may underestimate the true effect of the covariates on the dependent variable, and yield predictions that are outside the (0,1) interval (Cameron and Trivedi (2005)). On the other hand, nonlinear panel data models such as the logit may have the incidental parameters problem (Neyman and Scott (1948), Heckman (1981)), which the linear model avoids. The fixed-effect logit models in columns 5 and 10 drop banks if the CEO always increased her ownership during the sample period, or never did. The estimated fixed effect for these banks would be  $+\infty$ , and  $-\infty$ , respectively (Heckman (1981)).



– *Insert Table 8 here* –

To further assess the economic significance of the patterns in CEO trading, I next use the net number of stocks bought in the open market, scaled by the number of stocks owned by the CEO as the dependent variable. The regression estimates thus indicate what percentage of their total stock ownership CEOs sold in the open market. The results are shown in Table 8.<sup>14</sup> The results buttress earlier findings that CEOs in the bottom group sold substantially more stock in 2006 than CEOs of the top group. The difference between the two groups is approximately 9 percentage points (8.53-9.14), i.e. almost one-tenth of the total existing equity exposure, which is significant also economically. Moreover, considering that the average CEO of a bank in the bottom group sold 4.11% of her holdings in the market each year, the relative increase in CEO selling is in excess of 200% ( $8.53/4.11 = 208\%$ ). Columns 5-10 repeat the analysis for 2007 and find no significant difference.

Taken together, insiders, and in particular CEOs, of high-exposure banks reduced their exposure to the bank's stock more during 2006 than did their peers at low-exposure banks. Results for 2007 are, however, ambiguous. While the number of insiders decreasing their ownership remain significantly different across the two performance groups, dollar values traded on the open market do not differ on a yearly basis. Nonetheless, Figures 3 and 4 suggest that insider trading patterns started to diverge around May 2006, when the housing slump began. Therefore, the next section attempts to capture more accurately the relevant patterns in insider trading, by analyzing information at the quarterly level.

#### **4. Quarterly dynamics of housing prices, stock returns and insider trading**

The graphical analysis of the previous section suggests, and the regression results corroborate, that insiders of high-risk banks reduced their stock exposures significantly in 2006 but also that this effect faded or possibly reversed during 2007. This section offers a more fine-grained analysis of the dynamics of trading by bank insiders, by scrutinizing their trades at the quarterly level. This analysis may also shed light on the source and extent of insiders' informational advantage. To explicate the link between housing prices, insider trading, and subsequent stock returns, I analyze

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<sup>14</sup> Since one of the covariates, CEO ownership is highly correlated with the denominator of the dependent variable, in untabulated analyses I estimate alternative specifications in which this covariate is omitted, and find qualitatively and quantitatively similar results.

quarterly insider trading in a multivariate setting. While a quarterly analysis allows a more precise understanding of the timing of events, its drawback is that I cannot use information on executive compensation, as these data are yearly.

As an alternative to the ex-post risk measure used so far, which is based on stock returns, I now create a proxy for the sensitivity of banks' portfolios to the subprime mortgage market. I use the correlation between the return on the Barclays index of BBB-rated collateralized mortgage-backed securities (MBS) and the stock return of the bank during July 2007 – December 2008. As the BBB tranche takes losses before the higher-rated ones, this index should be more sensitive to the underlying asset pool, in this case mortgages, than indices of AA or AAA-rated collateralized MBS. As in the previous empirical setup, I once again group banks into three terciles based on the correlation coefficients.<sup>15</sup> I then test whether insiders of banks with a high exposure to the subprime mortgage market (high risk) reduced their ownership stakes significantly compared to insiders of banks with low subprime mortgage exposure, once housing prices started to decline.

There are several reasons for using this alternative proxy of bank risk. First, while the previous measure does not consider the reasons underlying banks' performance, this new proxy identifies one of the main sources of bank risk: exposure to subprime mortgages. Second, it addresses more precisely the nature of information available to bankers. This ex-post measure stresses risk stemming from the housing market. It therefore allows me to assess whether bankers understood that housing prices were a crucial driver of the value of their banks' portfolios. Third, to show that the results presented in Section 3 are insensitive to the treatment of delisted banks, in this analysis I ignore whether a bank was delisted between July 2007 – December 2008 or not. For banks delisted during this period, the correlations are measured based on the stock returns until the delisting date.

For banks with high exposures to the subprime mortgage market the impact of housing prices on insider trading is likely to not be linear. First, the information content of the first decrease in the 20-city housing price index, in May 2006, was qualitatively different than in December 2007, when it had been sinking for 9 months in a row. Second, insiders can adjust their positions relatively quickly once new information is available to them. It follows that, once they have adjusted their holdings by selling large amounts of stock, they may choose not to trade at all or to change their holdings only slightly. Therefore, specifications including the level or the return on the

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<sup>15</sup> To show that results are insensitive to the treatment of delisted banks, in this analysis I ignore whether a bank was delisted between July 2007 – December 2008 or not. For banks delisted during this period, the correlations are measured based on the stock returns until delisting date.

housing price index would not be able to accurately capture the effect. Instead, I use binary variables indicating whether housing prices declined in a given quarter. Furthermore, to allow for a non-linear effect, I use separate dummy variables for the first quarter in which the housing price index declined, the second quarter in which it declined, etc. up to the fifth quarter. Thereafter, I use a single dummy variable for all further decreases in the housing price index, i.e. the variable equals one in the sixth and all subsequent quarters with negative returns on the housing price index. The regressions I estimate on quarterly data take the form

$$Itr_{i,t} = \alpha + \beta_1 \text{Corr}_i + \beta_2 \text{HPD}_{j,t} + \delta \text{Corr}_i \text{HPD}_{j,t} + \gamma' \text{Control}_{i,t} + \varepsilon_{i,t} \quad (3)$$

where the dependent variable,  $Itr_{i,t}$ , is the net value of open market sales.  $\text{Corr}_i$  is the group effect, based on correlations between the stock price and the BBB-rated CMBS index.  $\text{HPD}_{j,t}$  (housing price decline) is an indicator equaling one for the  $j$ -th quarter in which the housing price index declined, except for  $j=6$ , which equals one in the sixth quarter and all quarters thereafter in which the housing price index decreased.  $\text{Control}$  is the vector of control variables. I report two further specifications, one with bank FE and one with quarter FE. In these regressions,  $\alpha_i$ , a bank fixed effect, or  $\alpha_t$ , a quarter fixed effect replaces the intercept,  $\alpha$ . For past stock returns, past return volatility and changes in past return volatility, I include two variables: one measured over the past quarter and the other measured over the past 252 trading days. Although past stock returns were not markedly different between the two groups in 2006, including these controls and book-to-market ratios ensures that the results are not driven by contrarian trading or portfolio rebalancing.

– *Insert Table 9 here* –

Table 9 summarizes the regression estimates. The strongly negative coefficients on the interaction terms suggest that insiders of banks with high exposure to subprime mortgages sold large amounts of stock in the open market immediately as housing prices started to decline. The economic effect is much (2-4 fold) larger than that estimated for banks with medium sensitivity to the subprime mortgage market. Furthermore, the economic magnitudes are larger or equal to those implied by the yearly regressions. The interaction terms for high-risk banks during the first three quarters of housing price declines suggest additional sales of 1.63, 2.66, and 1.81 million USD, respectively. The average quarterly value of net stock sales for high-correlation banks is -5.8 million USD (untabulated). The relative increases in quarterly selling suggested by each of the coefficients can then be estimated at 28% (1.63/5.8), 46%, and 31%.<sup>16</sup> The effect reverses during

<sup>16</sup> Since the criteria for sorting banks into groups differ in the two sections, finding similar magnitudes provides reassurance that the economic effects do not hinge on one specific group creation rule.

the 5<sup>th</sup> quarter of housing price declines, Q3 of 2007, and the period thereafter. This result explains the decrease in insider selling found in the yearly regressions of Table 4. Although the fit of the models is lower than in the yearly analysis, the regression with bank fixed effects is still able to explain almost 30% of the variation in quarterly insider trading activity.

To understand if these results are particular to any group of insiders, I run similar regressions separately for executive officers and independent directors. The estimates, tabulated in Table 10 corroborate the inference drawn from the full sample regression. The interaction terms for the first, second, and third decline in housing prices are strongly negative for the group with the highest correlation. The difference between the interaction terms measured for the group with high and the group with middle correlation remains sizeable, at a factor of 2-4. In all specifications, I can reject that the interaction terms for each of the housing price declines are equal in the high and the middle-correlation group. In terms of economic magnitudes, the incremental selling by executive officers is 1.02, 1.34, and 1.13 million USD, amounting to an increase of 33, 43, and 36% relative to the mean. Consistent with the steeper decline in the graph in Figure 4, I find that independent directors' selling activity is more pronounced. Their additional selling of 0.49, 0.68, and 0.37 million USD per quarter represent relative increases of 59, 82, and 45%, compared to the mean. Regarding the timing of insider selling, executive officers stop selling large amounts in the fifth quarter of housing price declines, while independent directors continue to sell in this quarter. Differences in selling then reverse for both types of insiders, and become insignificant for the sixth and subsequent quarters of housing price declines for independent directors.

– *Insert Table 10 here* –

The results in Tables 9 and 10 are suggestive of the nature of information possessed by insiders. It appears that, while insiders responded to the publicly observable information of housing price decreases in 2006, the magnitude and sign of this response was different according to the exposure of the bank to the subprime mortgage market. Despite regulatory requirements on the reporting of off-balance-sheet items, insiders still had a better understanding of these exposures than outside investors. For instance, data on the pool of mortgages underlying the MBSs held by the bank are crucial in evaluating these securities, but are not publicly available, nor was it straightforward to all investors how to value subprime mortgages and related instruments (Gorton (2009)). In sum, the empirical evidence suggests that bank insiders' response to public information was influenced by their private information regarding their exposure to the subprime mortgage market.

Combining this evidence on the dollar value of sales following housing price declines with the regressions of Tables 5 and 6 on the percentage of executives and independent directors increasing their ownership, the following conclusions emerge. During 2006, a high number of executive officers, but not independent directors, reduced their ownership in ex-post poor performers, while in 2007 insiders of both type were unwinding their exposures in their bank's stock. The extent of selling was, however, more intensive for independent directors. Hence, independent directors appear, on average, not as well-informed as executive directors (Ravina and Sapienza (2011)), but those who did understand the risks taken by the bank were able to sell large amounts of stock, as they were under no formal obligation to retain an equity exposure (Bhagat and Tookes (2011)), and may have been less concerned about the signaling effect of their trades.

## 5. Additional robustness tests

This section provides empirical evidence to complement the analyses of the previous sections. Subsection 5.1 discusses robustness of the results to assuming a non-linear effect of past stock returns on insider trading, varying the measure used to form groups, and restricting the sample period. Subsection 5.2 shows that the observed trading patterns are not driven by insiders that leave the bank. Subsection 5.3 examines the causes of the reduction in insider selling activity in high-risk banks during 2008 and 2009. Subsection 5.4 presents a new measure, insider trading duration, which offers a robustness test of the main result of the paper. Finally, as a further robustness check, Subsection 5.5 uses a trading strategy to assess the economic content of insider trading prior to the crisis.

### *5.1. The effect of past stock returns, group formation, and changing the sample period*

The regressions presented in the paper rely on the assumption that the impact of covariates on insider trading activity is close to linear, and does not change over time. As high-risk banks were favored by the markets in 2006, a possible concern is that high stock returns prompted additional selling over and above the normal portfolio rebalancing effect. In untabulated results, I account for possible non-linearities in the relationship between prior stock returns and the value of stock sales by insiders by including the square and the cube of gross returns as regressors in Table 4. These

variables are insignificant, while other coefficient estimates and significance levels remain unaffected. Also, from Figures 3 and 4 and Tables 9 and 10 it appears that strong insider selling started in mid-2006. If the upward trend in stock returns were the sole driver of the increase in insider selling, it is unclear why the surge in sales is present only in the second half of 2006, but not in the first.

As an additional test, I examine if results are sensitive to the measure used to form groups. First, the correlation between the tercile rankings based on stock price performance and correlation with the BBB-rated collateralized MBS index is -61%. Second, I repeat the yearly analysis using the correlation-based groups, and the quarterly analysis using the return-based groups. Estimates from these regressions are similar to those presented in the previous sections. I conclude that the main results of the paper are not sensitive to the measure used to form groups.

Finally, I also run all of the regressions discarding data points prior to 2000 (results are untabulated). This serves two related purposes. First, it is an attempt to mitigate the effect of time-variation in the coefficients of the control variables, if any. Second, it also serves to mitigate concerns of time-varying bank heterogeneity. If banks changed their profiles or policies over time, then reducing the length of the data set should alleviate the issue to the extent that these shifts would now have to take place within the span of 10 years, rather than 15. None of the results are sensitive to starting the sample in 2000, rather than 1996.

### *5.2. Pre-crisis trading by insiders leaving the bank*

The results so far suggest that insiders of ex-post poor performers sold significantly more stock during 2006 than insiders of banks emerging relatively well from the crisis. It is possible, however, that the results are influenced by differences in insider turnover across the two groups. If the number of insiders leaving during 2006 or 2007 was higher in banks that performed poorly during the crisis, it would also lead to fewer insider purchases and to higher amounts of net open market sales, for two reasons. First, since executive stock options lapse if the executive departs from the firm, it is rational for them to exercise rather than forfeit the options. Second, insiders are no longer bound by firm-level policies to retain large amounts of stock (Core and Larcker (2002), Bhagat and Tookes (2011)). Thus, portfolio diversification suggests that they should reduce their exposure to the firm's stock.

I perform a robustness exercise to address the issue of selling by insiders that leave the bank. First, I estimate turnover ratios in both performance groups and test whether they differ significantly. I compute turnover ratios from the Thomson Reuters insider trading database. An insider is assumed to have left the bank if the last year in which they are in the sample precedes the last year in which the bank is in the sample. By construction, it is impossible to calculate the turnover ratio in the last year that the bank is in the sample, and consequently for any bank in 2009, the end of the sample period.

– *Insert Table 11 here* –

Table 11 tests the equality of turnover ratios between the top and bottom performance groups during the sample years. While turnover of insiders was significantly higher in the top group in 2000, the bottom group saw notably higher turnover ratios in 2007 and 2008. The difference between the two groups was insignificant in 2006, however. Therefore, it is unlikely that the 2006 results are affected by differences in trading, whereas turnover may have an impact on the 2007 results. To assess whether the differences in 2007 insider trading are due to the differences in the fraction of insiders leaving the bank, for each year I keep only insiders that stay at the bank, and re-estimate the regressions of Tables 3 and 4. Coefficient estimates and significance levels are largely similar to those reported for the full sample, and are omitted to conserve space. I conclude that although the proportion of insiders leaving the bank was higher in 2007 in the bottom group than in the top, this difference is not driving the observed divergence of insider trading patterns during 2007. Restricting the sample to insiders that do not leave does not produce different results from those obtained for the full sample.

### *5.3. Trading patterns in 2008*

Figures 3 and 4 suggest that insider selling activity in high-risk banks slowed, or even showed a slight reversal during the crisis in 2008 and 2009. I investigate two explanations for this feature of the data.

– *Insert Table 12 here* –

First, Table 12 shows that option-related sales account for 30-50% of total stock sales. Following the large extent of selling during 2006 and part of 2007, insiders may not have had any options to exercise. Moreover, due to the slump in high-exposure banks' stock prices, a large part of their remaining option packages may have been underwater, as executive stock options are

customarily granted at the money (Brenner et al. (2000)). Table 12 also shows that the value of stock sales related to option exercises, relative to all stock sales, dropped dramatically for the high-exposure group in 2008-2009. This provides backing for the conjecture that part of the reduction in the value of net sales is due to option packages that were out of the money as a result of continued negative returns.

Second, the effect may also be driven by insiders joining the firm. Firstly, they may have no inside information on the bank, or have less than incumbents. Secondly, they may be required by their employment contract, or company policies to purchase a certain amount of company stock (Core and Larcker (2002)). If newly hired executives were purchasing more stock than in previous years, then the increased purchase component would also drive up the net value sold (or purchased) in the open market. I investigate this conjecture in two ways.

– *Insert Table 13 here* –

First, I examine what fraction newly joined insiders accounted for in the total dollar value of stock purchases each year. I calculate this percentage by summing the value of stock purchases by insiders joining the bank for all banks in a performance group, in a given year. Next, I divide it by the total value of stock purchases by all insiders. This measure is thus available at the performance group-year level. I repeat the same calculation for sales transactions, to obtain additional insight into the transactions placed by joining insiders. The results, shown in Table 13 indicate that in most of the years after 2000, joining insiders usually account for no more than 5% of all sales, and no more than 15% of all purchases. These figures are plausible as these insiders have very little stock to sell, and may be required to obtain a stock exposure in the bank. The fractions exhibited in Table 13 also show that neither the fraction of purchases by joining insiders, nor that of sales by joining insiders is consistently higher in either of the performance groups prior to the crisis. However, during 2008 and 2009, the fraction of purchases by joining insiders in the bottom group is remarkably higher compared to historic values of both the bottom and the top groups. The fraction of sales shows no similar change during the crisis. Thus, Table 13 confirms the second reason underlying the insider trading patterns in the bottom group during 2008-2009: insiders of high-risk banks purchased more stock.

Second, I regress the net value of open market sales placed by newly joined insiders on the bank-specific control variables of the baseline regression. For these regressions, only trades of newly joined insiders are considered in each of the bank-years, to ensure comparability. Compensation variables are not included in the regression, because these insiders received no compensation during the previous year. The results show that in 2008, insiders joining high-risk



banks purchased (sold) a significantly higher (lower) amount of shares than insiders joining low-risk banks. Adding bank fixed effects does not alter this finding. These results substantiate the argument that insiders joining high-risk banks purchased more stock during the crisis, contributing to the convergence in cumulative traded stock values between the high-risk and low-risk groups of banks.

#### 5.4. Insider trading duration

Part of the analysis presented so far stresses the differences between the value of stock traded by insiders of different banks. Although the explanatory power of my regressions of net open market trades is reasonably high, especially for models including bank FE, I now show that the differences in insider trading patterns remain even if I abstract completely from differences in traded values between banks, and focus solely on the time dimension. I construct a measure to gauge more precisely the time elapsed between trades of insiders and adverse events in the economy. I apply a modified version of the Macaulay duration used in the analysis of bonds. Specifically, I define the bankruptcy of Bear Stearns on March 16, 2008 as a reference point, and measure the time elapsed between each trade and this event, weighted by the dollar value of the trade. For each bank, I define

$$D = \sum_{i=1}^n t_i \frac{PV_i}{V} \quad (4)$$

where  $t_i$  is the time span between trade and the reference point, measured in days,  $PV_i$  is the value of the transaction, corrected by the appropriate discount factor, and  $V = \sum_{i=1}^n PV_i$  is the total discounted value of all transactions occurring during the measurement period.<sup>17</sup> To dispense with the difficulty of averaging both positive (purchases) and negative (sales) transaction values, I restrict the analysis to open market sales occurring after May 1, 2006.

Because  $D$  is a measure of time and is normalized by the total transaction value  $V$ , it is completely insensitive to differences in total traded values between banks, and focuses instead on how the “unit” of total value was traded over time. In the regressions presented in Tables 4, 11 and 12, the relation between bank size and the value of stock sold in the open market is parametric. Therefore, analyzing insider trading duration serves as a robustness test to accompany the

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<sup>17</sup> To simplify calculations I use a constant discount rate of 4.37%, which is the average yield on the one-month treasury bill during this period.

regressions. Specifically, this analysis relaxes the assumption that the value of insider sales is linearly related to the log of total assets. I convert the information embedded in the dynamics of trading into a single measure that is independent of bank size. The measure is higher if insiders sell stock predominantly around the time the housing prices decrease, and lower if they sell later, during 2007 or the first months of 2008.

– *Insert Table 14 here* –

Table 14 shows duration values for open market sales in each of the three performance groups of the baseline analysis. Banks in the bottom group that were delisted during the return measurement period (July 2007-December 2008) are excluded from the duration calculations, because their duration values are, by construction, higher than those of other banks. The mean and all three quartiles are highest for banks that performed worst during the crisis. Their selling activities, on average, occurred earliest and therefore the longest before the bankruptcy of Bear Stearns. When comparing the difference between the top and the bottom groups by means of a t-test, the null hypothesis of equality of the two duration values can be rejected at the 5% level. The non-parametric Mann-Whitney-Wilcoxon test also rejects the equality, albeit at the 10% level. I conclude that stock sales were concentrated more towards the beginning of the interval between May 2006 and March 2008 for insiders of high-exposure banks. Coupled with the results of the graphs and the regressions, this means that insiders of high-exposure banks sold not only more stock during 2006, but they were also quicker to decrease their exposures after housing prices began to decrease.

### *5.5. Returns to portfolio strategies based on insider trading information*

Considering the results of the previous sections, a further question that arises is whether insider trading up to and including 2006 was an economically meaningful source of information for subsequent stock investments. I explore the profitability of an investment strategy that relies on insider trading information using a two-step method. In the first step, I estimate residuals from a regression model of insider trading on control variables capturing trading motives other than private information. In the second step I use the residuals, which I call abnormal insider trading (AIT), to construct portfolios of bank stocks. The first step obtains estimates of AIT by regressing the total value of net open market purchases on the control variables detailed in Section II. AIT is defined as the residual,  $\varepsilon_{i,t}$  in each of the three the regressions

$$\text{Itr}_{i,t} = \alpha + \varphi' \mathbf{Comp}_{i,t} + \gamma' \mathbf{Control}_{i,t} + \varepsilon_{i,t} \quad (5)$$

To guard against look-ahead bias, I omit data from the years after 2006 when estimating these models. Furthermore to ensure that the results are not sensitive to the specification used, I estimate two additional models: a regression with bank FE and one with year FE.

I then use information on 2006 AIT to sort banks into portfolios. I employ two sorting methods: the first considers the 2006 AIT from all three regressions, and places banks in the positive (negative) AIT portfolio if their estimate 2006 AIT is positive (negative) in all three regression models (OLS, bank FE and year FE). While this method is intuitive and translates the information embedded in the 2006 AIT directly (i.e. it purchases stocks that insiders appear to have bought more heavily, and sells stocks that insiders appear to have sold more heavily), it results in portfolios containing unequal numbers of banks. To obtain portfolios with equal numbers of banks, the second method creates a ranking of banks based on their 2006 AIT values, separately for each three regression models. Next, it sorts banks into quintile portfolios based on their average ranks. Finally, I examine the value-weighted returns to investing in each of these seven portfolios (positive AIT, negative AIT, and 5 quintile portfolios), as well as two long-short portfolios, (*positive AIT – negative AIT*), and (*quintile 5 – quintile 1*). To control for the riskiness of these investment strategies I also calculate CAPM alphas, and alphas from three-factor and four-factor models. The returns to and the alphas on these investment strategies are evaluated during the two periods used earlier in the paper, July 2007 – December 2008, and January 2008 – December 2008. Table 15 exhibits the annualized returns and alphas.

– Insert Table 15 here –

The estimates show that a portfolio constructed on the basis of 2006 abnormal insider trading information yielded an annualized return of 33.65–34.66% during July 2007 – December 2008. Despite using two qualitatively different methods, the returns on the constructed long-short portfolios are remarkably similar. Moreover, the performance of the portfolios does not sink much after adjusting for risk factors: alphas are approximately 30%. The annualized performance is considerably higher during January 2008–December 2008: it is estimated between 51.61 and 53.89%. Annualized alphas are around 50%, and again, the two long-short portfolios produce very similar performance. Regarding the economic interpretation of the results, on the one hand, most of the reported results lack statistical significance, with t-statistics of 1.3–1.6. On the other hand, both returns and alphas increase gradually from the first quintile to the fifth, (although returns in the third

quintile are somewhat higher), suggesting that abnormal insider trading in 2006 did contain information about future stock returns.<sup>18</sup>

## 6. Discussion and limitations

The empirical analysis of the paper relies on the assumption that the variables driving high-exposure banks' risk-taking before 2006 do not also drive bank executives' insider sales in 2006. The evidence suggests that bankers' trades during 2006 were driven by their information regarding the risk exposures they had built up. However, the same unobserved variable that was driving risk-taking before 2006 might also drive, directly or indirectly, the additional insider selling in 2006 and later. Despite using several controls in the regression analysis that have been shown to impact insider trading activity, there may be a factor that the analysis does not incorporate correctly.

My paper suggests that insiders of high-exposure banks increased their stock sales as housing prices started decreasing. Did outsiders understand the significance of the mid-2006 housing price declines for the fate of the banks? First, Figures 3 and 4 suggest that bank stock prices did not exhibit a marked and lasting reaction to housing prices. Therefore, stock market investors did not appear worried about the effects of the housing market on banks' prospects. Second, as pointed out by Gorton (2009), the ABX.HE index (an index of subprime residential mortgage-backed securities) dropped steeply only in the first part of 2007. Thus, institutional investors' views on the value of subprime mortgages did not alter dramatically during 2006, implying that not even institutions possessed completely accurate and up-to-date information on banks' exposures. Third, the complexity of mortgage-backed securities rendered it easy for most entities to conceal their exposures by opaque reporting (Gorton (2009)).

A further caveat to the interpretation of the results is that insiders may hedge their stock exposures (Bettis, Bizjak and Lemmon (2001), Jagolinzer, Matsunaga and Yeung (2007), Gao (2009), and Bettis, Bizjak and Kalpathy (2011)). However, Fahlenbrach and Stulz (2011) report that they find no disclosures of such transactions for the sample banks. It is nonetheless possible that bankers traded (derivatives on) instruments other than their bank's stock to reduce the impact of their equity exposures. They could have taken positions, possibly through intermediaries, in the

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<sup>18</sup> As in section II, I assume that the delisting returns on the stocks are 0, which should lead me to understate the returns on the long-short portfolio, because the first quintile portfolio and the negative AIT portfolio contain most of the delisted banks.

CDS market (Acharya and Johnson (2007)), or placed transactions in their competitors' stocks (Tookes (2008)). If any of these forms of hedging were pervasive among the examined banks, it is intuitive that insiders of high-risk banks should make more use of such instruments. Therefore, any result I found on their insider trading would be attenuated, compared to a setting without hedging. Insofar as the entire portfolio of bank insiders cannot be observed, it is difficult to verify whether they had direct or indirect positions in competitors' stocks, or CDSs.

Finally, it is possible that although bankers understood the risks embedded in their banks' portfolios before 2006, they also anticipated that their informational advantage would allow them sufficient time to decrease their stock holdings before stock prices slumped. The literature on sophisticated investors riding bubbles (Abreu and Brunnermeier (2002, 2003), Brunnermeier and Nagel (2004)) motivates this basic idea. However, Brunnermeier and Nagel (2004) also indicate that hedge funds were able to outperform the market by timing investments in technology stocks with quarterly accuracy. If bank insiders were riding a bubble, it remains unclear why they started selling large amounts of equity 12 months prior to the fall of their banks' stock prices.

## 7. Conclusion

This paper provides evidence that insiders of banks that had the highest risk exposure going into the crisis sold significantly more stock in 2006, before the crisis hit. Specifically, I show that insiders of high-exposure banks were 12% more likely to decrease their ownership, and sold 30% more stock in the open market during 2006, than insiders of low-exposure banks. Changes in insider trading behavior were stronger for chief executive officers: the likelihood of reducing their ownership increased by 40% relative to the mean. Moreover, the amount of stock CEOs sold as a fraction of their total stock ownership increased by 200%. These results are not explained by contrarian trading, portfolio rebalancing following price increases, differences in the compensation structures of the banks, riskiness of the bank's stock, time-invariant bank heterogeneity, or differences in executive turnover.

The paper is the first to document that developments in the housing market had a close temporal correlation with the trading decisions of bank insiders. My results show that sales by insiders in banks with high subprime exposures accelerated in the 2<sup>nd</sup> quarter of 2006, when housing prices at the national level registered their first decline since 2000. The economic effects are sizeable, as bankers increase their sales by 30-45% during each of the first three quarters of

housing price declines. The results of the paper also have implications for investments. A simple portfolio strategy based on insider trading information up to 2006 earns an annualized, risk-adjusted return of 30-50% during the crisis.

The empirical evidence suggests that the complexity of mortgage-backed securities created an informational asymmetry that insiders used to their advantage. The results are difficult to reconcile with the view that bank insiders continued to believe the investments they made prior to the crisis would pay off after housing prices started to fall in 2006. However, there is no evidence of increased selling activity before the housing market weakened, in 2004-2005. This result suggests that bank insiders' foresight regarding the consequences of their policies was limited. Notwithstanding, they had more than 12 months to reduce their equity positions before the market gradually learned about the subprime risk exposures of their banks' portfolios. I conclude that bank insiders regarded investments in mortgage-backed securities profitable given the housing price growth, but revised their valuations of these investments following the reversal in housing prices.

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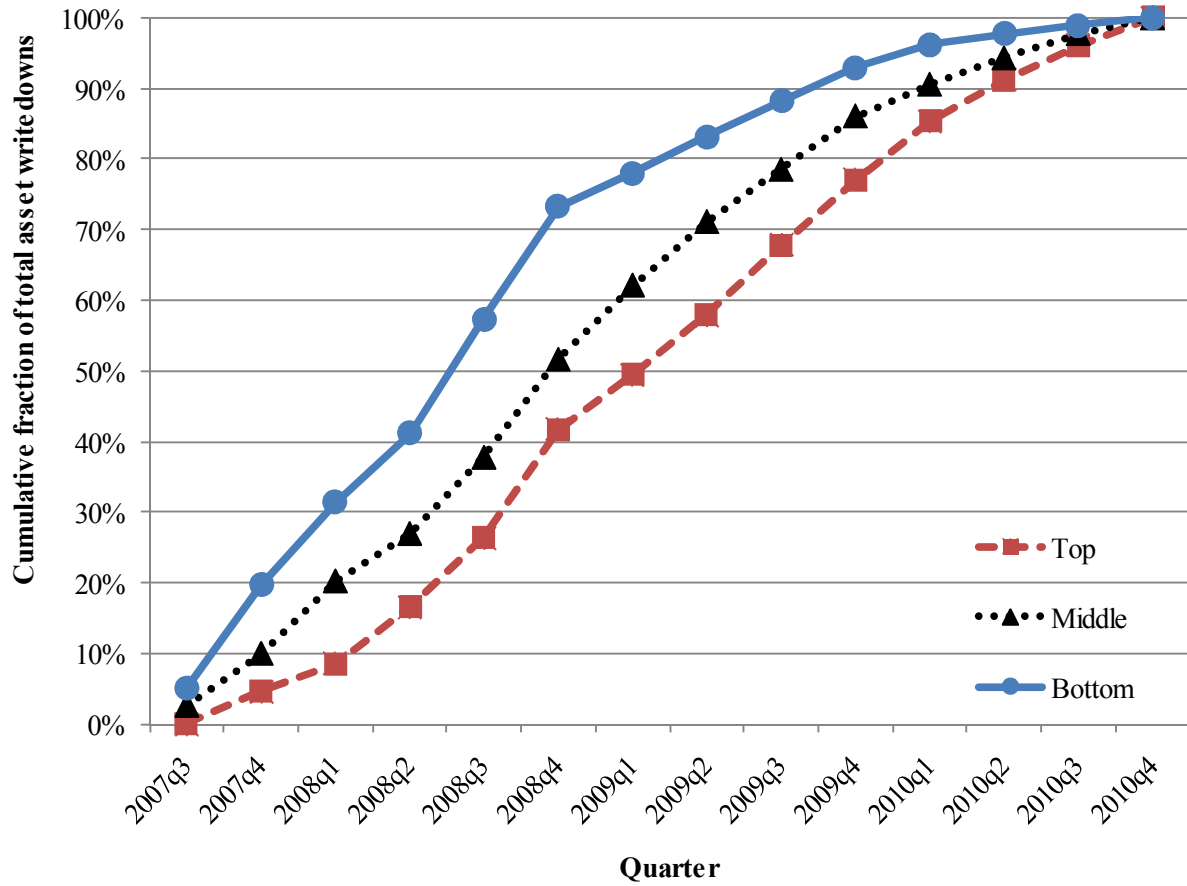
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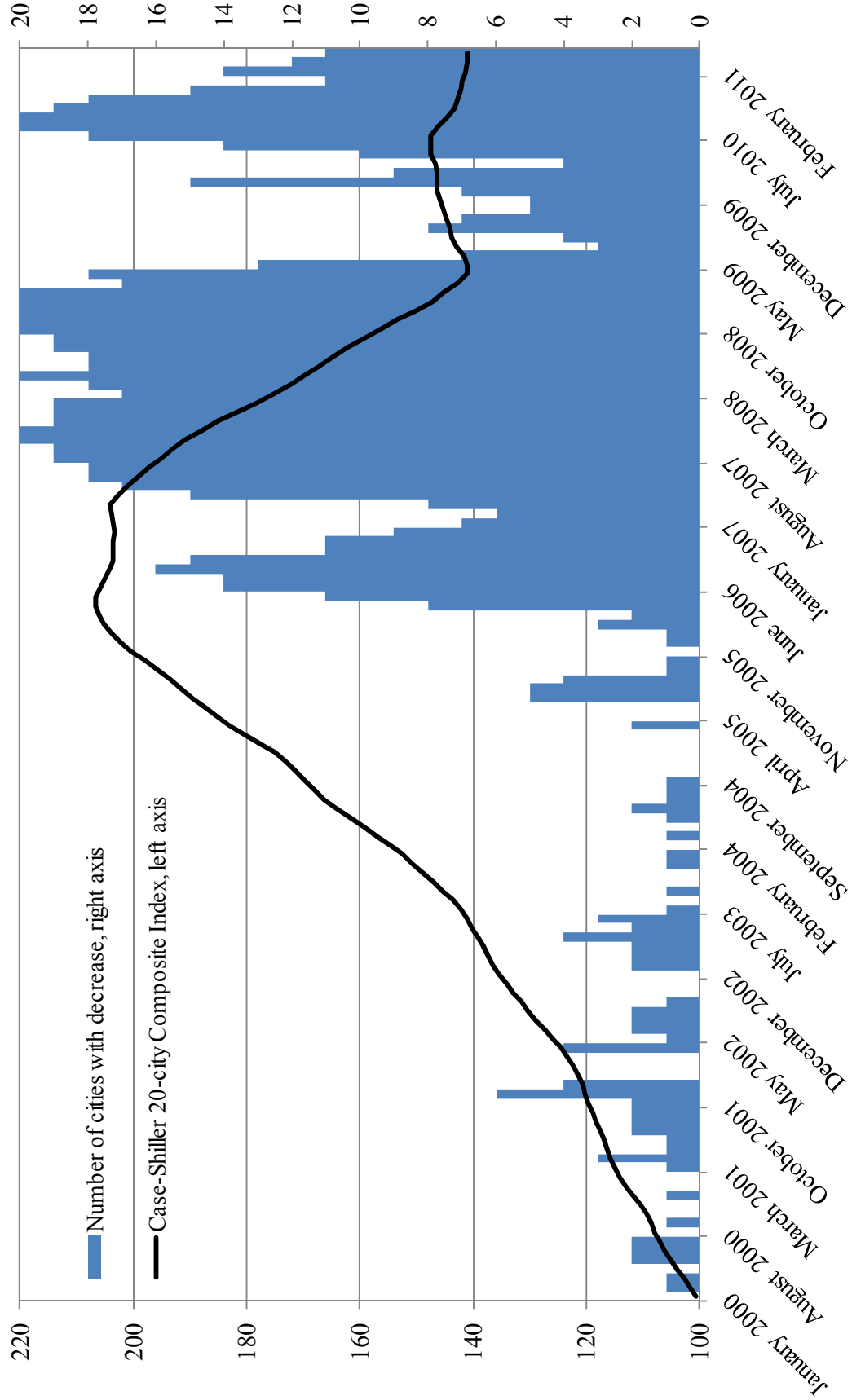
**Figure 1: Asset write-down dynamics across performance groups**

The data are from Bloomberg. The graphs show the cumulative percentage of total write-downs that occurred until the quarter on the vertical axis.



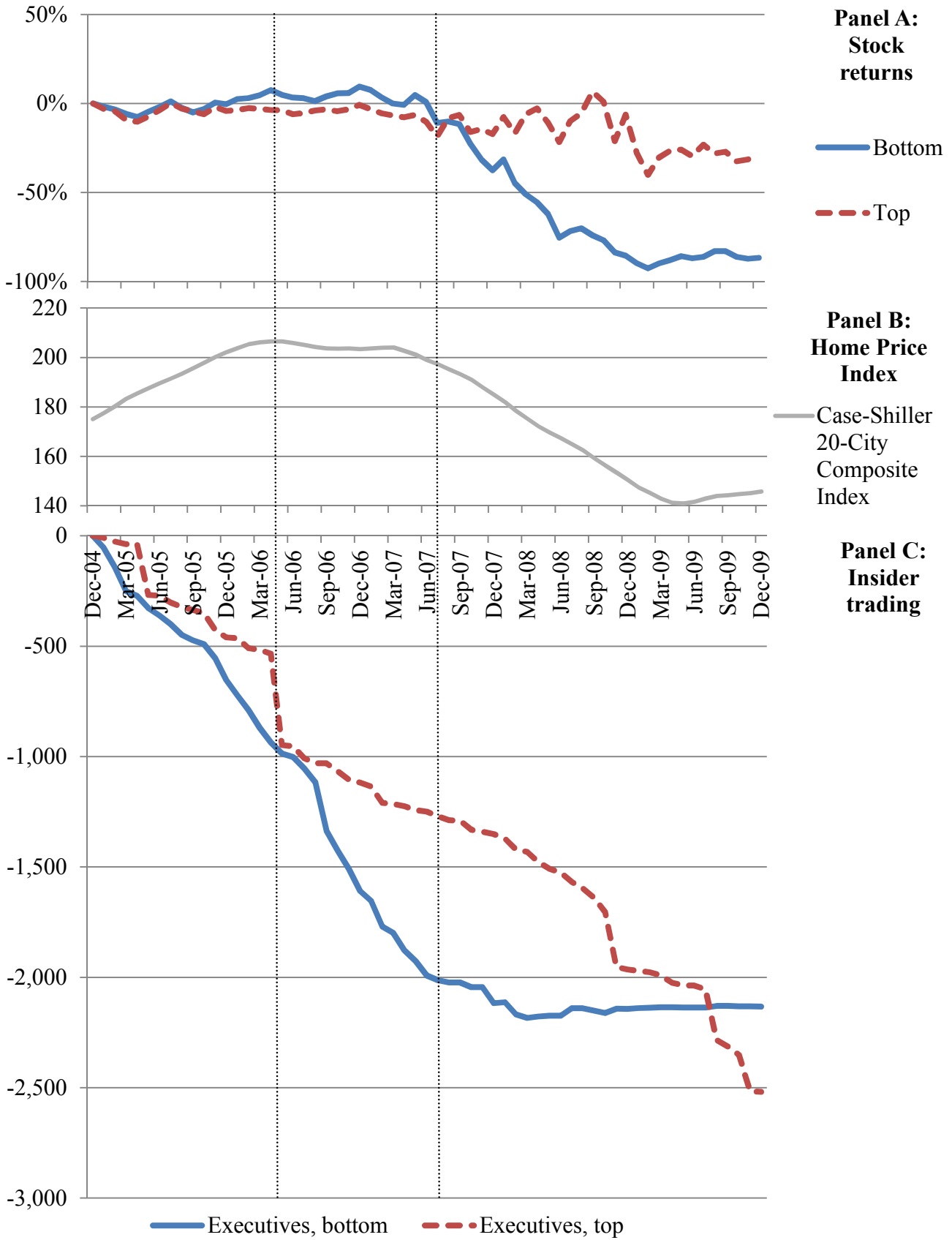
**Figure 2: Housing price dynamics from 2000: aggregate trend and geographic variation**

Data are from the Case-Shiller seasonally adjusted housing price indices. The solid line, scaled on the left vertical axis, shows the Case-Shiller 20-city Composite Index. The bar chart, scaled on the right vertical axis, represents the number of cities, out of the 20 index constituents, in which housing prices decreased.



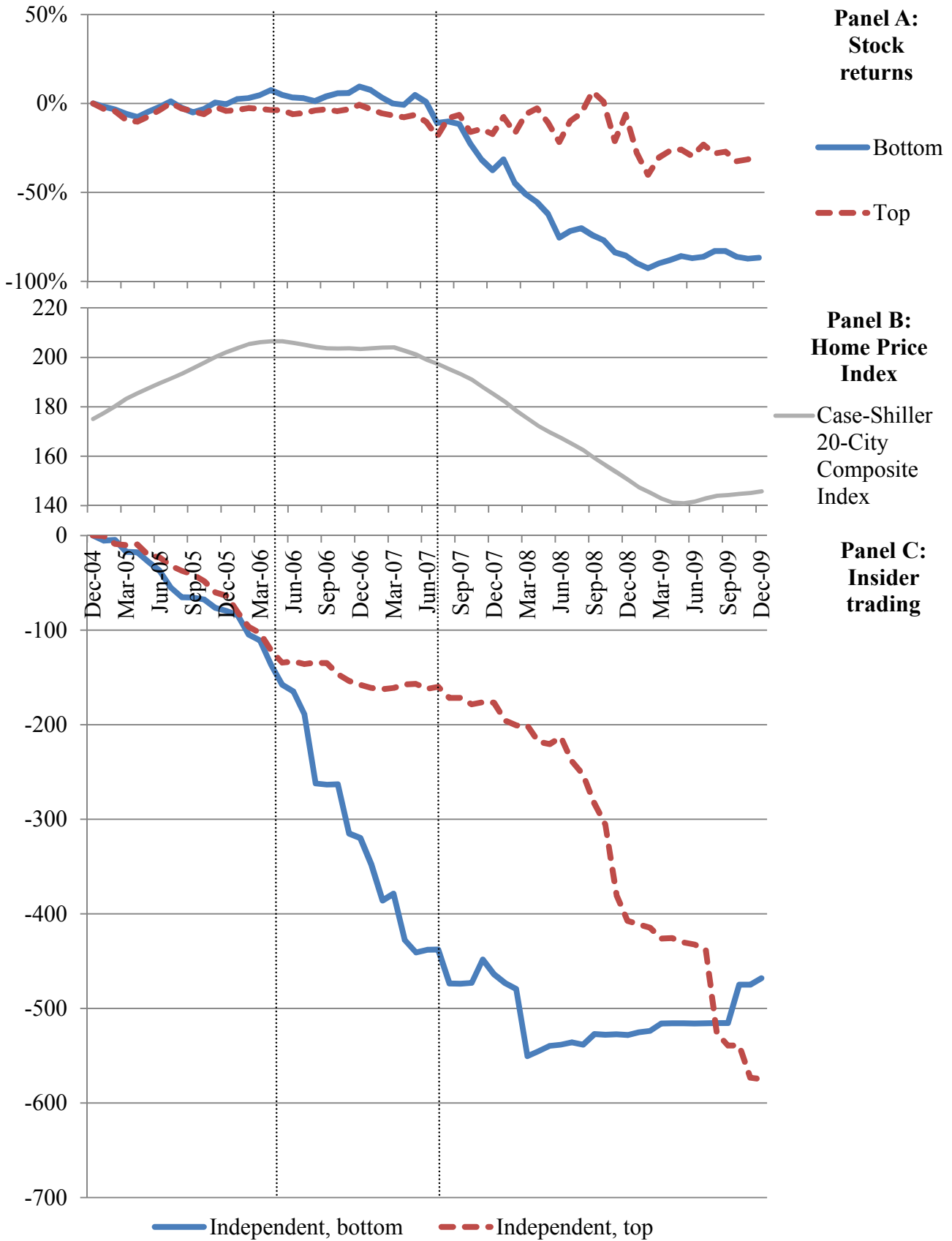
**Figure 3: Housing prices, stock returns, and insider trading – executive officers**

*Panel A* shows equally-weighted, cumulative stock returns for the bottom and the top performance groups, calculated using data from CRSP. The base date is January 1, 2005. *Panel B* graphs the Case-Shiller 20-City Composite Index of housing prices. *Panel C* plots the cumulative net open market value of insider trading by executive officers, retrieved from Thomson Reuters. The series for the executives of the top performance group is scaled up by 2.5, the ratio of total executive compensation between the two groups in 2006, to account for the difference in bank size.



**Figure 4: Housing prices, stock returns, and insider trading – independent directors**

*Panel A* shows equally-weighted, cumulative stock returns for the bottom and the top performance groups, calculated using data from CRSP. The base date is January 1, 2005. *Panel B* graphs the Case-Shiller 20-City Composite Index of housing prices. *Panel C* plots the cumulative net open market value of insider trading by independent directors, retrieved from Thomson Reuters.



**Table 1. Sample descriptives**

Insider trading data are from Thomson Reuters and span 1996-2009. Accounting data are collected from Compustat, and information on executive compensation from ExecuComp. Stock returns are taken from CRSP. Asset write-down data are recovered from Bloomberg. Banks are assigned to terciles based on their excess returns (returns less the risk-free rate) estimated for the period July 2007-December 2008. Banks delisted during that period with CRSP delisting codes 200-290 (“mergers”) and 500-591 (“dropped”) are relegated to the bottom group. *Panel A* reports the number of observations, daily excess returns, alphas, and market betas from a CAPM, Fama-French three-factor model, and Carhart four-factor model. The market beta is the loading on the market factor in each of the asset pricing models, estimated on daily data. *Panel B* shows the dynamics of asset write-downs. *Panel C* contains information on insider trading over the sample period. Percentage increasing ownership is the percentage of insiders that increased their ownership in the bank. *Panel D* shows descriptive statistics for the variables used in the regression analysis. Traded stock values are winsorized at the 1% level. Accounting, and executive compensation data are lagged one year, therefore these data are for the fiscal years 1995-2008. Similarly, stock returns and volatility are calculated for the calendar years 1995-2008. Difference between the two groups is assessed using a t-test. “Different trend” tests if the independent variables had different time trends in the top and the bottom performance groups prior to the crisis. The column shows the significance of the slope coefficient  $\beta_2$  from the regression  $x_{i,t} = \alpha_1 + \alpha_2 Grp + \beta_1 t + \beta_2 tGrp$ , estimated using observations from the top and the bottom groups, with the omission of years 2008 and 2009. *Grp* is a binary variable equal to 1 if the observation is in the bottom group, whereas *t* is the time-series variable. \*\* and \*\*\* denote significance at the 5% and the 1% level.

**Panel A: characteristics of groups based on excess returns during July 2007 – December 2008**

	Performance group			Total	Average
	Top	Middle	Bottom		
Bank-years	173	398	395	966	
Banks	22	37	41	100	
Excess return	0.0006	-0.0009	-0.0036		-0.0017
CAPM alpha	0.0019	0.0007	-0.0023		-0.0002
Fama-French alpha	0.0020	0.0007	-0.0026		-0.0002
Carhart alpha	0.0022	0.0010	-0.0018		0.0002
CAPM beta	1.18	1.39	1.70		1.47
Fama-French market beta					
beta	1.06	1.12	1.55		1.26
Carhart market beta	0.98	0.96	1.26		1.08

**Table 1 – continued****Panel B: Asset write-downs across performance groups**

	Performance group		
	Top	Middle	Bottom
Total value of asset write-downs (billion USD)	56.0	163.5	523.4
fraction occurring in 2007	4.64%	9.91%	19.65%
fraction occurring in 2008	37.14%	41.71%	53.61%
fraction occurring in 2009	35.36%	34.50%	19.68%
fraction occurring in 2010	23.04%	13.48%	6.44%
Average ratio of write-downs to total assets	0.21%	1.55%	1.33%
Number of banks with asset write-downs	1	11	13

**Panel C: Average transaction values and the percentage of insiders increasing their ownership across performance groups**

Year	Top group				Bottom group			
	Value of purchases	Value of sales	Net value	Percentage increasing ownership	Value of purchases	Value of sales	Net value	Percentage increasing ownership
1996	233,207	-3,782,575	-3,549,368	58.26%	463,535	-7,375,362	-6,911,827	54.91%
1997	1,228,701	-4,539,977	-3,311,276	50.60%	1,575,632	-15,800,000	-14,224,368	24.23%
1998	275,786	-6,567,943	-6,292,157	50.83%	891,971	-24,000,000	-23,108,029	46.28%
1999	1,243,064	-11,800,000	-10,556,936	43.02%	6,327,148	-26,900,000	-20,572,852	41.90%
2000	2,625,531	-13,300,000	-10,674,469	40.34%	1,124,246	-19,400,000	-18,275,754	37.18%
2001	1,706,912	-13,300,000	-11,593,088	35.70%	568,582	-28,400,000	-27,831,418	22.61%
2002	611,120	-9,790,518	-9,179,398	32.41%	512,129	-12,400,000	-11,887,871	26.68%
2003	454,869	-6,795,573	-6,340,704	33.12%	442,680	-17,400,000	-16,957,320	28.32%
2004	252,152	-10,800,000	-10,547,848	28.87%	811,133	-23,800,000	-22,988,868	28.82%
2005	496,170	-5,121,430	-4,625,260	38.29%	611,421	-18,500,000	-17,888,579	33.98%
2006	316,819	-7,562,016	-7,245,197	36.72%	610,773	-47,000,000	-46,389,227	25.57%
2007	1,284,887	-6,159,704	-4,874,817	50.52%	2,077,753	-19,600,000	-17,522,247	36.03%
2008	1,273,509	-13,900,000	-12,626,491	40.02%	3,854,335	-7,027,131	-3,172,796	37.99%
2009	3,128,726	-4,140,296	-1,011,570	42.25%	4,647,014	-79,086	4,567,928	53.29%



Table 1 – continued

Panel D: Descriptive statistics for variables used in the baseline regressions

Dependent variable	Top group			Bottom group			t-test difference	t-test different trend
	Mean	Std. Dev.	Median	Mean	Std. Dev.	Median		
% increasing ownership	39.65	27.53	35.29	33.76	25.12	29.69	2.50**	0.19
net purchases (mUSD) - winsorized	-7.50	14.00	-3.05	-16.82	37.69	-2.76	4.29***	-0.98
CEO increasing ownership	33.95	47.50	0	27.93	44.92	0	1.40	0.41
net volume of CEO purchases scaled by CEO ownership (%) - winsorized	-4.55	19.07	0	-4.11	20.51	0	-0.23	-1.40
<b>Independent variable</b>								
log total assets	9.12	1.33	8.76	10.41	1.84	10.24	-9.39***	1.20
book-to-market	0.45	0.20	0.40	0.65	0.58	0.56	-6.19***	-0.53
stock return in year (t-1)	0.13	0.28	0.07	0.11	0.44	0.10	0.68	-0.12
stock return volatility in year (t-1)	0.0191	0.0089	0.0168	0.0219	0.0135	0.0186	-2.89***	-1.43
change in stock return volatility from year (t-2) to year (t-1)	0.0020	0.0083	0.0000	0.0024	0.0123	-0.0004	-0.47	-1.61
total compensation (thousand USD)	1,853	2,631	924	5,121	8,654	1,706	-6.82***	0.17
year-on-year change in total compensation (%)	50.90	128.02	23.53	59.68	138.17	31.23	-0.71	-0.99
stock-based compensation (%)	31.34	20.31	30.02	36.54	20.20	36.69	-2.82***	-0.47
average stock-based compensation during the past three years (thousand USD)	678	1,100	279	2,346	4,098	684	-7.50***	-0.47
total executive ownership (%)	2.33	2.55	1.38	3.01	5.94	0.59	-1.91*	-0.02
intrinsic value of unexercised, exercisable options (thousand USD)	3,454	5,094	1,420	6,502	11,709	1,816	-4.32***	1.19
intrinsic value of unexercised, unexercisable options (thousand USD)	1,027	1,936	321	2,128	5,044	331	-3.75***	-0.50

**Table 2: Stock-based compensation across performance groups over time**

The data are from ExecuComp. Banks are assigned to terciles based on their excess returns estimated for July 2007-December 2008. Banks delisted during that period with CRSP delisting codes 200-290 (“mergers”) and 500-591 (“dropped”) are relegated to the bottom group. Percentages are calculated by adding the value of restricted stock and option grants, and dividing by total compensation, and taking bank-year averages. Data are then winsorized at the 1%. The t-statistic tests whether the percentage of stock-based compensation is different in the top and bottom group.

Fiscal year	Average stock-based to total compensation by performance group			t-statistic difference (bottom-top)
	Top	Middle	Bottom	
1995	20.71%	16.20%	27.77%	0.86
1996	24.71%	23.97%	35.32%	1.41
1997	27.83%	30.75%	42.68%	1.72*
1998	35.00%	32.47%	41.78%	0.89
1999	41.24%	36.28%	41.27%	0.00
2000	38.48%	36.89%	34.81%	-0.43
2001	31.78%	34.34%	41.72%	1.23
2002	24.30%	35.10%	38.80%	2.01**
2003	30.30%	31.51%	35.74%	0.91
2004	30.52%	28.90%	32.87%	0.45
2005	24.52%	28.78%	31.88%	1.58
2006	31.98%	32.13%	31.10%	-0.19
2007	29.79%	36.57%	37.92%	1.56
2008	39.29%	38.56%	34.97%	-0.55

**Table 3. Performance during the financial crisis and ownership increases**

The data span the period 1996-2009. Banks are assigned to terciles based on their excess returns estimated for the period July 2007-December 2008 for columns 1-3, and 2008 for columns 4-6. Banks delisted during that period with CRSP delisting codes 200-290 (“mergers”) and 500-591 (“dropped”) are relegated to the bottom group. The dependent variable is the ratio of insiders who increased their ownership of the bank’s stock. *Bottom performance group* is an indicator variable equaling 1 if the bank is in the bottom performance group. *Middle performance group* is an indicator variable equaling 1 if the bank is in the middle performance group. The base category is if the bank is in the top group based on its crisis performance. *Yr06* and *Yr07* are indicator variables equal to 1 if the bank-year observation is from 2006 and 2007, respectively. *Size* is the natural logarithm of total assets, *B/M* is the book to market ratio. *Past year return* is the return measured over the past calendar year. *Past year return volatility* is the realized volatility of the stock return measured over the past calendar year. *Change in return volatility* is the difference between stock return volatility between the past calendar year and the calendar year before. *Total compensation* is the bank-year average of the total compensation of all executives for whom data are available in ExecuComp. *% growth in total compensation* is the bank-year average year-on-year growth in total compensation. *% stock-based compensation* is the average ratio of the value of restricted stock grants and option grants divided by total executive compensation. *Past three-year stock-based compensation* is the average value of restricted stock grants and option grants received over the past three years. *% executive ownership* is the fraction of the company’s shares owned by executives. *Value of unexercisable options* is the bank-year average of the intrinsic value of unexercised, exercisable stock options held by executives. *Value of unexercisable options* is the bank-year average of the intrinsic value of unexercised, unexercisable stock options held by executives. Compensation data are measured in million USD. Coefficient estimates are multiplied by 100 for convenience. T-statistics, based on heteroskedasticity-robust standard errors clustered at the year level, are reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10% level.

	Dependent variable: % of insiders increasing ownership					
	OLS	OLS	OLS	Tobit	OLS	Tobit
Bottom performance group	-0.42 (-0.192)	-1.11 (-0.612)	-1.17 (-0.584)	-0.33 (-0.143)	-2.03 (-1.258)	-1.27 (-0.610)
Middle performance group	6.37** (2.816)	5.53** (2.714)	5.44** (2.992)	6.37*** (2.618)	4.32** (2.506)	5.29*** (2.850)
Yr06	-7.99*** (-4.197)	-7.50*** (-3.087)		-0.10*** (-4.805)		
Bottom performance group × yr06	-4.11** (-2.432)	-4.34** (-2.203)	-3.57** (-2.479)	-2.64 (-1.531)		
Middle performance group × yr06	1.48 (0.721)	3.27 (1.458)	2.15 (1.203)	3.00 (1.397)		
Yr07			11.57*** (4.737)		13.91*** (6.024)	0.12*** (4.901)
Bottom performance group × yr07			-13.45*** (-6.746)		-13.75*** (-5.191)	-15.01*** (-7.789)
Middle performance group × yr07			-4.14* (-1.866)		-7.42** (-2.795)	-1.69 (-0.869)
						-13.60*** (-4.488)
						-7.37*** (-2.706)

Table 3 - continued

Size	-2.64*** (-3.380)	-5.04* (-1.986)	-2.50*** (-3.392)	-2.69*** (-3.130)	-5.25 (-1.525)	-2.45*** (-3.188)	-6.23** (-2.342)	-2.48*** (-3.592)	-2.46*** (-2.971)	-6.60** (-2.048)
B/M	2.51 (1.276)	6.48 (1.588)	1.05 (0.534)	2.76 (0.780)	7.01 (0.788)	2.31 (0.983)	6.43 (1.467)	1.06 (0.468)	2.60 (1.115)	7.09 (0.803)
Past year return	-4.56 (-0.987)	-1.82 (-0.455)	-11.38*** (-3.175)	-4.98 (-0.931)	-2.57 (-0.459)	-2.71 (-0.516)	-0.92 (-0.220)	-11.07** (-3.009)	-2.97 (-0.521)	-1.39 (-0.238)
Past year return volatility	-406.21*** (-3.148)	-568.36*** (-3.315)	12.73 (0.0993)	-465.71*** (-2.771)	-645.34*** (-2.763)	-217.59 (-1.259)	-403.91* (-1.794)	52.28 (0.413)	-269.02 (-1.412)	-438.59 (-1.556)
Change in return volatility	426.40** (2.837)	538.53*** (3.761)	-228.23 (-1.354)	473.966** (2.385)	619.49*** (3.073)	305.44 (1.759)	447.44** (2.529)	-279.49 (-1.688)	348.313* (1.786)	498.37** (2.277)
Total compensation	-0.202 (-1.106)	-0.179 (-1.147)	-0.233 (-1.285)	-0.266 (-1.281)	-0.21 (-0.947)	-0.214 (-1.089)	-0.191 (-1.183)	-0.190 (-1.012)	-0.276 (-1.266)	-0.22 (-1.113)
% growth in total compensation	-0.004 (-0.774)	-0.005 (-1.091)	-0.004 (-1.015)	-0.004 (-0.746)	-0.004 (-0.805)	-0.004 (-0.853)	-0.004 (-0.837)	-0.005 (-1.409)	-0.004 (-0.852)	-0.003 (-0.560)
% stock-based compensation	-0.129** (-2.624)	0.016 (0.304)	-0.132*** (-3.236)	-0.133*** (-2.782)	0.026 (0.486)	-0.126** (-2.540)	0.024 (0.455)	-0.143*** (-3.657)	-0.130** (-2.530)	0.036 (0.638)
Past three-year stock-based compensation	-0.091 (-0.216)	-0.382 (-0.974)	-0.133 (-0.302)	-0.15 (-0.316)	-0.423 (-0.861)	-0.052 (-0.146)	-0.389 (-1.011)	-0.048 (-0.129)	-0.12 (-0.320)	-0.469 (-0.978)
% executive ownership	0.04 (0.247)	-0.39 (-1.257)	0.01 (0.0546)	0.024 (0.152)	-0.363 (-0.884)	0.03 (0.165)	-0.48 (-1.490)	0.04 (0.239)	0.014 (0.0732)	-0.450 (-1.165)
Value of exercisable options	-0.158** (-2.549)	0.016 (0.144)	-0.150** (-2.729)	-0.204*** (-3.005)	-0.00 (-0.00462)	-0.199*** (-3.283)	-0.013 (-0.126)	-0.157*** (-3.127)	-0.243*** (-4.065)	-0.04 (-0.321)
Value of unexercisable options	0.431** (2.954)	0.029 (0.125)	0.526*** (3.759)	0.598*** (3.610)	0.053 (0.198)	0.421** (2.621)	0.075 (0.305)	0.468*** (3.335)	0.590*** (3.437)	0.109 (0.398)
Constant	75.76*** (10.37)	98.95*** (3.589)	68.71*** (9.586)	0.772*** (8.652)		69.62*** (7.421)	106.32*** (3.818)	69.24*** (9.060)	0.705*** (6.976)	
Bank FE		Yes			Yes		Yes			Yes
Year FE			Yes					Yes		
Observations	966	966	966	966	966	966	966	966	966	966
Adjusted R <sup>2</sup>	11.2%	42.6%	15.3%	10.4%	42.3%	15.3%	15.3%	15.3%		

**Table 4. Performance during the financial crisis and dollar value of open market trading**

The data span the period 1996-2009. Banks are assigned to terciles based on their excess returns estimated for the period July 2007-December 2008 for columns 1-3, and 2008 for columns 4-6. Banks delisted during that period with CRSP delisting codes 200-290 (“mergers”) and 500-591 (“dropped”) are relegated to the bottom group. The dependent variable is the dollar value of net open market purchases by insiders, winsorized at the 1% level, measured in millions of US dollars. *Bottom performance group* is an indicator variable equaling 1 if the bank is in the bottom performance group. *Middle performance group* is an indicator variable equaling 1 if the bank is in the middle performance group. The base category is if the bank is in the top group based on its crisis performance. *Yr06* and *Yr07* are indicator variables equal to 1 if the bank-year observation is from 2006 and 2007, respectively. *Size* is the natural logarithm of total assets, *B/M* is the book to market ratio. *Past year return* is the return measured over the past calendar year. *Past year return volatility* is the realized volatility of the stock return measured over the past calendar year. *Change in return volatility* is the difference between stock return volatility between the past calendar year and the calendar year before. *Total compensation* is the bank-year average of the total compensation of all executives for whom data are available in ExecuComp. *% growth in total compensation* is the bank-year average year-on-year growth in total compensation. *% stock-based compensation* is the average ratio of the value of restricted stock grants and option grants divided by total executive compensation. *Past three-year stock-based compensation* is the average value of restricted stock grants and option grants received over the past three years. *% executive ownership* is the fraction of the company’s shares owned by executives. *Value of exercisable options* is the bank-year average of the intrinsic value of unexercised, exercisable stock options held by executives. *Value of unexercisable options* is the bank-year average of the intrinsic value of unexercised, unexercisable stock options held by executives. Compensation data are measured in million USD. Coefficient estimates are multiplied by 100 for convenience. T-statistics, based on heteroskedasticity-robust standard errors clustered at the year level, are reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10% level.

	<b>Dependent variable: value of net open market purchases, million USD</b>					
Bottom performance group	-0.47		-1.12	-2.81*		-3.19*
	(-0.355)		(-0.821)	(-1.814)		(-1.876)
Middle performance group	0.60		0.44	-0.33		-0.44
	(0.432)		(0.304)	(-0.406)		(-0.494)
Yr06	-3.49***	-4.64***				
	(-3.064)	(-6.441)				
Bottom performance group × yr06	-5.76***	-6.98***	-4.79**			
	(-3.492)	(-4.876)	(-2.693)			
Middle performance group × yr06	-1.14	-1.14	-0.97			
	(-0.693)	(-0.680)	(-0.588)			
Yr07				5.55***	5.83**	
				(4.661)	(2.853)	
Bottom performance group × yr07				3.77	1.73	4.32*
				(1.599)	(0.597)	(1.704)
Middle performance group × yr07				-4.64***	-6.19***	-4.32***
				(-4.454)	(-4.019)	(-3.607)
Size	-0.83	-0.50	-0.55	-0.62	-1.67	-0.50
	(-1.062)	(-0.270)	(-0.655)	(-0.828)	(-0.685)	(-0.584)
B/M	2.09	3.69	0.24	2.22	4.12	0.56
	(0.933)	(1.277)	(0.121)	(0.973)	(1.312)	(0.290)
Past year return	-4.36**	-3.23**	-3.40**	-3.07	-2.37	-3.21*
	(-2.839)	(-2.521)	(-2.172)	(-1.670)	(-1.612)	(-1.965)
Past year return volatility	-75.44	-251.47	306.34	81.86	-90.10	347.46
	(-0.546)	(-1.627)	(1.512)	(0.518)	(-0.461)	(1.636)
Change in return volatility	85.27	210.76	-35.36	-26.86	103.21	-76.75
	(0.774)	(1.335)	(-0.179)	(-0.214)	(0.605)	(-0.376)
Total compensation	-1.572***	-1.334***	-1.662***	-1.638***	-1.376***	-1.673***
	(-3.772)	(-3.121)	(-3.903)	(-3.860)	(-3.215)	(-3.948)
% growth in total compensation	0.001	-0.001	0.001	0.001	-0.000	0.001
	(0.153)	(-0.185)	(0.213)	(0.275)	(-0.0348)	(0.152)
% stock-based compensation	0.003	0.032	0.017	0.016	0.047	0.020
	(0.0834)	(1.071)	(0.491)	(0.414)	(1.348)	(0.568)
Past three-year stock-based compensation	0.452	0.722	0.394	0.457	0.718	0.433
	(0.514)	(0.839)	(0.452)	(0.521)	(0.836)	(0.496)
% executive ownership	-0.14	-0.19	-0.19	-0.17	-0.25	-0.19
	(-1.132)	(-0.818)	(-1.455)	(-1.405)	(-1.109)	(-1.481)
Value of exercisable options	-0.692***	-0.691***	-0.728***	-0.735***	-0.732***	-0.742***
	(-3.217)	(-3.093)	(-3.385)	(-3.492)	(-3.341)	(-3.495)
Value of unexercisable options	-0.909	-0.809	-0.845	-0.845	-0.754	-0.846
	(-1.651)	(-1.595)	(-1.532)	(-1.568)	(-1.474)	(-1.538)
Constant	7.50	4.52	-2.00	2.26	11.43	-2.66
	(1.046)	(0.263)	(-0.230)	(0.331)	(0.555)	(-0.294)
Bank FE		Yes			Yes	
Year FE			Yes			Yes
Observations	966	966	966	966	966	966
Adjusted R <sup>2</sup>	40.5%	50.6%	40.8%	40.4%	50.1%	41.0%

**Table 5. Performance during the financial crisis and ownership increases of executives**

The data span the period 1996-2009. Banks are assigned to terciles based on their excess returns estimated for the period July 2007-December 2008 for columns 1-5, and 2008 for columns 5-10. The dependent variable is the ratio of executives who increased their ownership of the bank's stock. *Bottom performance group* is an indicator variable equaling 1 if the bank is in the bottom performance group. *Middle performance group* is an indicator variable equaling 1 if the bank is in the middle performance group. The base category is if the bank is in the top group based on its crisis performance. *Yr06* and *Yr07* are indicator variables equal to 1 if the bank-year observation is from 2006 and 2007, respectively. All regressions control for size, B/M, past year return, past year return volatility, change in return volatility, total compensation, % growth in total compensation, the ratio of stock-based to total compensation, past three-year stock-based compensation, fraction of executive ownership, value of exercisable options, and value of unexercisable options. These variables are defined in Table 3. Coefficients of these control variables are not reported. Coefficient estimates are multiplied by 100 for convenience. T-statistics, based on heteroskedasticity-robust standard errors clustered at the year level, are reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10% level.

	Dependent variable: % of executive officers increasing ownership					
	OLS	OLS	OLS	Tobit	Tobit	Tobit
Bottom performance group	-0.39 (-0.148)	-2.04 (-0.941)	0.51 (0.182)	0.28 (0.0711)	-1.25 (-0.573)	1.09 (0.301)
Middle performance group	2.01 (0.869)	0.47 (0.219)	3.64 (1.320)	2.79 (0.864)	1.60 (0.619)	5.03 (1.554)
Yr06	-3.97 (-1.770)	-5.72* (-1.938)		-0.08** (-2.536)		
Bottom performance group × yr06	-10.85*** (-5.097)	-8.11*** (-3.706)		-9.67*** (-2.982)		
Middle performance group × yr06	-9.28*** (-4.255)	-4.72* (-1.981)		-9.79*** (-3.196)		
Yr07			9.00*** (4.143)			0.13*** (4.132)
Bottom performance group × yr07			-6.59** (-2.375)			-8.40** (-2.267)
Middle performance group × yr07			-8.77** (-2.634)			-12.04*** (-2.978)
Constant	74.57*** (7.941)	125.90*** (4.200)	12.61*** (5.561)	0.735*** (4.755)	68.93*** (9.292)	0.634*** (4.199)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE		Yes		Yes		Yes
Year FE						
Observations	962	962	962	962	962	962
Adjusted R <sup>2</sup>	10.6%	32.4%	9.4%	31.6%	15.9%	

**Table 6. Performance during the financial crisis and ownership increases of independent directors**

The data span the period 1996-2009. Banks are assigned to terciles based on their excess returns estimated for the period July 2007-December 2008 for columns 1-3, and 2008 for columns 4-6. Banks delisted during that period with CRSP delisting codes 200-290 ("mergers") and 500-591 ("dropped") are relegated to the bottom group. The dependent variable is the ratio of independent directors who increased their ownership of the bank's stock. *Bottom performance group* is an indicator variable equaling 1 if the bank is in the bottom performance group. *Middle performance group* is an indicator variable equaling 1 if the bank is in the middle performance group. The base category is if the bank is in the top group based on its crisis performance. *Yr06* and *Yr07* are indicator variables equal to 1 if the bank-year observation is from 2006 and 2007, respectively. All regressions control for size, B/M, past year return, past year return volatility, and change in return volatility. These variables are defined in Table 3. Coefficients of these control variables are not reported. Coefficient estimates are multiplied by 100 for convenience. T-statistics, based on heteroskedasticity-robust standard errors clustered at the year level, are reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10% level.

	Dependent variable: % of independent directors increasing ownership					
	OLS	OLS	OLS	Tobit	Tobit	Tobit
Bottom performance group	-1.00 (-0.378)	-0.51 (-0.207)	-2.57 (-0.964)	-2.32 (-1.041)	-3.52 (-1.103)	-3.52 (-1.103)
Middle performance group	8.68** (2.910)	8.78*** (3.135)	5.04 (1.436)	5.23 (1.580)	5.14 (1.317)	5.14 (1.317)
Yr06	-6.89** (-2.499)	-5.87** (-2.529)	-0.08** (-2.293)	-0.07** (-2.266)		
Bottom performance group × yr06	-0.09 (-0.0358)	-4.17 (-1.652)	-0.68 (-0.373)	-5.95** (-2.017)		
Middle performance group × yr06	6.30* (2.155)	5.64 (1.712)	7.04* (1.913)	6.07 (1.588)		
Yr07			14.33*** (5.531)	14.78*** (6.474)	0.20*** (6.634)	0.16*** (5.787)
Bottom performance group × yr07			-17.08*** (-6.435)	-19.71*** (-6.312)	-24.00*** (-7.615)	-21.74*** (-5.803)
Middle performance group × yr07			-2.21 (-0.656)	-6.32** (-2.173)	-6.86* (-1.854)	-5.78 (-1.520)
Constant	71.61*** (13.20)	63.01*** (15.33)	0.76*** (10.42)	68.14*** (14.05)	62.97*** (11.06)	62.97*** (11.06)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	970	970	970	970	970	970
Observations	4.9%	38.9%	7.1%	39.1%	6.7%	6.7%
Adjusted R <sup>2</sup>						



**Table 7. Performance during the financial crisis and CEO trading**

The data span the period 1996–2009. Banks are assigned to terciles based on their excess returns estimated for the period July 2007–December 2008 for columns 1–5, and 2008 for columns 6–10. The dependent variable is an indicator equal to 1 if the CEO increased her stock ownership in the bank. *Bottom performance group* is an indicator equaling 1 if the bank is in the bottom performance group. *Middle performance group* is an indicator equaling 1 if the bank is in the middle performance group. The base category is if the bank is in the top group based on its crisis performance. *Yr06* and *Yr07* are indicator variables equal to 1 if the bank-year observation is from 2006 and 2007, respectively. All regressions control for size, B/M, past year return, past year return volatility, change in return volatility, total compensation, % growth in total compensation, the ratio of stock-based to total compensation, past three-year stock-based compensation, fraction of executive ownership, value of exercisable options, and value of unexercisable options, as. These variables are defined in Table 3. Compensation is measured for the CEO. Coefficient estimates are multiplied by 100 for convenience. Columns 4, 5, 9, and 10 show panel logit regressions. T-statistics, based on heteroskedasticity-robust standard errors clustered at the year level, are reported in parentheses. \*\*\*, \*\*, \* and \* denote significance at the 1%, 5% and 10% level.

	Dependent variable: CEO ownership increase									
	OLS	OLS	OLS	Logit	OLS	OLS	OLS	Logit	OLS	Logit
Bottom performance group	-0.01 (-0.331)	-0.04 (-1.116)	-0.04 (-1.116)	0.24 (0.504)	0.06* (1.895)	0.04 (1.333)	0.04 (1.333)	0.60 (1.197)	0.04 (1.333)	0.60 (1.197)
Middle performance group	-0.02 (-0.434)	-0.03 (-0.596)	-0.03 (-0.596)	0.12 (0.300)	0.10*** (3.589)	0.09** (2.966)	0.09** (2.966)	0.80** (2.250)	0.09** (2.966)	0.80** (2.250)
Yr06	-0.06 (-0.952)	0.01 (0.0817)	0.01 (0.0817)	-0.33 (-0.649)	-0.11 (-0.205)					
Bottom performance group × yr06	-0.11** (-2.601)	-0.22*** (-3.997)	-0.07* (-2.101)	-1.03** (-2.332)	-1.24** (-2.183)					
Middle performance group × yr06	0.17*** (3.374)	0.07 (1.587)	0.18*** (3.463)	0.75** (1.984)	0.47 (1.159)					
Yr07										
Bottom performance group × yr07					-0.17*** (-4.641)	0.04 (0.698)	0.04 (0.698)	-0.28 (-0.525)	0.10*** (3.497)	-0.60 (-1.297)
Middle performance group × yr07					0.07* (2.084)	-0.21*** (-4.168)	-0.21*** (-4.168)	-0.60 (-1.297)	0.24*** (8.358)	0.41 (1.285)
Constant	0.532*** (3.101)	0.568 (1.546)	0.375** (2.240)	0.664 (0.482)	0.496** (2.939)	0.514 (1.381)	0.514 (1.381)	0.305 (0.195)	0.305 (0.195)	1.69 (0.246)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE										
Year FE			Yes	Yes					Yes	Yes
Observations	825	825	825	825	825	825	825	825	825	665
Adjusted R <sup>2</sup> or pseudo-R <sup>2</sup>	1.9%	23.3%	3.1%	8.5%	2.2%	22.7%	22.7%	825	3.3%	7.8%

**Table 8. Performance during the financial crisis and the value of the CEO's open market transactions**

The data span the period 1996-2009. Banks are assigned to terciles based on their excess returns estimated for the period July 2007-December 2008 for columns 1-3, and 2008 for columns 4-6. The dependent variable is the net number of sales purchased by the CEO in the open market, scaled by their initial stock ownership. *Bottom performance group* is an indicator variable equaling 1 if the bank is in the bottom performance group. *Middle performance group* is an indicator variable equaling 1 if the bank is in the middle performance group. The base category is if the bank is in the top group based on its crisis performance. *Yr06* and *Yr07* are indicator variables equal to 1 if the bank-year observation is from 2006 and 2007, respectively. All regressions control for size, B/M, past year return, past year return volatility, change in return volatility, total compensation, % growth in total compensation, the ratio of stock-based to total compensation, past three-year stock-based compensation, fraction of executive ownership, value of exercisable options, and value of unexercisable options. These variables are defined in Table 3. Compensation variables are measured for the CEO. Coefficient estimates are multiplied by 100 for convenience. T-statistics, based on heteroskedasticity-robust standard errors clustered at the year level, are reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10% level.

	Dependent variable: CEO net open market purchases scaled by total holdings					
Bottom performance group	1.08 (0.770)		1.12 (0.772)	0.85 (0.463)		1.06 (0.533)
Middle performance group	1.47 (0.848)		1.54 (0.837)	-1.30 (-0.764)		-1.15 (-0.617)
Yr06	3.18* (1.978)	1.39 (1.091)				
Bottom performance group × yr06	-8.92*** (-4.770)	-8.53*** (-4.382)	-9.14*** (-4.837)			
Middle performance group × yr06	-9.76*** (-6.110)	-8.98*** (-5.687)	-10.10*** (-5.854)			
Yr07				5.58*** (3.831)	4.32* (2.038)	
Bottom performance group × yr07				0.75 (0.365)	2.17 (1.025)	0.47 (0.214)
Middle performance group × yr07				-2.81* (-1.892)	1.12 (0.498)	-3.07* (-1.887)
Constant	-13.50** (-2.606)	-23.31 (-1.372)	-14.40*** (-3.223)	-13.80** (-2.650)	-13.94 (-0.855)	-11.84** (-2.398)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE		Yes			Yes	
Year FE			Yes			Yes
Observations	825	825	825	825	825	825
Adjusted R <sup>2</sup>	8.0%	22.1%	8.4%	8.0%	21.4%	8.3%

**Table 9. Housing market exposures and insider trading during times of housing price declines**

The data span the period 1996-2009. The unit of observation is a bank-quarter. The dependent variable is the dollar value of net open market purchases by insiders, winsorized at the 1% level, measured in millions of US dollars. Banks are assigned to terciles based on the correlation between their stock return and the return on the Barclays index of BBB-rated collateralized mortgage-backed securities estimated during the period July 2007-December 2008. For banks delisted during that period, the correlations are measured based on the stock returns up to the delisting date. *High correlation* is an indicator variable equaling 1 if the bank is in the highest group based on correlations. *Medium correlation* is an indicator variable equaling 1 if the bank is in the middle group based on correlations. Regressions include six dummy variables for the 1st-5th, and all subsequent *decreases in housing prices*. These variables are based on the Campbell-Shiller 20-City Composite Housing Price Index. *Size* is the natural logarithm of total assets, *B/M* is the book to market ratio. *Past quarter return* is the stock return measured over the past calendar quarter. *Past 252-day return* is the stock return measured over the 252 trading days ending on the last day of the past calendar quarter. *Past quarter return volatility* is the realized volatility of the stock return measured over the past calendar quarter. *Past 252-day return volatility* is the realized volatility of the stock return measured over the 252 trading days ending on the last day of the past calendar quarter. *Change in return volatility, quarterly* is the difference between stock return volatility during the past calendar quarter and the calendar quarter before. *Change in return volatility, 252-day* is the difference between stock return volatility during the past 252 trading days and the 252 trading days before. Coefficient estimates are multiplied by 100 for convenience. T-statistics, based on heteroskedasticity-robust standard errors clustered at the year level, are reported in parentheses. - \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10% level.

	Dependent variable: value of net open market purchases, million USD		
High correlation	-0.34 (-1.481)		-0.22 (-0.840)
Medium correlation	0.36** (2.316)		0.36** (2.385)
1 <sup>st</sup> decrease in housing prices	0.08 (0.569)	0.57*** (3.423)	
2 <sup>nd</sup> decrease in housing prices	0.25* (1.695)	0.74*** (4.061)	
3 <sup>rd</sup> decrease in housing prices	-0.56*** (-3.670)	0.02 (0.106)	
4 <sup>th</sup> decrease in housing prices	0.02 (0.132)	0.59*** (2.911)	
5 <sup>th</sup> decrease in housing prices	0.81*** (4.700)	1.44*** (7.124)	
6 <sup>th</sup> and further decreases in housing prices	-0.53 (-1.276)	-0.09 (-0.221)	
High correlation × 1 <sup>st</sup> decrease in housing prices	-1.63*** (-5.474)	-1.53*** (-5.098)	-1.72*** (-5.992)
High correlation × 2 <sup>nd</sup> decrease in housing prices	-2.66*** (-8.815)	-2.63*** (-8.766)	-2.71*** (-9.290)
High correlation × 3 <sup>rd</sup> decrease in housing prices	-1.81*** (-6.208)	-1.77*** (-6.040)	-1.88*** (-6.485)
High correlation × 4 <sup>th</sup> decrease in housing prices	-1.39*** (-4.630)	-1.44*** (-4.806)	-1.43*** (-4.661)

**Table 9 – continued**

High correlation × 5 <sup>th</sup> decrease in housing prices	1.64*** (4.650)	1.46*** (4.410)	1.65*** (4.635)
High correlation × 6 <sup>th</sup> and further decreases in housing prices	2.55** (2.533)	2.44** (2.504)	2.71** (2.641)
Medium correlation × 1 <sup>st</sup> decrease in housing prices	-0.66*** (-4.289)	-0.53*** (-3.641)	-0.72*** (-4.646)
Medium correlation × 2 <sup>nd</sup> decrease in housing prices	-0.37** (-2.362)	-0.25* (-1.689)	-0.41** (-2.625)
Medium correlation × 3 <sup>rd</sup> decrease in housing prices	-0.80*** (-5.066)	-0.73*** (-5.069)	-0.83*** (-5.239)
Medium correlation × 4 <sup>th</sup> decrease in housing prices	-1.16*** (-7.247)	-1.15*** (-7.725)	-1.18*** (-7.517)
Medium correlation × 5 <sup>th</sup> decrease in housing prices	0.15 (0.923)	0.22 (1.390)	0.14 (0.896)
Medium correlation × 6 <sup>th</sup> and further decreases in housing prices	0.70* (1.902)	0.80* (1.984)	0.69* (1.831)
Size	-1.25*** (-12.04)	-1.60*** (-9.058)	-1.26*** (-11.41)
B/M	0.43 (1.395)	0.19 (0.633)	0.39 (1.577)
Past quarter return	-0.68 (-1.100)	-1.02* (-1.857)	-0.25 (-0.329)
Past 252-day return	-2.29*** (-5.479)	-1.69*** (-4.725)	-3.25*** (-7.152)
Past quarter return volatility	-42.97 (-1.133)	-23.69 (-0.650)	-29.81 (-0.763)
Past 252-day return volatility	12.36 (0.297)	24.11 (0.619)	-33.85 (-0.722)
Change in return volatility, quarterly	-12.28 (-0.591)	-7.39 (-0.390)	-23.82 (-1.365)
Change in return volatility, 252-day	149.12*** (2.975)	82.50* (1.739)	152.40*** (3.306)
Constant	10.26*** (10.31)	12.90*** (7.669)	11.10*** (8.815)
Bank FE		Yes	
Quarter FE			Yes
Observations	5041	5041	5041
Adjusted R <sup>2</sup>	14.6%	29.5%	16.2%

**Table 10. Housing market exposures and trading by executives during times of housing price declines**

The data span the period 1996-2009. The unit of observation is a bank-quarter. The dependent variable is the dollar value of net open market purchases by executives, winsorized at the 1% level, measured in millions of US dollars. Banks are assigned to terciles based on the correlation between their stock return and the return on the Barclays index of BBB-rated collateralized mortgage-backed securities estimated during the period July 2007-December 2008. For banks delisted during that period, the correlations are measured based on the stock returns up to the delisting date. *High correlation* is an indicator variable equaling 1 if the bank is in the highest group based on correlations. *Medium correlation* is an indicator variable equaling 1 if the bank is in the middle group based on correlations. Regressions include six dummy variables for the 1st-5th, and all subsequent decreases in housing prices. These variables are based on the Campbell-Shiller 20-City Composite Housing Price Index. All regressions control for size, B/M, past quarter return, past 252-day return, past quarter return volatility, change in quarterly return volatility, and change in 252-day return volatility. These variables are defined in Table 9. Coefficients of these control variables are not reported. Coefficient estimates are multiplied by 100 for convenience. T-statistics, based on heteroskedasticity-robust standard errors clustered at the year level, are reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1%, 5% and 10% level.

	Dependent variable: value of net open market purchases, million USD					
	Executive officers			Independent directors		
High correlation	-0.24 (-1.209)	-0.12 (-0.566)	-0.06 (-0.816)	-0.06 (-0.780)		-0.06 (-0.780)
Medium correlation	0.33*** (3.115)	0.34*** (3.156)	0.04 (0.607)	0.03 (0.589)		0.03 (0.589)
1 <sup>st</sup> decrease in housing prices	0.28** (2.497)	0.71*** (6.217)	-0.20*** (-4.105)	-0.16** (-2.549)		-0.16** (-2.549)
2 <sup>nd</sup> decrease in housing prices	0.09 (0.837)	0.52*** (4.243)	0.17*** (3.172)	0.22*** (3.232)		0.22*** (3.232)
3 <sup>rd</sup> decrease in housing prices	-0.56*** (-4.857)	-0.07 (-0.599)	0.01 (0.146)	0.07 (1.085)		0.07 (1.085)
4 <sup>th</sup> decrease in housing prices	-0.10 (-0.774)	0.39*** (2.846)	0.14** (2.421)	0.20*** (2.720)		0.20*** (2.720)
5 <sup>th</sup> decrease in housing prices	0.38*** (2.867)	0.91*** (6.872)	0.43*** (6.956)	0.50*** (6.411)		0.50*** (6.411)
6 <sup>th</sup> and further decreases in housing prices	-0.51* (-1.798)	-0.11 (-0.409)	0.00 (0.0127)	0.04 (0.314)		0.04 (0.314)
High correlation × 1 <sup>st</sup> decrease in housing prices	-1.02*** (-3.856)	-0.89*** (-3.479)	-0.49*** (-6.420)	-0.49*** (-5.950)		-0.49*** (-5.950)
High correlation × 2 <sup>nd</sup> decrease in housing prices	-1.34*** (-4.971)	-1.22*** (-4.676)	-0.68*** (-8.806)	-0.73*** (-8.681)		-0.68*** (-8.681)
High correlation × 3 <sup>rd</sup> decrease in housing prices	-1.13*** (-4.315)	-1.03*** (-4.084)	-0.37*** (-4.989)	-0.39*** (-4.922)		-0.37*** (-4.922)
High correlation × 4 <sup>th</sup> decrease in housing prices	-1.06*** (-4.001)	-1.03*** (-4.023)	0.10 (1.327)	0.06 (0.692)		0.06 (0.692)

**Table 10 – continued**

High correlation $\times$ 5 <sup>th</sup> decrease in housing prices	2.33*** (7.683)	2.30*** (8.134)	2.38*** (7.709)	-0.54*** (-5.739)	-0.64*** (-6.562)	-0.58*** (-6.398)
High correlation $\times$ 6 <sup>th</sup> and further decreases in housing prices	1.98*** (2.852)	1.99*** (2.947)	2.17*** (3.118)	0.45 (1.446)	0.44 (1.341)	0.44 (1.381)
Medium correlation $\times$ 1 <sup>st</sup> decrease in housing prices	-0.52*** (-4.447)	-0.38*** (-3.476)	-0.58*** (-4.975)	-0.18*** (-2.962)	-0.18*** (-3.101)	-0.18*** (-3.004)
Medium correlation $\times$ 2 <sup>nd</sup> decrease in housing prices	-0.35*** (-2.999)	-0.22* (-1.996)	-0.40*** (-3.377)	-0.10 (-1.565)	-0.11* (-1.789)	-0.09 (-1.585)
Medium correlation $\times$ 3 <sup>rd</sup> decrease in housing prices	-0.71*** (-5.963)	-0.62*** (-5.597)	-0.74*** (-6.207)	-0.20*** (-3.303)	-0.23*** (-3.863)	-0.20*** (-3.304)
Medium correlation $\times$ 4 <sup>th</sup> decrease in housing prices	-0.71*** (-5.916)	-0.66*** (-5.896)	-0.72*** (-6.093)	-0.01 (-0.189)	-0.04 (-0.710)	-0.01 (-0.216)
Medium correlation $\times$ 5 <sup>th</sup> decrease in housing prices	0.28** (2.277)	0.36*** (3.133)	0.27** (2.249)	-0.18*** (-2.877)	-0.20*** (-3.184)	-0.19*** (-3.051)
Medium correlation $\times$ 6 <sup>th</sup> and further decreases in housing prices	0.54* (1.684)	0.67* (1.885)	0.54 (1.648)	0.09 (0.981)	0.07 (0.669)	0.08 (0.913)
Constant	8.49*** (10.99)	11.17*** (8.757)	9.33*** (9.356)	1.29*** (4.936)	1.20** (2.501)	1.29*** (4.379)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE						
Quarter FE						
Observations	5041	5041	5041	5041	5041	5041
Adjusted R <sup>2</sup>	14.1%	30.2%	15.3%	4.0%	11.2%	5.1%

**Table 11. Turnover of insiders in the two performance groups over time**

This table shows the percentage of insiders leaving the bank in the top and the bottom performance group. Turnover information is extracted from the Thomson Reuters Insiders database. The percentages reported are calculated by dividing the number of insiders that left the bank with the total number of insiders trading in each calendar year. An insider is assumed to have left the bank in the year after which no transactions of hers are reported in the database. Accordingly, the sample is right-censored in 2009. \*\*, and \*\*\* denote significance at the 5% and 1% level.

Fraction of insiders leaving				Fraction of insiders joining			
Year	Top	Bottom	t-test difference	Year	Top	Bottom	t-test difference
1996	9.47%	11.46%	0.44	1996	36.63%	24.45%	-1.10
1997	8.18%	17.15%	1.40	1997	10.73%	15.71%	0.95
1998	20.87%	23.30%	0.52	1998	32.88%	22.20%	-1.04
1999	9.73%	9.16%	-0.20	1999	10.72%	15.83%	1.21
2000	15.86%	11.44%	-2.14**	2000	7.44%	10.56%	1.29
2001	13.84%	14.13%	0.07	2001	12.16%	11.78%	-0.09
2002	12.80%	14.05%	0.33	2002	9.93%	10.52%	0.16
2003	15.59%	13.71%	-0.48	2003	6.32%	13.92%	2.09**
2004	10.97%	15.23%	1.33	2004	9.21%	14.29%	1.58
2005	13.40%	9.26%	-1.26	2005	10.51%	12.79%	0.69
2006	16.90%	14.87%	-0.48	2006	8.64%	13.38%	1.38
2007	7.05%	19.68%	3.63***	2007	13.22%	9.74%	-0.77
2008	13.28%	33.48%	2.84***	2008	8.90%	9.86%	0.29
				2009	4.70%	18.48%	3.26***

**Table 12. Option-related stock sales across performance groups**

This table shows the average fraction of insider sales in which the insider first exercised stock options, then sold all the shares obtained through the option exercise. Data are from Thomson Reuters.

Year	Top	Bottom
1996	18.28%	24.78%
1997	21.14%	28.00%
1998	43.00%	36.07%
1999	30.59%	29.90%
2000	17.66%	41.90%
2001	50.10%	39.39%
2002	39.36%	47.18%
2003	33.03%	41.68%
2004	39.70%	42.49%
2005	34.40%	42.25%
2006	41.54%	41.44%
2007	40.40%	38.79%
2008	28.17%	12.28%
2009	23.34%	3.02%

**Table 13: Fraction of stocks sold and purchased by joining insiders**

This table shows the fraction of purchases and sales which were made by insiders joining the bank in a given bank-year. Total purchase (sale) values for joining insiders are aggregated each year for the performance group, then divided by total purchase (sale) values of all insiders in the performance group, yielding the fractions in the table. An insider is assumed to have joined the bank in a given year if her first insider transaction is observed in that year. Data are from Thomson Reuters.

Year	Purchases		Sales	
	Top	Bottom	Top	Bottom
1996	39.30%	50.95%	10.70%	19.11%
1997	70.79%	78.12%	25.22%	3.11%
1998	21.29%	6.64%	21.22%	53.44%
1999	2.33%	1.79%	1.72%	1.71%
2000	42.37%	6.92%	3.96%	3.61%
2001	3.33%	5.39%	0.00%	10.09%
2002	13.04%	4.32%	1.64%	4.09%
2003	3.58%	2.82%	10.33%	4.55%
2004	37.85%	9.21%	1.46%	3.80%
2005	2.53%	17.64%	0.97%	0.41%
2006	2.91%	7.71%	1.02%	0.20%
2007	25.00%	9.27%	6.39%	1.74%
2008	3.51%	48.12%	0.68%	1.61%
2009	5.99%	79.42%	0.01%	2.34%

**Table 14. Average time span (duration) between open market sales by insiders and the bankruptcy of Bear Stearns**

All open market sales made by insiders between May 1, 2006 and March 16, 2008 are included in the calculation. The average time span is calculated analogously to Macaulay duration, as described in Section V.4. Banks in the bottom group that were delisted during July 2007-December 2008 are excluded from the calculations. *Panel A* presents means and quartiles of the distribution of duration across performance groups. *Panel B* shows statistical tests assessing if the duration values calculated for the top and the bottom groups are significantly different.

**Panel A: Means and quartiles of duration by performance group**

	Mean	Std. dev.	Bottom quartile	Median	Top quartile
Top	388.97	135.58	279.67	430.80	469.73
Middle	396.50	119.50	350.93	407.81	472.16
Bottom	474.18	85.94	466.97	513.15	518.88

**Panel B: Comparing duration values of banks in the top and the bottom group**

t-test $D_{\text{top}} = D_{\text{bottom}}$	2.07**	p-value	0.0496
Wilcoxon-test $D_{\text{top}} = D_{\text{bottom}}$	1.92*	p-value	0.0544





## Chapter 4

### CEO Horizon and Insider Trading

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**Abstract:** This paper studies how CEOs vary their insider trading activity as a function of their career horizon and finds evidence for two effects. First, CEOs diversify the risk of their human capital, especially if they expect not to have control over the firm in the future. We use data on planned contract expiration dates to test this view. Consistent with this argument we find that CEOs are 1-2% less likely to purchase stock with each year in office, and the absence of stock purchases is strongly correlated with CEO turnover. Second, as CEOs learn about the firm over time, they are able to predict performance better when they have been in office longer. In line with this argument, we find that one additional year in office increases the profitability of CEO purchases by 55 basis points. We conclude that CEO incentive packages, employment contracts, and firm-level insider trading policies should be viewed and designed in conjunction.

#### 1. Introduction

We investigate the interaction between two devices that corporations employ to mitigate the agency problem: equity ownership and CEO employment contracts. While Jensen and Meckling (1976) suggest that managerial equity ownership aligns incentives, it may also induce myopic behavior as managers preterm investment opportunities that increase the stock price only in the long run (Narayanan (1985), Stein (1989)). Firms face a second trade-off when setting the terms of managerial employment contracts (Xu (2012)). Long-term contracts offset managerial myopia. Short-term contracts facilitate dismissal of managers that underperform or misbehave. The empirical literature has considered these two solutions to the agency conflict separately. In this paper, we establish that they are interlinked: the way managers manage their equity ownership is related to the type of employment contract they have, and how long they have been with the firm.

There are two reasons why we expect the CEO's insider trading to vary as a function of CEO career horizon. First, if the CEO leaves, she cannot gather private information about the firm.

Second, the value of her human capital is correlated with the firm, and becomes riskier if she leaves. Therefore, she tries to diversify by reducing her portfolio exposure to the firm's stock. We thus expect that CEOs are more reluctant to purchase stock as they spend more time in office.

We capture two aspects of CEO career horizon. An *ex-post* measure of horizon is tenure, defined as a running count of the number of years the CEO has spent in office. The private information and diversification motives dictate that CEO tenure should be negatively related to CEO stock purchases. We then isolate this effect from that of *ex-ante* horizon, i.e. the number of years the CEO expects to stay in office based on her contract. The longer the CEO expects to remain in office, the less likely she is to decrease her exposure to the firm's stock, because of the expected lasting informational advantage. Using a hand-collected dataset of 3,033 CEO contracts, and information on the insider trading of these CEOs, we analyze how CEO career horizon affects CEOs' equity ownership. Information on CEO contract terms enables us to distinguish between the *ex-ante* and *ex-post* aspects of CEO career horizon. The latter captures the effect of the CEO's time spent in office, while the former is the expectation that she forms about her career given her contract.

Our results indicate that CEO horizon, both *ex ante* and *ex post*, is related to CEO equity ownership. We document a strong relation between insider trading by the CEO and tenure. During the first years of their spell CEOs are more likely to be net buyers of their firm's stock. The propensity to purchase the stock declines with tenure. The average CEO is 1-2 percentage points less likely to purchase the firm's stock with each additional year spent in office, which corresponds to a relative decrease of 5-10% in the probability of purchasing. When CEOs do purchase stock, the information content of the transaction increases with tenure. The average cumulative abnormal return (CAR) following a CEO purchase is 55-60 basis points higher for a CEO who has served one year in office compared to a CEO just starting their term. The relation between post-purchase CARs and tenure is concave: the rate of increase in CARs shrinks by 2 basis points for each additional year of tenure.

Furthermore, we show that CEO employment contracts are related to CEOs' insider trading patterns. In the US, CEOs can be employed under two contract types. Under fixed-term contracts, it is costly for the firm to dismiss the CEO before the contractual termination date. Under at-will employment, the firm or the employee can terminate the relationship at any time and for any cause. This allows us to capture *ex-ante* horizon in two ways. First, we distinguish between CEOs employed under at-will and fixed-term contracts. Second, we measure contract length, the number

of years for which the firm agrees to employ the CEO in the contract. By definition, contract length is positive for fixed-term contracts and zero for at-will contracts.

For CEOs employed under fixed-term contracts we find that the probability of being a net buyer of the firm's stock is negatively related to the length of the contract. Thus, a longer contract is negatively related to the CEO's willingness to purchase the firm's stock. Holding both tenure and ex-post horizon constant, a CEO employed under a fixed-term contract is 1.6 percentage points less likely to purchase the firm's stock for each additional year of contract length. This is equivalent to a decrease of 7% relative to the mean.

Finally, insider trading is strongly correlated with CEO turnover. CEOs are significantly less likely to leave when they are net buyers of the company's stock, both under at-will and under fixed-term contracts. A CEO under at-will contract is 53-54% less likely to be dismissed in a year when they are net buyers of the firm's stock, while a CEO employed under a fixed-term contract is 59-60% less likely to leave. This result is robust to several alternative specifications, and to the inclusion of control variables commonly used in the turnover literature. We regard this pattern as a first indication that CEO insider trading can predict CEO turnover. We then discuss the robustness of this result and point out ways to further refine our tests to disentangle correlation from actual predictive ability.

Our results are consistent with the view that human capital risk and the ability to gather private information play a role in CEOs insider trading decisions. The positive relation between the profitability of CEO purchases and tenure suggests that CEOs enhance their understanding of their firm over time. The negative correlation between contract length and CEO stock purchases is congruent with the view that long-term contracts and equity ownership are substitute mechanisms. Finally, our result on CEO turnover suggests that CEOs anticipate their departure from the firm and reduce their ownership stake accordingly.

The analysis of the paper makes several contributions to the existing literature. First and most importantly our paper contributes to the literature on CEO turnover.<sup>1</sup> The debate in this area has focused on two issues. First, CEO turnover is driven by firm performance, and several factors influence the slope of the performance-turnover relation. Second, in addition to firm performance, governance characteristics have also been shown to affect the level of CEO turnover.<sup>2</sup> Our paper

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<sup>1</sup> For reviews see Brickley (2003) and Jenter and Lewellen (2010).

<sup>2</sup> CEO turnover is less likely for founder CEOs (Morck, Shleifer and Vishny (1989), Denis, Denis and Sarin (1997), Huson, Parrino and Starks (2001)), and for CEOs with large equity holdings (Denis et al. (1997), Mikkelsen and Partch

contributes to the discussion on the level of CEO turnover. Predictions of CEO turnover can be improved by taking into account contractual time, which sets the timing structure ex-ante, independent of performance (Xu (2012)). However, ex-ante contract terms are imperfect measures, as contracts can be renewed. Our paper refines the prediction based on ex-ante contract terms by introducing insider trading as a proxy for the CEO's assessment of her future at the firm. We find that insider trading by the CEO is strongly correlated with CEO turnover. The relation between insider trading and CEO turnover remains significant after controlling for past performance, firm and industry characteristics, governance factors used in prior studies, and CEO contract terms. This result suggests that insider trading by the CEO may be used to predict CEO turnover.

Second, our paper adds to the literature on CEO equity incentives by empirically showing that contract terms influence how CEOs manage their equity holdings in the firm. A large number of papers focus on the role and usefulness of managers' equity holdings (Jensen and Meckling (1976), Morck, Shleifer and Vishny (1988), McConnell and Servaes (1990), Jensen and Murphy (1990), Himmelberg, Hubbard and Palia (1999)). We provide evidence on the interaction of two devices firms use to incentivize CEOs: contract terms and equity. In particular, we show that the propensity of CEOs employed under fixed-term contracts to purchase their firm's stock is inversely related to the length of their contract. Thus, we document that contract length is one source of firm heterogeneity that is correlated with CEO equity trades and has not been considered in the literature to date.

Third, our paper contributes to the young empirical literature on CEO contracts (Schwab and Thomas (2006), Gillan, Hartzell, and Parrino (2009) and Xu (2012)). Xu (2012) introduces the dataset that we use, using it to analyze effects of contract horizon on investment and compensation. We use that same dataset to document that the terms of these contracts are correlated with how CEOs manage their exposure to the firm's stock. We thus show that CEO employment contracts influence not only the decisions the CEO makes for the firm (Xu (2012)), but also those that she makes regarding her own equity holdings.

Fourth and finally, we contribute to the literature on insider trading. Several studies examine the determinants of the profitability of insider trades.<sup>3</sup> While many of these determinants are

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(1997), Perry (1999), Huson et al. (2001)). CEO turnover is higher in firms with blockholders (Denis et al. (1997)) and companies that grant incentive compensation to directors (Perry (1999)).

<sup>3</sup> Cross-sectional determinants of insider trading profits include the size of the trade Seyhun (1986), the role of the insider at the firm (Seyhun (1986), Lin and Howe (1990), Jeng, Metrick and Zeckhauser (2003)), ownership structure

essentially cross-sectional, there is also evidence that the profitability of insider trading varies over time. Fidrmuc et al. (2006) show that insider trades are less profitable following news releases on mergers and acquisitions and CEO turnover. Cohen, Malloy, and Pomorski (2011) extract information from the insider trading history of managers to identify trades that are more likely to be information-motivated. In this paper, we uncover a further determinant of insider trading profits in the time series: we show that the trades CEOs become more informative as they spend more time in office.

Overall, our results suggest that CEO horizon is an important determinant of CEO equity holdings. The longer the CEO's horizon, the less willing they are to purchase the firm's equity. This finding is consistent with the view that long-term CEO contracts and equity ownership are substitutes. There are many caveats to this interpretation, however, which we intend to explore in further versions of the paper. In practice, our results underline that CEO incentive packages, employment contracts, and firm-level insider trading policies should be viewed and designed in conjunction.

The remainder of this paper is organized as follows. We develop our hypotheses in Section 2. Section 3 presents the data used in the study. Section 4 examines the relation between CEO horizon and equity trades. In Section 5 we attempt to predict CEO turnover using information on the insider trading of the CEO. Section 6 discusses the robustness of our findings, and Section 7 concludes the paper.

## **2. Hypothesis development**

Our analysis builds on three factors that have been documented in the literature. First, the literature on insider trading maintains that corporate insiders have an informational advantage over other market participants. The majority of empirical studies concludes that insiders realize abnormal returns on their trades (Seyhun (1986), Lakonishok and Lee (2001), Fidrmuc et al. (2006), Ravina and Sapienza (2010), Cohen, Malloy and Pomorski (2011)). Furthermore, insiders more familiar with the activity of the firm earn higher returns on their transactions (Seyhun (1986), Lin and Howe (1990), Jeng et al. (2003)), although Wang, Shin, and Francis (2011) suggest that CFOs trade more

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(Fidrmuc, Goergen, and Renneboog (2006)), or the firm's governance environment (Ravina and Sapienza (2010), Cziraki, De Goeij, and Renneboog (2011)).

profitably than CEOs. Once the CEO leaves the firm, they no longer have the ability to gather private information.

Second, a growing body of literature addresses the role of human capital as a non-tradable asset in portfolio choice (Campbell (1996), Jagannathan and Wang (1996)). Empirical evidence on the topic confirms the relation between stock returns and the returns on human capital (Campbell (1996), Palacios-Huerta (2003), Lustig and Van Nieuwerburgh (2008)). As the CEO approaches the end of their spell at the firm, their human capital becomes more risky.

We aim to sever two aspects of CEO career horizon. Ex-post horizon captures the effect of the CEO's time spent in office, while ex-ante horizon is the number of years the CEO expects to stay in office based on her contract. We use information on CEO contract terms to capture ex-ante horizon and thereby distinguish between the two effects. In the US, CEOs can be employed under two types of contracts. Under a fixed-term contract, the firm agrees to pay the CEO compensation for a given number of years. If the firm terminates the contract without cause, it is still obliged by to pay compensation to the CEO, which renders interim termination of fixed-term contracts costly for the firm. The amount that the CEO receives in the case of early termination is proportional to the number of years left on the contract. Therefore, the cost of dismissal declines over time. Hence, for CEOs under fixed-term contracts, dismissal is less likely for CEOs with more years remaining until contract expiration (Xu (2012)).

Under an at-will contract, employment can be terminated at any time by both the employer and the employee.<sup>4</sup> Therefore, while termination may still be costly to the firm, the costs do not vary over time. For our purposes, the key feature of contracts is the protection they offer against dismissal. CEOs employed under an at-will contract have a higher threat of dismissal compared to CEOs employed under a fixed-term contract.

The first question we ask is whether CEOs' insider trading behavior changes over their time in office. Based on the argument on private information, we expect that the CEO will be less likely to purchase stock in the later years of their spell, to avoid possessing a large amount of shares in a firm whose future they can no longer control. Portfolio optimization with risky human capital would also lead to the same pattern: the human capital of the CEO becomes more risky if she leaves. Hence, she will to increase precautionary savings, and decrease the correlation of her portfolio with the firm's stock. For these two reasons, we hypothesize that

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<sup>4</sup> The employment relationship can be terminated "*for good cause, for no cause, or even for cause morally wrong, without being thereby guilty of legal wrong*". (Payne vs. Western & Atlantic Railroad Co., 81 Tenn. 507, 519-520, 1884 WL 469 at \*6 (September Term, 1884).)

*H1. The probability that the CEO purchases the firm's stock is decreasing with tenure.*

Next, we ask whether it matters for CEO insider trading how long the CEO expects to stay in office. If the CEO expects to remain in office for a longer spell, she is less likely to decrease their exposure to the firm's stock, because of the expected lasting informational advantage. In contrast, a CEO with a shorter contract faces more uncertainty regarding the end of her employment. As she anticipates that she will not have ample time to reduce their holdings if she is dismissed, she is less keen on purchasing firm stock. By this reasoning, it follows that

*H2. For CEOs employed under fixed-term contracts, the probability that the CEO is a net buyer is positively related to the length of the contract.*

The third question we explore is whether CEO insider trading (CEO trading) predicts turnover. If the CEO expects to remain in office, she will retain their influence on firm policy and therefore also their ability to access private information. If, however, the CEO anticipates that they will be dismissed, they will unwind their equity position. We therefore hypothesize that

*H3. CEO trading patterns predict turnover: CEOs are less likely to buy their firm's stock prior to their departure.*

Finally, we ask whether CEOs' insider trades contain more information as the CEO spends more time in office. To the extent that trades are based on private information, the better the CEO understands the firm, the more accurately they can trade. Given the competition in the market for CEOs and the board scrutiny in picking the CEO, we expect that the CEO adapts to their role rapidly. Therefore, the relation between tenure and the informativeness of CEO insider trading should be concave. On average, insider purchases contain more information than insider sales, because executives may sell stock for reasons other than private information, such as portfolio rebalancing, or liquidity needs (Lakonishok and Lee (2001), Jenter (2005)). Our last hypothesis is therefore

*H4. The returns to CEO purchases are an increasing and concave function of CEO tenure.*



### 3. Data sources and sample selection

The Securities Exchange Act of 1934, Regulation S-K, Item 402 requires the disclosure of all employment contract terms between the registrant and a named executive officer. We use a sample of 3,717 CEO employment contract terms between firms and their CEOs (Xu (2012)). These contracts and descriptions of terms are collected from SEC filings and, where possible, from The Corporate Library. We recover separation dates from ExecuComp, Risk Metrics, or BoardEx. We exclude contracts if we cannot verify that the CEO is still in office, and fixed-term contracts whose expiration date cannot be ascertained.<sup>5</sup> We then match these data with information on the CEO's insider trades from Thomson Reuters, stock prices from CRSP and accounting data from Compustat. Insider trading data are aggregated for each calendar year. We drop all trades that occur after the CEO leaves the firm to ensure that none of the transactions are mechanically associated with the CEO's departure (Dahiya and Yermack (2008)).

– *Insert Table 1 here* –

This procedure results in a final sample of 7,343 firm-year observations from 2,308 CEOs of 2,110 firms. Panel A of Table 1 summarizes the number of observations in the sample. Approximately one quarter of our sample CEOs are employed at will, whereas the rest have fixed-term contracts. Panel B reports a breakdown of the number of contracts per firm: 1,418 of the sample firms are represented with one, 506 firms with two, and 186 firms with more than two contracts. The data span 1989-2008, with the number of firm-year observations increasing through time, as shown in Panel C. In Panel D, we provide descriptive statistics on CEO trading in the company stock by calendar year. In total, there are almost 80,000 trades, most of which are sales. Following Jenter (2005) we consider CEOs net buyers if the total value of their insider purchases exceeds the total value of their insider sales in a given calendar year. Panel E summarizes the number of CEOs in each of these categories. The sample contains more CEO-years of net sellers than net buyers, as CEOs sell stock for diversification and liquidity reasons (Lakonishok and Lee (2001), Jenter (2005)). There are also 448 firm-years with no change in CEO stock ownership, and 1,317 firm-years with no open market trading. In these years, CEO ownership did change, but not through purchasing or selling stock in the open market.

– *Insert Figure 1A here* –

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<sup>5</sup> Not all CEOs sign explicit employment contracts: Gillan et al. (2009) report that fewer than half of the CEOs of S&P 500 firms do. These CEOs are *de facto* under at-will employment.

CEO trading varies during the CEO's spell at the firm. Figure 1A tracks CEO trading behaviour during the first 6 years of their tenure. The horizontal axis shows the number of years the CEO has spent at the firm: a value of 0 corresponds to a CEO's first year in the job. During the first two years of their tenure, 25% and 34% of CEOs are net buyers of their firm's stock. This is consistent with building up the mandatory ownership stake described in Core and Larcker (2002). As CEOs spend more time at the firm, they start trading the stock more in the market: the percentage of CEOs not trading declines from the initial 58% to 45% in years 7 and later. At the same time, CEOs are more likely to be net sellers of their firm's stock: the percentage more than doubles from 18% in year 1 to 37% in years 7 and later.

– *Insert Figure 1B here* –

Even if CEOs sell stock in the market, their ownership may still increase as a result of stock option exercises or the vesting of restricted stock grants. Figure 1B shows the actual ownership changes of CEOs over the first 6 years of their employment. The median CEO in our sample increased her stock ownership in every year of her spell. Otherwise, the pattern is similar to the one observed in the open market transactions. First, CEOs tend to decrease their ownership as they spend more years at the helm: the percentage of CEOs with a decrease in stock ownership rises gradually from 16% to 32% from year 1 to year 7 or more. By contrast, the percentage of CEOs with no change in ownership sinks from 32% to 15% over the same period. The difference between the fraction of net buyer CEOs and CEOs increasing ownership points to the importance of stock-based compensation in determining CEO ownership (Ofek and Yermack (2000)).

– *Insert Figure 2A here* –

– *Insert Figure 2B here* –

After showing that CEO trading changes with CEO tenure, we now focus on the year that the CEO leaves. In Figure 2A we examine how CEOs trade the firm's stock in the years prior to their turnover. Year 0 is defined as the calendar year in which the CEO leaves the firm, year 1 as the year prior to CEO turnover, and so on. While 30% of CEOs are net buyers of their firm's stock 3 years prior to their departure, this percentage decreases significantly, to 11% in the year they leave. In the year of CEO turnover, the percentage of CEOs not trading reaches its peak at 59%. Finally, in Figure 2B, we verify that the low percentage of net buyers also means that more CEOs decrease their holdings in the company stock. While in the four years preceding turnover, the percentage of CEOs with declining ownership does not exceed 25%, in the year that the CEO leaves, it rises to 32%.

– *Insert Table 2 here* –

We summarize the variables capturing insider trading, contract, CEO and firm characteristics in Table 2. The average (median) CEO in the sample has been in office for 5.9 (4) years, and is 53 (53) years old. 28% of all observations come from CEOs with at-will contracts. Coding these at-will contracts as agreements with a term of 0 years, the average (median) contract length of our sample CEOs is 2.8 (3) years. The average CEO earns a salary of 545,000 USD, and received a restricted stock grant of 695,000 USD, which are part of a total compensation package worth 3,696,000 USD. The average company in our sample has total assets of 1,725 million USD, and a book-to-market ratio of 0.62.

We use cumulative abnormal returns (CARs) to measure the information content of CEO transactions. The CARs are calculated based on a Carhart four-factor model. The model parameters are estimated using returns for the period starting 280 days and ending 41 days before the event. We show summary statistics for the CARs following sales and purchases in Table 3, first for the full sample, then partitioning by contract type in Panel A. The average CAR following a CEO purchase is 2.63% (3.84%) over a 10-day (20-day) window. These returns are somewhat larger than those reported by Seyhun (1986) and Lin and Howe (1990) for purchases of all insiders in the US, and lower than those found by Fidrmuc et al (2006) for CEOs in the UK, where insiders must report their trades quicker during their sample period. We use a conventional t-test, and the z-test proposed by Boehmer, Musumeci and Poulsen (1991), which corrects for event-induced variance, to assess whether the CARs are different from zero. Both tests reject at the 1% level that the CARs after CEO purchases are equal to 0. CARs following CEO sales are significantly negative, albeit smaller in absolute value, because CEOs sell stock also for portfolio rebalancing or liquidity reasons (literature). The average 10-day (20-day) CAR following a CEO sale is -1.15% (-2.10%).

– *Insert Table 3 here* –

When comparing the differences in CARs following trades of CEOs employed at will versus on fixed-term contracts, we find evidence that at-will CEOs possess more short-term information. The absolute value of CARs following CEO purchases is higher for CEOs with at-will contracts, and the difference is significant at the 1% level. We find a similar pattern for the absolute value of CARs after CEO sales, but the results lack strong statistical significance, consistent with the idea that the subsample of sales is noisier. These results suggest that CEOs employed at will trade more on short-term information.

Panel B of Table 3 shows CARs following CEO sales and purchases partitioned according to the number of years the CEO has been in office. CARs following purchases increase with the number of years in office, although not monotonically, as they are lower for CEOs with a tenure of

2 and 4 years. We conclude that there is some evidence in favor of our hypothesis 4, that the informativeness of CEO purchases increases with tenure. In contrast, the absolute value of CARs following CEO sales decreases as the CEO spends more years at the helm. This is consistent with the results of Ofek and Yermack (2000), who document that once an executive reaches a target ownership level, they sell most of the stock they receive as part of their compensation. If this is the case, after the target ownership level is met, stock sales serve diversification purposes, and are hence less informative. To eliminate explanations other than the effect of CEO tenure, we analyze CARs in a multivariate setting in the next section.

#### 4. Insider trading, CEO tenure, and horizon

We first examine how CEOs trade the firm's stock over their tenure at the firm. We regress insider trading activity on CEO tenure, ex-post horizon, and various control variables. The results are shown in Table 4. The dependent variable is an indicator equal to one if the CEO is a net buyer of the firm's stock. The coefficient of tenure is negative in all regressions: CEOs are more likely to voluntarily purchase their firm's stock in the open market towards the first years of their tenure.

– *Insert Table 4 here* –

The coefficients of the linear models, and the marginal effects calculated from the logit models (not shown) imply that one additional year in office reduces the CEO's propensity to purchase stock by 0.6-2 percentage points. Considering that the sample average for the fraction of CEOs who are net buyers is 22.6%, this effect is equivalent to a relative decrease of 3-9%. The relation between CEO trading and tenure does not appear to be driven by CEO age, ex-post horizon, firm characteristics, CEO equity ownership, or unobserved CEO heterogeneity.<sup>6</sup> While the inclusion of CEO FE alongside our full set of control variables does render the correlation between net purchasing and CEO tenure insignificant (columns 8 and 9), this is likely due to the reduction in sample size, as no other variables are significant either. We conclude that CEOs are less likely to voluntarily purchase their firm's stock in the later years of their tenure.

We now ask whether not only the incidence, but also the profitability of insider purchases varies as the CEO spends more time in office. We regress the 10-day CAR following CEO

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<sup>6</sup> As most CEOs appear in our sample only once, we cannot include ex-post horizon and CEO FE in the same regression. Age is also dropped from the specifications that include CEO FE, as it cannot be identified separately from tenure.

purchases on tenure, tenure squared, and control variables commonly used in the literature. We use CEO fixed effects in all regressions to diminish the impact of time-invariant CEO-specific heterogeneity, such as training in business/economics, or prior work experience in a finance role. Our results are shown in Table 5. The coefficient of tenure is positive in all specifications, and the coefficient of tenure squared is negative. Column 1 shows that tenure does not seem to be significantly correlated with the profitability of CEO purchases. However, when we allow for a concave relation in column 2, both tenure and its square become significant, which, along with the rise in the adjusted  $R^2$  suggests that this specification fits the data better. Column 3 indicates that the relation between tenure and CEO trading profits is not driven by past stock returns. Finally, in column 4 the level form of CEO tenure loses its significance ( $p=0.19$ ), although neither market valuation, nor size are significant in the regression, while the number of observations drops by 7%.

– *Insert Table 5 here* –

Based on the results in columns 2 and 3, we can interpret the magnitude of the effect of tenure on the profits to CEOs' insider purchases. One additional year in office increases the profitability of CEO trading by 55-64 basis points, but this effect is concave, and declines by 2 basis points with each additional year of tenure. The average 10-day CAR following insider purchases is 2.63% (from Table 3), therefore the effect of one additional year of tenure relative to the mean is 21-25%, decreasing by 0.8% each year.

To further investigate the relation between CEO contract horizon and insider trading, we now restrict the analysis to the sample of fixed-term contracts and regress insider trading on contract length and control variables. The results, shown in Table 6, indicate that fixed-term CEOs with a longer contract horizon are less likely to be net buyers of their firm. The coefficient of the number of remaining years is negative in all specifications, and significant except in columns 6 and 8. The result that CEOs under fixed-term contracts are less likely to purchase stock if their contract horizon is long may be an indication that equity and contract length are substitutes. A possible alternative interpretation is that CEOs with longer contract horizons stay in office longer, increasing the number of years in which they do not purchase stock. To distinguish between this explanation and the one based on contract horizon, we include the ex-post horizon of the CEO in the regressions shown in columns 4, 5, 7 and 8. We find that the ex-post horizon of the CEO is positively related to the propensity to purchase the firm's stock, whereas the relation between contract horizon and being a net buyer remains significantly negative. CEOs of large firms are less likely to be net buyers, as are CEOs who already own a considerable stake, or have received large amounts of restricted stock. There are two possible interpretations for the positive relation between fixed-term CEOs'

purchasing stock and their ex-post spell at the firm. First, since CEOs with fixed-term contracts invest more (Xu (2012)), they may be at an informational advantage regarding the profitability of the firm going forward, and purchase more stock well before they expect the investments to pay off. A second interpretation is that both the CEO's decision to purchase stock and her ex-post horizon at the firm are driven by the quality of the match between the CEO and the firm, which we do not observe in this specification.

– *Insert Table 6 here* –

In all of the models reported in Table 6, the magnitude of the effect is larger than that of tenure. The estimates in column 4 show that for two CEOs employed under fixed-term contracts who have served the same number of years, and will remain in office for the same number of years, the CEO with a contract that is one year longer is 1.6% less likely to be a net buyer of the firm's stock. This is a 7% decrease relative to the average probability of a fixed-term CEO being a net buyer, which is 23%. From the logit model shown in column 5 we calculate the marginal effects evaluated at the mean of the covariates. This procedure also yields the same marginal effect of -1.6 percentage points for the number of years remaining on the contract. To summarize, we find some evidence that contract terms are correlated with CEOs' equity trades. The evidence we find is consistent with the interpretation that fixed-term contracts with long horizons and equity ownership are substitute mechanisms. This is a question that we intend to explore in further detail in a future version of the paper.

## 5. Insider trading and CEO turnover

Next, we test whether the insider trading behavior of the CEO predicts CEO turnover using duration models.. We estimate proportional hazard models of the general form

$$\lambda(t, \mathbf{X}) = \lambda_0(t)e^{\beta' \mathbf{X}} \quad (1)$$

where  $\lambda(t)$  represents the probability that the CEO departs in year  $t$ , conditional on having remained in office until year  $t$ .  $\lambda_0(t)$  is the baseline hazard, and  $\mathbf{X}$  is a matrix containing the variables that predict CEO turnover. We use two models for the baseline hazard: a Cox partial likelihood model (Cox (1972)), which does not specify a functional form for  $\lambda_0(t)$ , and a Weibull specification, which defines

$$\lambda_0(t) = \lambda \alpha t^{\alpha-1} \quad (2)$$

Table 7 presents the results of the estimated hazard models. Columns 1 and 2 show the estimates for the full sample, including both at-will and fixed-term contracts. The coefficient of the net buyer dummy is negative, statistically significant, and similar in magnitude in the two specifications. If the CEO is a net buyer of the firm's stock in a given year, they are 53-54% less likely to leave office. The estimated hazard models also show that CEOs employed at will have a higher turnover probability than otherwise similar CEOs on a fixed-term contract (Xu (2012)). The other variables with significant coefficients have the expected sign: CEOs are less likely to leave office if they are also chairmen of the board, were paid a high amount of restricted stock in the year before, or have a large ownership stake.

– *Insert Table 7 here* –

In columns 3 and 4 we present estimates of similar models for the subsample of fixed-term CEOs. Once again, the estimated coefficient of the net buyer dummy is negative and significant, its value is very similar in the two specifications, moreover, it is also comparable to the estimates for the full sample. Holding other firm and contract characteristics constant, a CEO employed under a fixed-term contract is 59-60% less likely to leave in a year in which they were net buyers of the firm's stock. Contract terms remain an important determinant of turnover in the fixed-term subsample: CEOs with one additional year to contract expiration are less likely to be dismissed. The coefficients of the chairman dummy and restricted stock awards are similar to those in the full sample, while CEO ownership appears not to be related to turnover for fixed-term CEOs. Finally, we find some evidence that larger firms are more likely to dismiss the CEO, as documented by Jenter and Lewellen (2010).

We report the shape parameter  $\alpha$  for the estimated Weibull models in columns 2 and 4. In both cases,  $\alpha$  is significantly larger than 1: the distributions exhibit positive duration dependence, which is quite plausible for CEO spells. To summarize, we show that CEOs are less likely to leave office if they are net buyers of the firm's stock in that year. We regard this as a first indication that CEO insider trading patterns predict CEO turnover. In the next section we subject this analysis to robustness checks and discuss how to enhance our empirical setup to better understand whether insider trades can indeed predict CEO turnover.

## 6. Robustness tests

This section presents robustness exercises and proposed extensions to our empirical methodology. In the analysis so far, we have considered all CEO transactions as voluntary, undertaken either because the CEO had private information, or because of their diversification or liquidity needs. However, firms impose a minimum level of stock ownership on CEOs (Core and Larcker (2002)). Especially if the CEO was hired from outside the firm, fulfilling these mandatory ownership requirements may lead to mechanical CEO purchasing in the first year of their tenure. To ensure that these transactions are not driving our results, we discard all firm-years in which the CEO is in their first year (tenure equals 0). Doing so reduces our sample by 1,300 observations (17.5%). Using this reduced sample, we re-estimate the models of Table 4 (tenure and CEO trading) and Table 7 (CEO trading and turnover).

– *Insert Table 8 here* –

Table 8 shows the relation between tenure and CEO trading with the first year of each CEO dropped. The results are qualitatively and quantitatively quite similar to those of the baseline analysis (reported in Table 3): CEOs who have served a longer tenure are less likely to buy the firm's stock. Moreover, in all of models 1-7 the magnitude of the coefficient of tenure increases. The relative increase is approximately 20% across models, and is largest (90%) in column 5. In all models except 6 and 9, this increase in the absolute value of the coefficient is coupled with a rise in the goodness-of-fit measures. We therefore conclude that eliminating the first year of each CEO's tenure from the sample reduces the number of noninformation-motivated purchases, and renders the relation between tenure and CEO insider trading stronger.

– *Insert Table 9 here* –

We present the hazard models of CEO turnover in Table 9. Excluding the first year of each CEO from the sample appears not to have a large impact on our models. The results from this robustness exercise are very similar to those shown in Table 7. CEOs are less likely to be dismissed in a year when they are net buyers of the firm's stock. Our inference on contract terms, stock ownership, and the CEO holding the position of chairman also remain unchanged. Our conclusion is that insider trading during the initial year of the CEO in office is not responsible for the relation we find between CEO trading and turnover.

– *Insert Table 10 here* –



The majority of the literature on CEO turnover uses logit (e.g. Denis et al. (1997), Mikkelsen and Partch (1997), Perry (1999), Huson et al. (2001)) or probit (Jenter and Lewellen (2010)) regressions to model CEO turnover. To ensure that our results are not driven by our empirical specification, we also estimate logit and probit models on firm-year observations, using a dummy equal to one if the CEO leaves in a given firm-year. Because duration models estimate the hazard rate, defined as the probability that the CEO leaves at time  $t$  *conditional on* having stayed in office until time  $t$ , we add tenure to the explanatory variables in the regressions to render them comparable to the duration models. The results from these models of CEO turnover are shown in Table 10. The estimates from both the logit and the probit models confirm that CEOs are significantly less likely to be net buyers of the firm's stock in the year that they leave.

There are two further refinements that we are going to address in a further version of the paper. First, to guard against sample selection bias arising from concentrating on CEOs fixed-term contracts, we propose to estimate a Heckman (1979) selection model. In the first stage, we run a probit regression to predict whether the CEO is employed under a fixed-term contract or an at-will contract. We rely on the literature in choosing the determinants of contract type (Miles (2000), Xu (2012)).

Second, we plan to refine our measurement of insider trading for the analysis of CEO turnover. Currently, we drop all trades of the CEO that occur after the CEO leaves, to ensure that selling stock from restricted stock grants or option packages with accelerated vesting (Dahiya and Yermack (2008)) do not affect our results. This means that the final calendar year of CEO trading information is truncated. A potential concern is that the CEO would have purchased stock exactly during the months that we discard, had they not been dismissed. To address this issue, we propose to omit all CEO trades *each year* that occur after the date (month and day) on which the CEO left in their last year. For a CEO who left the firm on May 26, 2012, this means that we would only consider trades that she placed prior to May 26 in all of her years in office. Using this procedure, we hope to shed further light on the relation between CEO equity trading and turnover.

## 7. Conclusion

This paper investigates the relationship between two devices that corporations use to mitigate the agency problem between shareholders and managers: managerial stock ownership and employment

contracts. We use data on the contracts and equity trades of 3,033 CEOs in the United States to show that CEO tenure, contract terms, and insider trading are interlinked.

We find that CEO tenure of the CEO is negatively related to the likelihood of purchasing stock: CEOs with an additional year served are 1-2 percentage points less likely to buy their firm's shares. This result reflects that CEOs are reluctant to increase their ownership if they anticipate that they will leave the firm. First, they will not have access to private information about the stock, second, they diversify their financial investments as their human capital becomes more risky.

The profitability of CEO purchases increases with tenure. The CARs following CEO purchases increase by 55-60 basis points with each year spent in office. However, the relation is concave as the rate of increase in CARs is 2 basis points lower for each additional year of tenure. This pattern suggests that CEOs learn about the firm over time, and that they learn the most during their first years in office.

We also document that insider trading is strongly correlated with CEO turnover. After controlling for past performance, firm and industry characteristics, governance factors used in prior studies, and CEO contract terms, we find that CEO turnover is 53-60% less likely in a year when CEOs are net buyers of the firm's stock. This result is a first indication that CEOs anticipate their departure, and reduce their equity stake in the firm.

Finally, CEO contract terms appear to matter for insider trading decisions. For CEOs employed under fixed-term contracts, we document that a longer contract horizon is associated with a lower likelihood of the CEO purchasing the firm's stock. This finding is congruent with the idea that long-term contracts and equity ownership are substitutes.

The results of our paper underscore that CEOs manage their equity ownership depending on where they are and where they expect to go in their career. Our analysis highlights a source of endogeneity for CEO equity ownership, and suggests that CEO incentive packages, employment contracts, and firm-level insider trading policies should be viewed and designed jointly.

**Appendix – variable definitions**

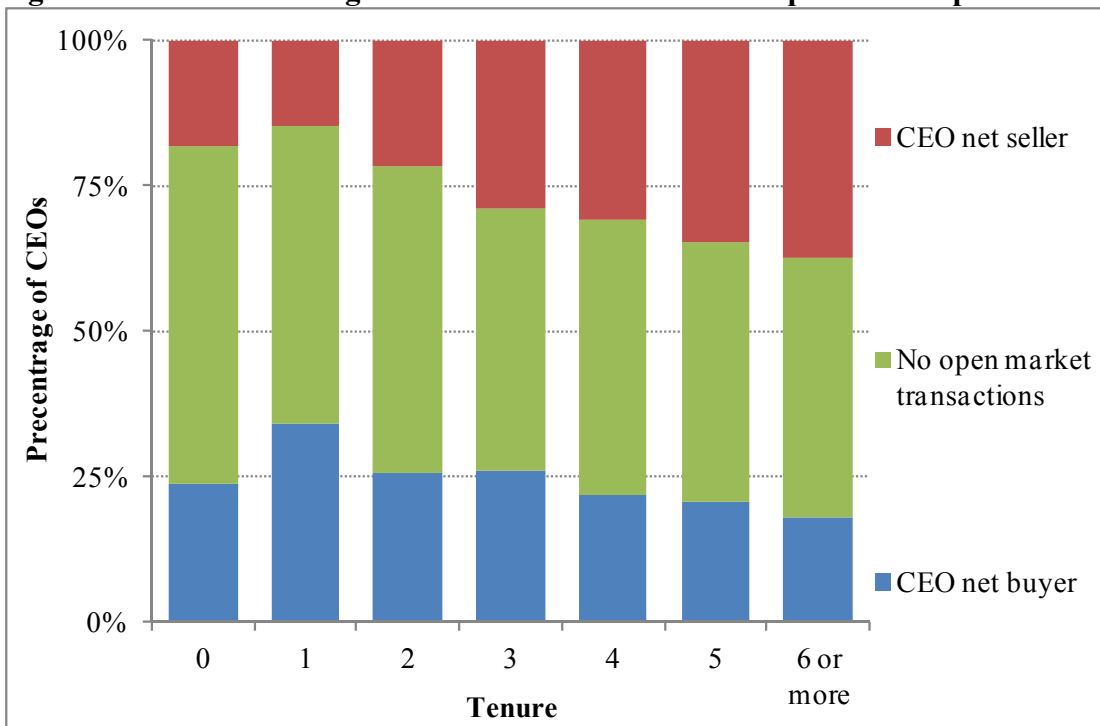
<b>Variable name</b>	<b>Definition</b>
Acquisition expense	Ratio of acquisition expenses to total assets
Age	Executive's age in years
At-will	1 if the CEO is employed under an at-will contract and 0 otherwise
B/M	Ratio of the book value of assets to the market value of assets: the market value is calculated as the sum of the book value of assets and the market value of common stock less the book value of common stock, cash, and deferred taxes. Market values are measured at the end of the fiscal year.
Board size	Number of board members
CEO ownership	The fraction of the firm's stock held by the CEO
Chairman = CEO	1 if the CEO is also chairman of the board
Change in return volatility	Difference between stock return volatility from during the past calendar year and the year before
Contract length	The length of the contract offered to the CEO
Director ownership	The fraction of the firm's stock held by directors
Dividend payer	1 if the firm pays dividends in the previous year
Industry homogeneity	Median (across all firms of one of the 49 Fama-French industries) of the percentage variation in monthly stock returns that is explained by an equally weighted industry index; market-adjusted returns are annual stock returns adjusted by the value-weighted CRSP index.
Industry returns	Stock return of the industry computed based on the 49 Fama-French industries
Institutional ownership	Fraction of institutional ownership listed in the 13f filings compiled by Thomson Reuters
Market-to-book	The inverse of B/M
CEO net buyer	1 if the CEO bought more stock in the open market than she sold
Over 60	1 if the CEO is over 60
Ex-post horizon	The total number of years between the CEO entering in office and leaving
Remaining years	Year of contract expiration less the current year
Restricted stock awards	Value of restricted stock awarded in the current year as a fraction of total compensation
Stock return	Stock returns over the calendar year
Return volatility	Realized volatility of the stock return measured over the calendar year
RiskMetrics data	1 if RiskMetrics data are available on CEO and director voting rights
ROA growth	Year-on-year growth of return on assets
Salary	CEO's base salary (in \$ thousands)
Size	Natural logarithm of total assets
Tenure	The number of years the CEO has been in office
Total compensation	CEO's total annual compensation in thousands of US\$

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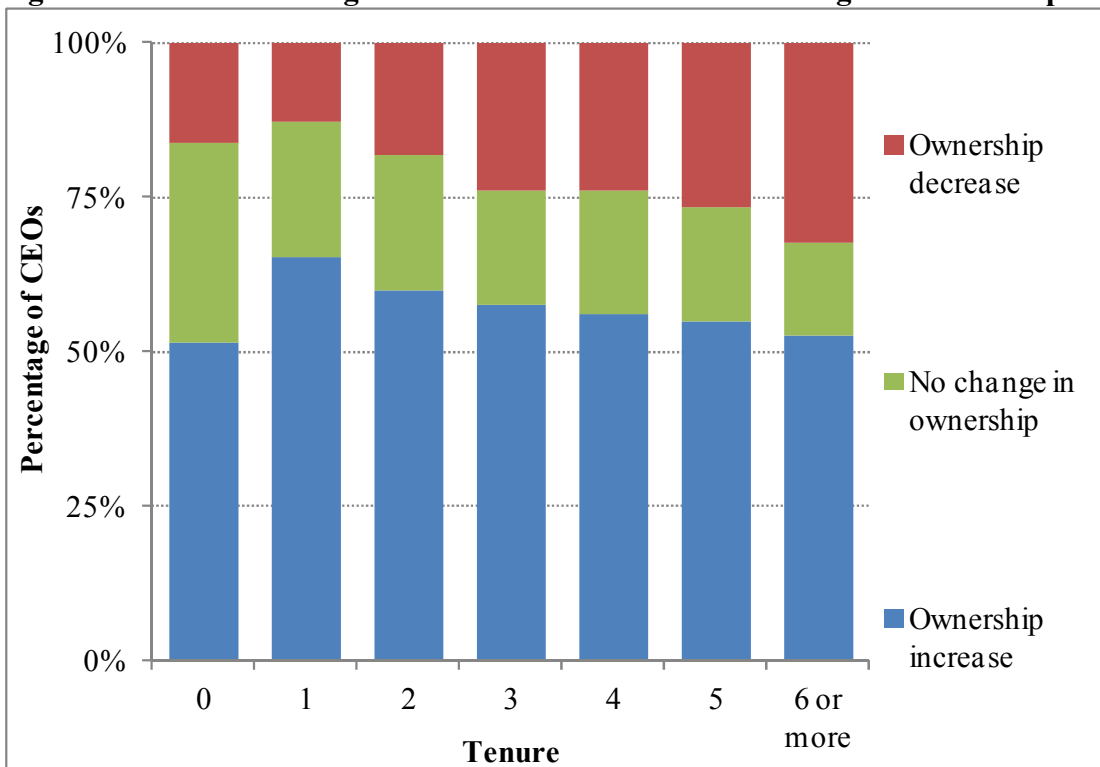
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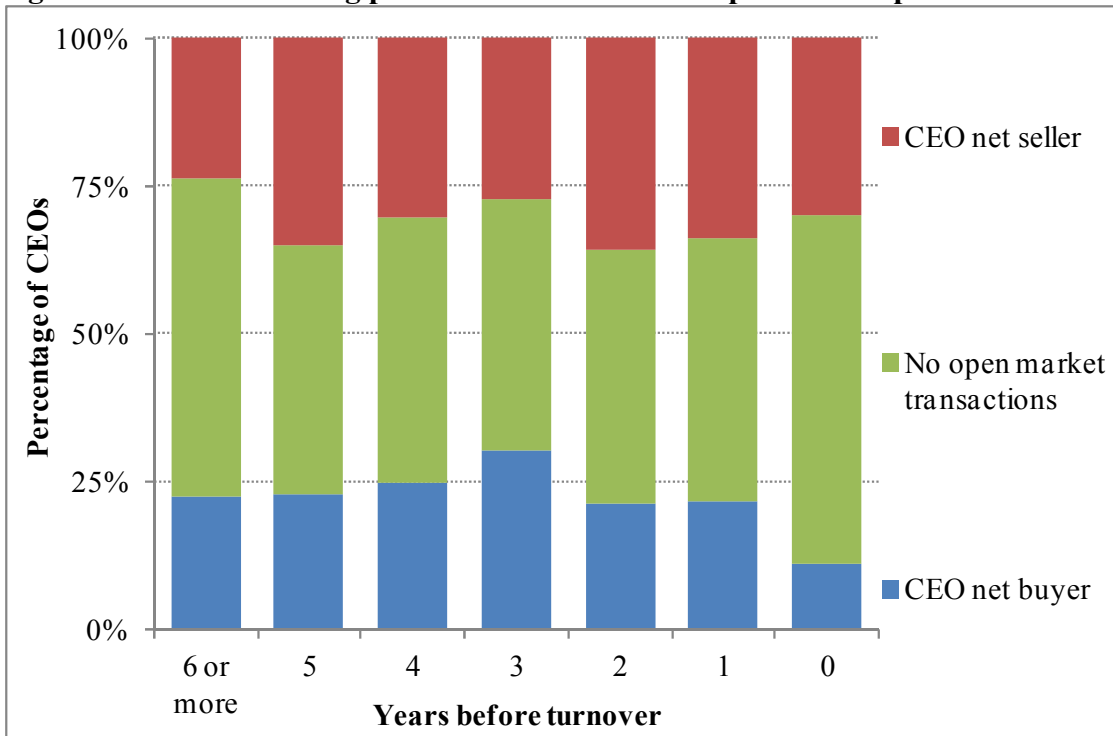
**Figure 1A. Insider trading over the tenure of the CEO – open market purchases**



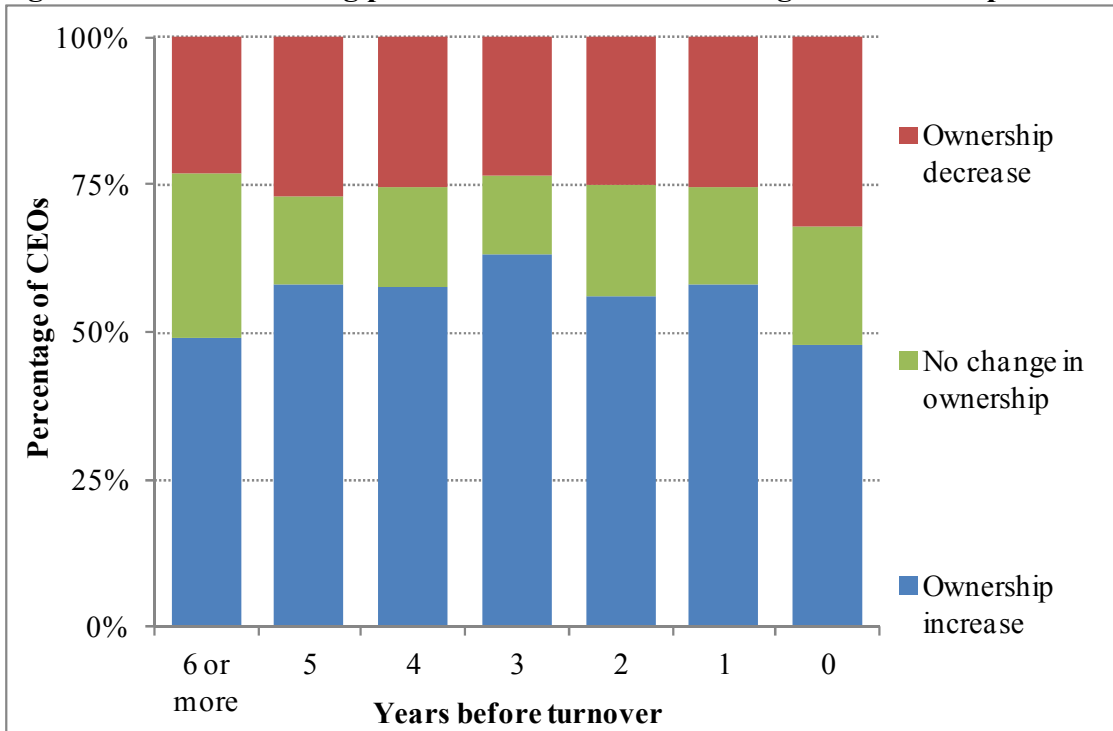
**Figure 1B. Insider trading over the tenure of the CEO – changes in ownership**



**Figure 2A. Insider trading prior to CEO turnover – open market purchases**



**Figure 2B. Insider trading prior to CEO turnover – changes in ownership**



**Table 1. Sample composition**

Information on CEO contracts is gathered from SEC filings and The Corporate Library. Insider trading data are from Thomson Reuters. *Panel A* reports the number of observations in the sample. *Panel B* tabulates the number of CEO employment contracts per firm. *Panel C* provides a break-down of observations by calendar year. In *Panel D*, we show the number of open market transactions placed by our sample CEOs. *Panel E* summarizes CEO insider trading by calendar year

## Panel A

	Total	At-will	Fixed-term
Number of firms	2,110		
Number of CEOs	2,308		
Number of CEO contracts	3,033	683	2,350
Number of firm-years	7,434	2,061	5,378

## Panel B

	Number of contracts	Number of firms	Percent of firms
1		1,418	67.20
2		506	23.98
3		149	7.06
4		32	1.52
5		3	0.14
6		1	0.05
7		1	0.05
Total		2,110	



## Panel C

Year	Firm-years			Percent	Cumulated
	At-will	Fixed-term	Total		
1989	3	11	14	0.19	0.19
1990	3	14	17	0.23	0.42
1991	5	14	19	0.26	0.67
1992	12	15	27	0.36	1.04
1993	17	19	36	0.48	1.52
1994	26	28	54	0.73	2.25
1995	36	51	87	1.17	3.42
1996	51	102	153	2.06	5.47
1997	65	191	256	3.44	8.92
1998	70	266	336	4.52	13.44
1999	101	317	418	5.62	19.06
2000	121	366	487	6.55	25.61
2001	127	394	521	7.01	32.62
2002	142	445	587	7.90	40.52
2003	146	436	582	7.83	48.35
2004	188	477	665	8.95	57.29
2005	211	538	749	10.08	67.37
2006	241	551	792	10.65	78.02
2007	230	544	774	10.41	88.43
2008	266	594	860	11.57	100.00
Total	2,061	5,373	7,434	100	

## Panel D

Year	Purchases	Sales	Open market trades
1989	4	4	8
1990	17	9	26
1991	35	32	67
1992	9	58	67
1993	22	34	56
1994	58	33	91
1995	62	104	166
1996	173	277	450
1997	192	444	636
1998	639	511	1,150
1999	847	697	1,544
2000	867	1,300	2,167
2001	741	1,946	2,687
2002	1,155	4,488	5,643
2003	636	4,236	4,872
2004	810	6,487	7,297
2005	1,019	10,069	11,088
2006	939	11,454	12,393
2007	1,397	15,224	16,621
2008	2,693	9,415	12,108
Total	12,315	66,822	79,137

## Panel E

	Firm-years
CEO net buyer	1,683
CEO net seller	2,128
No open market transactions	3,623
Ownership increase	4,107
Ownership decrease	1,808
No change in ownership	1,519
Total	7,434

**Table 2. Descriptive statistics**

This table shows descriptive statistics for the variables used in the multivariate analysis. Insider trading data are from Thomson Reuters, accounting data are collected from Compustat, information on executive compensation from ExecuComp. Stock returns are taken from CRSP. Accounting, and executive compensation data are lagged one year. The data span 1989-2008.

	Mean	Median	St. Dev.	Minimum	Maximum	N
Net buyer	0.23	0.00	0.42	0	1	7434
Tenure	5.90	4.00	6.47	0	44	7,434
Contract length	2.71	3.00	2.37	0	22	7,434
At-will	0.28	0.00	0.45	0	1	7,434
Ex-post horizon	3.48	3.00	3.08	0	20	3,540
Age	53.05	53.00	7.94	22	84	7,230
Total assets (million USD)	1,725	463	2,705	1	8,549	6,717
Log total assets	6.01	6.14	1.98	0.29	9.05	6,717
B/M	0.62	0.49	0.72	-3.68	36.21	6,267
Stock return	0.02	0.01	0.13	-0.35	0.52	5,855
Industry return	0.03	0.04	0.23	-0.57	0.59	6,744
Return volatility	0.04	0.03	0.09	0	4.58	4,443
Change in return volatility	0	0	0.14	-4.56	4.49	4,183
Salary	545	475	326	0	3,550	5,007
Total compensation	3,696	1,188	13,255	-4,828	575,596	5,001
CEO ownership	0.56	0	4.38	0	97.40	7,434
Restricted stock awards	695	0	2,282	-5,170	44,200	3,813
Director ownership	1.62	0.00	6.23	0	46.10	7,434

**Table 3. Cumulative Abnormal Returns following CEO purchases and sales of company stock**

This table contains descriptive statistics on cumulative abnormal returns (CARs) following CEO transactions. CARs are calculated based on a Carhart four-factor model. The model parameters are estimated using returns for the period starting 280 days and ending 41 days before the event. *Panel A* shows summary statistics on the full sample, and then splitting the transactions by CEO contract type in the last 3 columns. The statistical significance of CARs is assessed using a conventional t-test, and the z-test proposed by Boehmer, Musumeci and Poulson (1991). The rightmost column of *Panel A* contains t-statistics testing if CARs are equal across contract types. *Panel B* provides a breakdown of CARs by the CEO tenure.

Panel A											
	Average	St. Dev	Median	Minimum	Maximum	N	t-test	z-test	Fixed-term Average	At-will Average	Difference t-test
Purchases											
CAR(0,10)	2.63%	11.90%	1.32%	-30.97%	36.69%	4,793	15.30***	15.19***	2.17%	4.22%	-4.77***
CAR(0,20)	3.84%	16.03%	2.17%	-43.45%	47.80%	4,516	16.08***	16.42***	3.27%	5.81%	-4.33***
Sales											
CAR(0,10)	-1.15%	9.32%	-1.02%	-30.97%	36.69%	11,501	-11.94***	-12.58***	-1.09%	-1.30%	1.05
CAR(0,20)	-2.10%	13.21%	-1.55%	-43.45%	47.80%	10,917	-15.34***	-15.94***	-1.95%	-2.45%	1.74*
Panel B											
	Tenure										
	0	1	2	3	4	5	6 or more				
Purchases											
CAR(0,10)	2.19%	2.54%	1.43%	3.45%	1.33%	4.20%	2.81%				
CAR(0,20)	3.08%	2.88%	1.22%	6.57%	4.27%	6.74%	3.82%				
Sales											
CAR(0,10)	-0.68%	-2.12%	-2.89%	-1.07%	-1.05%	-0.92%	-1.05%				
CAR(0,20)	-1.59%	-3.69%	-4.54%	-2.50%	-1.67%	-1.51%	-1.92%				

**Table 4. CEO tenure and insider trading**

The dependent variable is a dummy equal to 1 if the CEO is a net buyer of the firm's stock. Independent variables are defined in the Appendix, and are winsorized at the 1% level, except for binary variables. Columns 2, 4, 7, and 9 contain estimates from logit regressions, all other columns contain estimates from OLS regressions. The table shows coefficient estimates and standard errors (in brackets). Standard errors for OLS regressions are robust to heteroskedasticity and clustered at the CEO level. Standard errors for logit regressions are based on bootstrap estimation with 100 replications. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level.

	Dependent variable: CEO net buyer								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	OLS	Logit	OLS	Logit	OLS	OLS	Logit	OLS	Logit
Tenure	-0.0119*** [0.0030]	-0.1073*** [0.0174]	-0.0053*** [0.0011]	-0.0556*** [0.0146]	-0.0036** [0.0016]	-0.0074*** [0.0018]	-0.0736*** [0.0187]	-0.0102 [0.0124]	-0.1091 [0.1235]
Age			0.0003 [0.0009]	-0.0052 [0.0082]	-0.0005 [0.0012]	0.0006 [0.0016]	0.0103 [0.0134]		
Ex-post horizon					0.0074** [0.0030]				
Size						-0.0136 [0.0091]	-0.0484 [0.0665]	0.0319 [0.0494]	0.2944 [0.3835]
B/M						0.0606*** [0.0225]	0.2880* [0.1514]	0.0069 [0.0536]	-0.0593 [0.2547]
Stock return						-0.0227** [0.0107]	-0.1286 [0.1049]	-0.0105 [0.0166]	-0.1311 [0.2011]
Return volatility						-0.2318 [0.6174]	-0.4294 [5.1963]	2.8580 [1.8086]	24.6961 [17.5152]
Change in return volatility						0.3643* [0.2199]	10.1489 [6.4602]	-0.4282 [1.2113]	0.7458 [15.9928]
Salary						-0.0001** [0.0000]	-0.0002 [0.0004]	-0.0001 [0.0002]	-0.0007 [0.0017]
Total compensation						-0.0000** [0.0000]	-0.0003*** [0.0001]	-0.0000 [0.0000]	-0.0003 [0.0002]
CEO ownership						-0.0083** [0.0039]	-0.0745 [0.0614]	0.0030 [0.0108]	0.0681 [0.2825]
Restricted stock awards						-0.0000** [0.0000]	0.0000 [0.0000]	0.0000 [0.0000]	0.0000 [0.0000]
Constant	0.2963*** [0.0180]		0.2446*** [0.0443]	-1.1452*** [0.4270]	0.2329*** [0.0639]	0.3859*** [0.0933]	-0.9959 [0.7847]	0.0631 [0.3012]	Yes 517
CEO FE	Yes	Yes						Yes	Yes
Observations	7,434	3,057	7,230	7,230	3,396	1,766	1,766	1,800	517
Adjusted R <sup>2</sup>	32.60%		0.60%			4.90%		35.50%	

**Table 5. CEO tenure and the informativeness of insider purchases**

The dependent variable is CAR(0,10), the cumulative abnormal return measured over the 10 trading days following a CEO purchase. Independent variables are defined in the Appendix, and are winsorized at the 1% level, except for binary variables. All columns contain estimates from OLS regressions. The table shows coefficient estimates and standard errors (in brackets). Standard errors for OLS regressions are robust to heteroskedasticity and double-clustered at the CEO and at the year level. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level.

	<b>Dependent variable: CAR(0,10)</b>			
	(1) OLS	(2) OLS	(3) OLS	(3) OLS
Tenure	0.0014 [0.0014]	0.0064*** [0.0024]	0.0055* [0.0030]	0.0042 [0.0032]
Tenure <sup>2</sup>		-0.0002** [0.0001]	0.0002*** [0.0001]	-0.0002** [0.0001]
Stock return			-0.0862** [0.0348]	0.0852*** [0.0326]
Size				-0.0011 [0.0097]
B/M				0.0150 [0.0113]
Constant	0.0192*** [0.0000]	0.3296 [.0113]	0.0110 [0.0143]	0.0504 [0.1910]
CEO FE	Yes	Yes	Yes	Yes
Observations	4,793	4,793	4,485	4,196
Adjusted R <sup>2</sup>	17.80%	18.00%	20.10%	20.20%

**Table 6. CEO contract length and insider trading for CEOs employed under fixed-term contracts**

The dependent variable is a dummy equal to 1 if the CEO is a net buyer of the firm's stock. Independent variables are defined in the Appendix, and are winsorized at the 1% level, except for binary variables. Columns 2, 5, and 8 contain estimates from logit regressions, all other columns contain estimates from OLS regressions. The table shows coefficient estimates and standard errors (in brackets). Standard errors for OLS regressions are robust to heteroskedasticity and clustered at the CEO level. Standard errors for logit regressions are based on bootstrap estimation with 100 replications. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level.

	Dependent variable: CEO net buyer							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	Logit	OLS	OLS	Logit	OLS	OLS	Logit
Tenure	-0.0041*** [0.0012]	-0.0515*** [0.0158]	-0.0045*** [0.0012]	-0.0041** [0.0016]	-0.0435* [0.0226]	-0.0066*** [0.0020]	-0.0054* [0.0028]	-0.1102 [0.1879]
Contract length	-0.0170*** [0.0033]	-0.1060** [0.0540]	-0.0177*** [0.0034]	-0.0157*** [0.0037]	-0.1473** [0.0631]	-0.0074 [0.0060]	-0.0101* [0.0059]	-0.1260 [0.3843]
Age			0.0006 [0.0010]	-0.0001 [0.0014]	-0.0108 [0.0118]	0.0013 [0.0018]	0.0020 [0.0027]	0.0206 [0.0878]
Ex-post horizon				0.0088** [0.0036]	0.1293*** [0.0465]		0.0225** [0.0108]	0.2877 [0.3992]
Size						-0.0149 [0.0099]	-0.0250* [0.0146]	-0.1588 [0.5933]
B/M						0.0605** [0.0287]	0.0216 [0.0385]	-0.0575 [0.8938]
Stock return						-0.0273** [0.0121]	0.0004 [0.0194]	0.1827 [0.6570]
Return volatility						0.3721 [0.7404]	0.9916 [1.0959]	9.7775 [36.7917]
Change in return volatility						0.3424 [0.2093]	1.1219 [1.0680]	11.7817 [42.2137]
Salary						-0.0001** [0.0001]	-0.0001 [0.0001]	0.0002 [0.0032]
Total compensation						-0.0000* [0.0000]	-0.0000 [0.0000]	-0.0002 [0.0006]
CEO ownership						-0.0103*** [0.0029]	-0.0178*** [0.0061]	-0.3504 [0.4427]
Restricted stock awards						-0.0000** [0.0000]	-0.0000 [0.0000]	0.0000 [0.0000]
Constant	0.3198*** [0.0157]	-1.0718*** [0.2048]	0.2929*** [0.0498]	0.2682*** [0.0747]	-1.0542 [0.6816]	0.3639*** [0.1062]	0.2555 [0.1561]	-2.1205 [5.1887]
Observations	5,373	5,373	5,211	2,426	2,426	1,264	508	508
Adjusted R <sup>2</sup>	1.10%		1.20%	1.40%		5.50%	5.90%	

**Table 7. Insider trading and CEO turnover**

This table presents hazard models of CEO turnover. Independent variables are defined in the Appendix, and are winsorized at the 1% level, except for binary variables. The table shows hazard rates and z-statistics (in parentheses). Columns 1 and 3 contain Cox partial hazard models, columns 2 and 4 contain Weibull models. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level.

	(1) All Cox	(2) All Weibull	(3) Fixed-term Cox	(4) Fixed-term Weibull
Net buyer	0.4608*** (-4.044)	0.4727*** (-3.909)	0.4033*** (-3.43)	0.4120*** (-3.348)
At-will	1.5246*** (3.409)	1.5519*** (3.544)		
Remaining years			0.7659*** (-5.09)	0.7631*** (-5.16)
Age	1.1037 (1.208)	1.1080 (1.268)	1.0502 (0.508)	1.0602 (0.602)
Age <sup>2</sup>	0.9990 (-1.25)	0.9989 (-1.375)	0.9997 (-0.333)	0.9996 (-0.444)
Over 60	1.2205 (0.933)	1.2379 (0.994)	0.9612 (-0.157)	0.9704 (-0.119)
Stock return	0.9463 (-0.114)	0.9207 (-0.17)	1.1698 (0.255)	1.1447 (0.219)
Industry return	1.2371 (0.485)	1.2350 (0.481)	0.7822 (-0.444)	0.7957 (-0.411)
Dividend payer	1.0689 (0.521)	1.0839 (0.631)	0.9021 (-0.645)	0.9015 (-0.648)
Market-to-book	0.9889 (-0.354)	0.9918 (-0.26)	1.0673* (1.7)	1.0690* (1.732)
ROA growth	0.9935 (-0.199)	0.9932 (-0.21)	0.9800 (-0.498)	0.9824 (-0.432)
Size	1.0214 (0.558)	1.0224 (0.576)	1.0944* (1.804)	1.0947* (1.794)
Acquisition expense	10.3226 (0.952)	14.0340 (1.075)	0.1045 (-0.639)	0.1245 (-0.588)
Industry homogeneity	0.9768 (-0.176)	0.9901 (-0.075)	1.0718 (0.411)	1.0819 (0.467)
Institutional ownership	0.5615*** (-2.759)	0.5658*** (-2.714)	0.6497* (-1.712)	0.6612 (-1.642)
Chairman = CEO	0.3504*** (-8.239)	0.3289*** (-8.7)	0.3444*** (-6.54)	0.3257*** (-6.86)
Restricted stock awards	0.6271* (-1.834)	0.6278* (-1.824)	0.5605* (-1.767)	0.5664* (-1.725)
CEO ownership	0.9474* (-1.856)	0.9457* (-1.924)	0.9720 (-1.219)	0.9712 (-1.237)
Director ownership	1.0046 (0.719)	1.0044 (0.677)	1.0114 (1.569)	1.0114 (1.569)
Board size	1.0301 (1.344)	1.0287 (1.269)	1.0246 (0.853)	1.0259 (0.885)
RiskMetrics data	1.2488 (0.969)	1.2363 (0.919)	1.1094 (0.375)	1.0997 (0.342)
Year FE	Yes	Yes	Yes	Yes
$\alpha$		1.4600***		1.4197***
Observations	4,271	4,271	2,963	2,963



**Table 8. CEO tenure and insider trading – dropping the first year of each CEO**

The dependent variable is a dummy equal to 1 if the CEO is a net buyer of the firm's stock. Independent variables are defined in the Appendix, and are winsorized at the 1% level, except for binary variables. The first year in office of each CEO is discarded from the data. Columns 2, 4, 7, and 9 contain estimates from logit regressions, all other columns contain estimates from OLS regressions. The table shows coefficient estimates and standard errors (in brackets). Standard errors for OLS regressions are robust to heteroskedasticity and clustered at the CEO level. Standard errors for logit regressions are based on bootstrap estimation with 100 replications. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level.

	Dependent variable: CEO net buyer								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	OLS	Logit	OLS	Logit	OLS	OLS	Logit	OLS	Logit
Tenure	-0.0146*** [0.0034]	-0.1303*** [0.0296]	-0.0061*** [0.0012]	-0.0676*** [0.0104]	-0.0055*** [0.0018]	-0.0076*** [0.0020]	-0.0773*** [0.0206]	-0.0040 [0.0130]	-0.0508 [0.1439]
Age		0.0011 [0.0009]	0.0011 [0.0009]	0.0042 [0.0077]	0.0015 [0.0014]	0.0013 [0.0017]	0.0160 [0.0148]		
Ex-post horizon					0.0098*** [0.0036]				
Size						-0.0135 [0.0095]	-0.0455 [0.0716]	-0.0004 [0.0519]	0.0382 [0.4012]
B/M						0.0630*** [0.0235]	0.3213** [0.1610]	0.0085 [0.0627]	-0.0811 [0.3533]
Stock return						-0.0153 [0.0114]	-0.0386 [0.1089]	-0.0031 [0.0160]	-0.0430 [0.1863]
Return volatility						-0.2354 [0.6503]	-2.0325 [5.8296]	2.5087 [1.8758]	29.7564 [20.2294]
Change in return volatility						0.3655 [0.2221]	12.6752* [7.2566]	-0.1433 [1.2483]	4.3351 [19.3439]
Salary						-0.0001* [0.0001]	-0.0000 [0.0005]	-0.0001 [0.0002]	-0.0005 [0.0022]
Total compensation						-0.0000** [0.0000]	-0.0004*** [0.0001]	-0.0000 [0.0000]	-0.0003 [0.0003]
CEO ownership						-0.0061 [0.0038]	-0.0301 [0.0555]	0.0077 [0.0110]	0.1448 [0.3785]
Restricted stock awards						-0.0000** [0.0000]	0.0000 [0.0000]	0.0000 [0.0000]	0.0000 [0.0000]
Constant	0.3287*** [0.0241]		0.2109*** [0.0486]	-1.5401*** [0.3953]	0.1337* [0.0727]	0.3351*** [0.0991]	-1.2724 [0.8732]	0.2312 [0.3129]	
CEO FE	Yes	Yes						Yes	Yes
Observations	6,134	2,427	6,044	6,044	2,728	1,555	1,555	1,573	419
Adjusted R-squared	33.60%	2.57%	0.80%		1.00%	4.70%		37.60%	8.64%

**Table 9. Insider trading and CEO turnover – dropping the first year of each CEO**

This table presents hazard models of CEO turnover. Independent variables are defined in the Appendix, and are winsorized at the 1% level, except for binary variables. The first year in office of each CEO is discarded from the data. The table shows hazard rates and z-statistics (in parentheses). Columns 1 and 3 contain Cox partial hazard models, columns 2 and 4 contain Weibull models. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level.

	(1) All Cox	(2) All Weibull	(3) Fixed-term Cox	(4) Fixed-term Weibull
Net buyer	0.4861*** (-3.585)	0.5013*** (-3.432)	0.4590*** (-2.918)	0.4697*** (-2.831)
At-will	1.5022*** (3.093)	1.5316*** (3.23)		
Remaining years			0.7911*** (-4.283)	0.7876*** (-4.358)
Age	1.1455 (1.49)	1.1492 (1.54)	1.0807 (0.722)	1.0936 (0.826)
Age <sup>2</sup>	0.9986 (-1.556)	0.9986* (-1.75)	0.9994 (-0.6)	0.9992 (-0.8)
Over 60	1.1415 (0.584)	1.1573 (0.641)	0.8848 (-0.457)	0.8948 (-0.412)
Stock return	1.0656 (0.123)	1.0354 (0.067)	1.5217 (0.65)	1.5096 (0.635)
Industry return	0.8748 (-0.284)	0.8760 (-0.28)	0.5497 (-1.007)	0.5484 (-1.005)
Dividend payer	1.0400 (0.29)	1.0579 (0.415)	0.8208 (-1.165)	0.8186 (-1.176)
Market-to-book	0.9793 (-0.613)	0.9835 (-0.487)	1.0509 (1.198)	1.0523 (1.223)
ROA growth	0.9877 (-0.357)	0.9871 (-0.375)	0.9705 (-0.697)	0.9724 (-0.645)
Log sales	1.0471 (1.119)	1.0487 (1.147)	1.0970* (1.734)	1.0961* (1.703)
Acquisition expense	19.1211 (1.147)	28.5183 (1.298)	0.2875 (-0.344)	0.3452 (-0.292)
Industry homogeneity	1.0145 (0.103)	1.0283 (0.199)	1.0798 (0.431)	1.0941 (0.506)
Institutional ownership	0.5487*** (-2.662)	0.5544*** (-2.605)	0.6493 (-1.6)	0.6620 (-1.527)
Chairman = CEO	0.3525*** (-7.776)	0.3275*** (-8.274)	0.3430*** (-6.26)	0.3228*** (-6.597)
Restricted stock awards	0.4731*** (-2.682)	0.4741*** (-2.667)	0.4916** (-2.02)	0.4967** (-1.982)
CEO ownership	0.9323* (-1.788)	0.9308* (-1.858)	0.9672 (-1.061)	0.9669 (-1.066)
Director ownership	1.0004 (0.051)	0.9999 (-0.012)	1.0068 (0.81)	1.0065 (0.756)
Board size	1.0374 (1.562)	1.0356 (1.477)	1.0422 (1.377)	1.0448 (1.446)
RiskMetrics data	1.1531 (0.563)	1.1271 (0.469)	0.8644 (-0.477)	0.8368 (-0.58)
Year FE	Yes	Yes	Yes	Yes
$\alpha$		1.4830***		1.4400***
Observations	3,742	3,742	2,603	2,603

**Table 10. Insider trading and CEO turnover – alternative functional forms**

This table presents logit and probit models of CEO turnover. The dependent variable is equal to 1 if the CEO leaves in a given year, and 0 otherwise. Independent variables are defined in the Appendix, and are winsorized at the 1% level, except for binary variables. The table shows coefficients and standard errors (in brackets). Columns 1 and 3 contain probit models, columns 2 and 4 show logit models. \*, \*\*, and \*\*\* indicate significance at the 10%, 5%, and 1% level.

	Dependent variable: CEO turnover			
	(1) All Probit	(2) All Logit	(3) Fixed-term Probit	(4) Fixed-term Logit
Net buyer	-0.5376*** [0.0904]	-1.1147*** [0.1966]	-0.5757*** [0.1191]	-1.2688*** [0.2711]
At-will	0.1662** [0.0651]	0.3238** [0.1295]		
Remaining years			-0.1356*** [0.0268]	-0.3072*** [0.0576]
Tenure	-0.0009 [0.0052]	-0.0009 [0.0104]	-0.0050 [0.0064]	-0.0112 [0.0128]
Age	0.0223 [0.0441]	0.0430 [0.0870]	-0.0078 [0.0546]	-0.0098 [0.1056]
Age <sup>2</sup>	-0.0001 [0.0004]	-0.0002 [0.0008]	0.0003 [0.0005]	0.0006 [0.0010]
Over 60	0.0519 [0.1149]	0.1365 [0.2243]	-0.0927 [0.1394]	-0.1278 [0.2702]
Returns	-0.0148 [0.2415]	0.0269 [0.5007]	-0.0032 [0.3091]	0.0784 [0.6459]
Industry returns	0.1164 [0.2220]	0.2380 [0.4539]	-0.1441 [0.2821]	-0.2852 [0.5776]
Dividend payer	-0.0046 [0.0663]	-0.0184 [0.1328]	-0.0537 [0.0822]	-0.1214 [0.1655]
Market-to-book	-0.0064 [0.0155]	-0.0171 [0.0316]	0.0266 [0.0197]	0.0524 [0.0395]
ROA growth	-0.0097 [0.0165]	-0.0132 [0.0324]	-0.0185 [0.0212]	-0.0271 [0.0422]
Size	0.0054 [0.0179]	0.0125 [0.0361]	0.0347 [0.0235]	0.0873* [0.0483]
Acquisition expense	0.7909 [1.2771]	1.4733 [2.5568]	-1.0544 [1.7446]	-2.6448 [3.6351]
Industry homogeneity	-0.0604 [0.0696]	-0.1430 [0.1412]	-0.0220 [0.0885]	-0.0773 [0.1803]
Institutional ownership	-0.3031*** [0.1050]	-0.6148*** [0.2153]	-0.2880** [0.1297]	-0.6110** [0.2643]
Chairman = CEO	-0.2415*** [0.0668]	-0.4890*** [0.1354]	-0.2768*** [0.0846]	-0.5699*** [0.1723]
Restricted stock awards	-0.2545* [0.1311]	-0.5083* [0.2656]	-0.3269** [0.1663]	-0.6169* [0.3345]
CEO ownership	-0.0149 [0.0109]	-0.0375 [0.0292]	-0.0102 [0.0111]	-0.0171 [0.0219]
Director ownership	0.0041 [0.0035]	0.0064 [0.0067]	0.0071* [0.0042]	0.0142* [0.0076]
Board size	0.0169 [0.0111]	0.0307 [0.0222]	0.0119 [0.0139]	0.0124 [0.0278]
RiskMetrics data	0.1189 [0.1139]	0.2795 [0.2345]	0.0787 [0.1427]	0.2023 [0.2891]
Constant	-1.9630* [1.1845]	-3.4930 [2.3564]	-1.5839 [1.5079]	-2.9511 [2.9781]
Year FE	Yes	Yes	Yes	Yes
Observations	4,271	4,271	2,963	2,963