LARGE SHAREHOLDING NETWORKS AND EQUITY RAISING:

EVIDENCE FROM BANK-HOLDING COMPANIES

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- Large Shareholding Network
- Multiple Large Shareholders
- Seasoned Equity Offerings
- Bank-holding Companies
- Social Network Analysis
- Information Network
- Event Study
- Information Theory
- Adverse Selection

List of Abbreviations

AMEX	American Stock Exchange
BHC	Bank-holding Company
BIS	Bank for International Settlements
CAR	Cumulative Abnormal Return
CPP	Capital Purchase Program
CRSP	Center for Research in Security Prices
FDIC	Federal Deposit Insurance Corporation
FED	Federal Reserve System
GDP	Gross Domestic Product
GFC	Global Financial Crisis
NASDAQ	National Association of Securities Dealers Automated Quotations
NYSE	New York Stock Exchange
OCC	Comptroller of the Currency
OLS	Ordinary Least Square
SEC	Securities and Exchange Commission
SEO	Seasoned Equity Offering
SNA	Social Network Analysis
SNL	Saving and Loan
TARP	Troubled Assets Relief Program
VIF	Variance Inflation Factor
WRDS	Wharton Research Data Services

Abstract

Network centrality plays an important role in the relation between large shareholdings and firm performance. Network analysis suggests that, with information diffusing through large shareholding networks, firms that are more strategically positioned in the network can make more informed decisions. While social network analysis (SNA) has been widely used in corporate finance, there is a paucity of work in the context of banking firms.

My thesis examines the information network created by multiple large shareholders around seasoned equity offerings (SEOs) of bank-holding companies (BHCs). Analyzing the large shareholding network using SNA, which suggests that the participation of a central large investor is more value-enhancing than of other investors, I ask two main research questions: (i) is the presence of a large shareholders' network related to the value impact of SEO announcements, and if so, how?; and (ii) does the SEO announcement effects spill over to non-issuing BHCs that share the same large shareholding network as the issuing BHCs?

Using a sample of 148 SEO announcements made by 113 listed BHCs from 2010 to 2015 and 32,682 non-issuing BHCs which share the same large shareholders as the issuing BHCs, my main findings are as follows. First, results from the standard event study are consistent with the adverse selection (Myers and Majluf, 1984) explanation for SEO value effects, showing that issuing BHCs on average earn statistically significantly negative returns. OLS regressions show cross-sectional differences in the abnormal returns are related to large shareholding network centrality measures. This finding

contributes to the SEO literature for BHCs and support for my hypothesis (H1) that multiple large shareholders are able to capitalize on their position in the network to mitigate agency cost and information asymmetries.

Second, since the network created by large shareholders facilitates the transmission of relevant information across BHCs in the network, I hypothesise (H2) that there is a spillover in SEO announcement effects to non-issuing BHCs in the large shareholding network. My results show significant cumulative abnormal returns (CARs) to non-issuers, albeit substantially less negative and lower in magnitude than for issuers, around the SEO announcement. The spillover in the SEO announcement effect to non-issuers is associated with non-issuers' large shareholder centrality measures but not with those of the issuing BHCs. My results contribute to network centrality literature by suggesting that large shareholding networks create a spillover effect by transmitting information about the SEO announcements from issuers to other non-issuers belonging to the same large shareholder network.

My results are generally robust to the choice of the length of the event window and to using ownership concentration as an alternative way to capturing the information environment and the efficacy of agency conflict mitigation in BHCs.

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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature:

QUT Verified Signature

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Chapter 1

Introduction

1.1 Background and Motivation

A social network is a set of socially relevant nodes connected by one or more relations between constituents in the network, such as individuals, firms, and shareholder groups. Social network theory suggests that networks are valuable to businesses because the connections created allow relevant information and resources to be shared by those in the network. Previous research shows the informational advantage derived from social networks affects positively the investment performance of venture capitalists' funds (Hochberg, Ljungqvist, and Lu, 2007); reduces interest rates when banks and firms are connected through interpersonal linkages (Engelberg, Gao, and Parsons, 2012); facilitates good strategic decision making leading to higher average excess returns (Larcker, So, and Wang, 2013); increases monitoring efficacy (Kang, Luo, and Na, 2018); and mitigates asymmetric information such as when drafting contracts (Schoorman, Bazerman, and Atkin, 1981; Larcker and Tayan, 2010; Konijn, Kräussl, and Lucas, 2011; Fracassi, 2017). In the specific case of director networks, the evidence shows that such networks can improve information flow, decision making, operating performance, and stock returns (Larcker and Tayan, 2010; Renneboog and Zhao, 2011; Larcker et al., 2013; Omer, Shelley, and Tice, 2016).

Recent studies use social network analysis[1] (SNA) to investigate the role of institutional investors in blockholding networks[2] of corporate firms, and find that firms whose large shareholding network which includes institutional investors have higher value than those without. For example, Konijn et al. (2011) show that institutional investors with high network centrality are more likely to have investment in firms with large shareholders and have more co-ownership relationships (higher centrality). Fracassi (2017) finds that if large shareholders invest in two or more firms, their capital investment decisions are likely to be more similar. He concludes that firms with a more central social network have a less idiosyncratic investment policy relative to firms that are less connected. In other words, these firms can make better policy decisions and exhibit better economic performance because they can leverage the potential information from other firms in the network. Thus, network analysis suggests that, with information diffusing through large shareholding networks, firms which are more strategically positioned in the network can make more informed decisions.

Bajo, Croci, and Marinelli (2020) use metrics from SNA to determine the position and size of multiple blockholders[3] in the network of institutional blockholders. They find that network centrality plays an important role in the relation between large shareholding and firm performance. In particular, they report that the status of large S&P500 firms attracts more well-connected institutional blockholders, suggesting a

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[1] Social network analysis, which is the mapping and measuring of a social relationship among individuals, firms, banks, and other connected information entities, refers to structural analysis, is not a formal theory, but rather a broad strategy for examining social structures (Wellman and Berkowitz, 1988; Otte and Rousseau, 2002).

[2] Blockholding networks involve the connection among large shareholders who exercise control by having direct ownership of 5% or more of outstanding shares in two or more firms.

[3] A multiple blockholder is a shareholder who owns at least 5% of the outstanding shares in two or more firms.

positive association between the ability of connected institutional blockholders to establish valuable co-investment ties and to enhance firm value. Since multiple large shareholders create a multitude of co-investment ties, the greater connectedness may also be associated with higher shareholding dispersion. Bajo et al. (2020) consequently argue that network centrality may serve as a proxy for block ownership dispersion. Thus, SNA suggests that the shareholding of a central large investor is more value-enhancing than participation from other investors.

In this thesis, I argue that the presence of a shareholding network is also beneficial to bank-holding companies[4] (hereafter, BHCs) at the time when they issue seasoned equity offerings (SEOs) due to the social network (Larcker et al., 2013) and information network (Stulz, 1988; Maury and Pajuste, 2005; Kang et al., 2018; Bajo et al., 2020) that are created by the multiple large shareholders. Social network and information network theories support the information transmission in the network, allowing both BHCs and their large shareholders to share and better act on new information about the BHC as well as other BHCs in the same network. This creates significantly greater operating and financial interdependence across BHCs.

For example, large shareholders can exploit the information network to improve investee BHCs' performance. Multiple large shareholders can also create boardroom centrality in other BHCs, thus enabling them to nominate the board of directors as their representatives. They, perhaps due to their sheer size and thus influential position in the market, have more intimate business connections with their investee firms. These

[4] A bank-holding company is a company (including a bank) which owns or controls one or more U.S. banks (The Bank Holding Company Act, 1956).

connections offer many opportunities to access private information not available to individual investors (Szewczyk, Tsetsekos, and Varma, 1992), thus reducing the information search cost and monitoring efforts of multiple blockholders. The advantage of internal information is also provided through their learning, aggregated from large shareholdings in their portfolio (Kang et al., 2018). Multiple large shareholders are the biggest losers if managers were to seize the firm and extract private benefits. Thus, these large shareholderss are incentivized to mitigate agency conflicts by monitoring managers (Hartzell and Starks, 2003), thereby improving BHC performance.

My focus on BHCs is apparent given the important role they play in the banking industry and economy. BHCs have, in fact, become a dominant form of bank ownership. According to Federal Reserve System and World Bank, in 2016, the total assets held by the five largest BHCs[5] were USD 9.3 trillion. To put things in perspective, the U.S. gross domestic product (GDP) was USD 18.6 trillion at that time. My research is therefore motivated, in part, by the significance of BHCs to the U.S. banking industry and economy. Given the huge asset values of BHCs and their significant role in the economy, the effects of BHCs in stress or failure can potentially spill over to the wider financial and economic system, disrupting the credit intermediation process as well as undermining the transactional role via the payment and settlement system (Bollard, Hunt, and Hodgetts, 2011). It follows that greater stability of BHCs provides more safety to the market and will make the financial system more efficient.

[5] The five largest BHCs are JPMorgan Chase & Co.; Bank of America Corporation; Wells Fargo & Company; Citigroup Inc.; and Goldman Sachs Group, Inc.

BHCs also provide a unique setting to examine the information hypothesis. Unlike non-bank firms, the capital structure decisions of banking firms are constrained by rules imposed by regulators who have access to considerable inside information about the banks they regulate. Specifically, regulators impose minimum capital ratios and restrictions on the types of securities that qualify for inclusion in the capital requirement ratios (Tier 1). The financial crisis of 2007–2009 highlighted the increased riskiness of banks that resulted in the collapse of the financial system, suggesting that bank capital (or lack of) is a major concern for regulators. This additional layer of regulation, which uniquely applies only to banks, permits a test of the robustness of information theory expounded in the corporate finance literature.

Additionally, capital regulation restricts the flexibility of BHCs to select the type and quantity of capital. For instance, the regulation restricts the extent to which BHCs can utilize notes and debentures to meet capital requirement, in contrast to non-bank firms, which can use different debt instruments in different proportions depending on their preferences and insolvency risk. In the presence of such regulatory restriction, the market may be less able to assess the information content of the seasoned equity offerings (SEOs) of BHCs than of non-bank firms (Polonchek, Slovin, and Sushka, 1989). In this instance, the role of multiple large shareholders may become important insofar as the network they create across the BHCs can enhance the information environment at the time of the equity offering.

My study is also motivated by differences in the characteristics of large shareholders between BHCs and non-bank firms. For example, while large shareholders of BHCs are often financial institutions (Adams and Mehran, 2003), families, individual investors, and the state are prevalent among the large shareholders of non-banking firms (La Porta, Lopez-de-Silanes, and Shleifer, 1999). These differences may influence the role of multiple large shareholders in operating, financing, and investment decisions (Kang and Luo, 2012; Kang et al., 2018) of BHCs vis-à-vis non-bank firms, and may in turn affect the market response to the SEO announcements of the two types of organizations.

A salient feature of BHCs and social networks, which is at the center of my investigation in this thesis and which has become increasingly more prevalent in recent years, is the complex hierarchical ownership and control structures created by large shareholders. Despite the extensive literature examining the association between ownership concentration and SEO performance, especially for corporate firms, no research has analyzed the role of large shareholding networks on the SEO announcement stock returns of BHCs, through the lens of SNA, as well as the potential spillover effect of these announcements to non-announcing BHCs which share the same large shareholder network as the announcing BHCs. My thesis aims to fill this void. Specifically, I examine how the presence of large shareholding networks impact on SEO abnormal stock returns in BHCs. My thesis is also the first to explore whether the value effects of SEO announcements spill over to non-issuers which share the same large shareholders as the BHCs which make an SEO.

1.2 Research Aims and Questions

My research aims to investigate the role of large shareholder networks, ownership concentration, BHCs' characteristics, and their performance in the transmission of information flow from one BHC to other BHCs sharing the same large shareholding network at the time when the former makes an SEO. The study uses SNA, which is predicated on the shareholding of a central investor being more value-enhancing than that of other investors, to analyze the large shareholding network. My research thus provides an empirical exposition of the valuation effects of SEOs by BHCs in the presence of large shareholder networks. I use centrality measures (i.e., degree, betweenness, eigenvector, and closeness), which emphasize different topological properties of the network.

Accordingly, a network is said to be created when there exist shareholders who hold a large ownership stake ($\geq$ 2%) not only in the issuing BHC but also in other non-issuing BHCs. The presence of such a network allows me to examine the role of multiple large shareholers in shaping the market response to the SEO announcements, and whether there are spillover effects to non-issuing BHCs which share the same large shareholding network as the announcing BHCs. I predict that due to potential information sharing in the network, issuing BHCs' financing decisions can impact not only their firm value but also that of non-issuing BHCs which share the same large shareholding network.

Network centrality provides an important angle to my investigation on the relation between ownership composition and the SEO performance of BHCs – a relation which has so far remained largely unexplored in the literature. By making use of the data on the interactions between BHCs through multiple large shareholders around an equity offering, I am able to compute a variety of network centrality measures such as degree, betweenness, eigenvector, and closeness[6] from SNA to characterize the relative position of each large shareholder in the network.

My research period spans from 2010 to 2015 since the number of equity offerings by BHCs and the availability of ownership data prior to 2010 are highly limited. The global financial crisis (GFC), which began in 2007, has resulted in a severe erosion of bank capital, with many BHCs losing their capital, loan provisions, and other pre-tax income categories, including net interest income, service charges, trading accounts, and fiduciary activities. The aggregate loss to the U.S. banking sector amounted to approximately USD 551.4 billion over the five-year period from 2007 (Boswell, 2013). In response, the U.S. Government established the Capital Purchase Program[7] (CPP) and Troubled Assets Relief Program[8] (TARP) in 2008 to buy back subprime securities and provide liquidity assets. As preferred stocks are similar to debt in that it gets paid before common stocks, the purchasing of preferred stocks by the CPP would be effective in getting banks to lend again (Wilson and Wu, 2010; Wilson, 2012). However, issuing preferred stocks cannot increase bank capital and thus cannot be used to meet regulatory requirements. Issuing common stocks can. To enhance the stability of banking subsidiaries, BHCs were required to maintain minimum capital ratios by

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[6] *Degree*, which is the most intuitive and straightforward centrality measure, counts the total number of connections that a large shareholder has in the network. *Betweenness* is constructed using a different idea of centrality, namely, the ability of a BHC to serve as a link between two (or more) disconnected (or not directly connected) groups of other BHCs. *Eigenvector* is a variation of *Degree* centrality in which connections are weighted by their relative importance in the network. *Closeness* centrality refers to the shortest possible path or link on which information access is optimal. *Closeness* centrality measures how quick information from other members of a network gets to an individual.

[7] The term *Capital Purchase Program (CPP)* refers to stock and equity warrant purchase program conducted by U.S. Treasury's Office of Financial Stability as part of *Troubled Assets Relief Program (*TARP).

[8] The term *Troubled Assets Relief Program (TARP)* refers to a program of the U.S. Government to purchase toxic assets and equity from financial institutions to strengthen its financial sector.

providing financial assistance to banking subsidiaries in distress (Avraham, Selvaggi, and Vickery, 2012). As undercapitalized (inadequately capitalized) banks, many of which were owned by BHCs, encountered financial distress, they could not issue equity to increase their bank capital to meet the capital requirements. Instead, their BHCs-parent companies did. The decision to issue an SEO is thus among the most important financial decisions that BHCs make, significantly impacting their investment policy, capital structure, and major shareholders' ownership stakes.

My thesis poses two research questions relating to the valuation effect of SEO announcements in the presence of large shareholding networks in BHCs.

First, I ask whether and how the presence of large shareholding networks impact on the market's response to the SEO announcements of BHCs. Previous studies show that SEO announcements have deleterious effects on announcing issuers' stock price due to adverse selection problem (Myers and Majluf, 1984). I argue that this adverse selection problem can be somewhat mitigated by the presence of an information channel created by large shareholding networks, and predict that BHCs with large multiple shareholders are associated with less negative abnormal stock returns around the SEO announcement.

My second research question asks whether the SEO announcement effects spill over to non-issuing BHCs which share the same large shareholding network (hereafter, non-issuers) as the issuing (announcing) BHCs. I argue that the network created by large shareholders across BHCs facilitates the transmission of relevant information to other non-issuing BHCs which share the same large shareholders as the issuing BHCs.

Consequently, I predict that there is a spillover in the value effects (market response) of SEO announcement to non-issuers.

1.3 Summary of Main Findings

My final sample consists of 148 SEO announcements made by 113 listed BHCs, spanning over a period from 2010 to 2015. For each issuing BHC, I carefully track each of its large shareholders (≥ 2%) to see if they too are large shareholders in non-issuing BHCs. I identify a total of 32,682 non-issuing BHCs which share the same large shareholders as the issuing BHCs over the sample period. To gauge the market's reaction to the SEO announcements, I apply the standard event study methodology.

My key findings are summarized as follows. First, I find the results from the event study are consistent with the adverse selection (Myers and Majluf, 1984) explanation for SEO value effects, showing that issuing BHCs on average earn statistically significantly negative returns. These results are significant for the short event windows, i.e., (-5, 5), (-1, 0), (0, 1), and (-1, 1) days surrounding the SEO announcement, but not for the long window of (-10, 10) days. Results from my event study are in line with prior SEO literature for BHCs, including Slovin et al. (1991) and Krishnan et al. (2010).

To test whether the SEO valuation effects are related to large shareholding networks, I regress the issuers' cumulative abnormal returns (CARs) on measures of network centrality extracted from the social network literature (Bajo et al., 2020), i.e., degree, betweenness, eigenvector, and closeness. Following previous studies, I use the short event window of (-1, 1) days surrounding the SEO announcement in this cross-sectional analysis; using a short event window has the advantage of being less likely to be confounded by other events vis-à-vis a long window.[9]

My regressions results show that only the network centrality measure *Degree* is statistically positive. This finding suggests that the CARs around SEO announcements are less negative for issuing BHCs which are more central in the large shareholding network, consistent with hypothesis H1, which predicts that multiple large shareholders are able to capitalize on their position in the network to mitigate agency cost and information asymmetries (Kang et al., 2018). However, the economic significance of this association is small, showing that a one standard deviation increase in *Degree* centrality increases the abnormal return on days surrounding the SEO announcement date by 0.012 percentage points.

Second, I find some evidence of a spillover effect in SEO announcements on non-issuing BHCs which share the same large shareholding network as the issuing BHCs, in weak support of hypothesis H2. To be precise, results from the event study show significant CARs for non-issuers, albeit substantially less negative and lower in magnitude than for issuers, around the time when the issuing BHCs in the same large shareholding network make an SEO announcement. My results also show that the more central the non-issuers' multiple large shareholders are in the network, the stronger is the spillover announcement effect, consistent with past studies for corporate (non-banking) firms. For example, Kang and Luo (2012) report that non-issuing firms observe a negative market reaction when issuing firms in the same large shareholding network announce equity offerings.

[9] I also use a longer window of (-10, 10) days, for rosbustness purposes. See the discussion in Chapter 6.

The above results seem to be sensitive to the length of the event window, as shown in robustness tests. I find that none of the centrality measures are significant when the long event window (-10, 10) is used, perhaps due to confounding events. For the long window, about 10% of the issuer's CAR spills over to other BHCs in the large shareholding network. Further, the spillover in the SEO announcement effect on non-issuers is found to be associated only with non-issuers' large shareholder centrality measures but not with those of the issuing BHCs.

I also conduct a robustness test using ownership concentration in place of large shareholder network as an alternative measure of the information environment and the efficacy of agency conflict mitigation. Ownership concentration variable is computed as the sum of the percentage shareholdings of large shareholders, where large shareholders are defined as those who own at least 2% of outstanding shares. Ownership concentration is one such mechanism through which large shareholders can directly influence the managers by threatening managers of their positions through the use of concentrated voting rights to protect shareholders' interests (Shleifer and Vishny, 1986; Hu and Izumida, 2008). Results show a non-linear association between SEO abnormal stock returns and ownership concentration. As ownership concentration increases, the SEO abnormal returns increase up to a certain point (the point of inflection is 35%), suggesting an alignment of interest, after which it decreases, suggesting an entrenchment effect.

1.4 Research Contributions

My thesis contributes to the literature in several ways. First, it adds to the literature on the role of multiple large shareholders in BHCs. Prior studies examine the importance of large shareholders in corporate monitoring. For example, Cornett et al. (2007) find that monitoring is more effective when institutional investors have more potential business connections in their network. My study contributes to this strand of the literature by showing that multiple large shareholders can provide effective monitoring in the banking industry due in part to information transmission in the network they create.

To the best of my knowledge, my thesis is the first to study the association between large shareholding networks and the SEO valuation effects for BHCs. The empirical findings in my study indicate that the abnormal stock returns around SEO announcements are less negative for BHCs which are more central in the large shareholding network, suggesting that multiple large shareholders have greater informational advantage than others. Similar evidence for non-bank firms is provided by Kang and Luo (2012). However, unlike their study, which examines the monitoring effectiveness of the *largest* multiple institutional blockholder, my thesis focuses on large multiple shareholders, defined as those with shareholding in abnormal of 2%. My thesis is premised on the argument that unlike the largest owner whose presence aggravates the adverse selection problem at the SEO, the presence of multiple large owners mitigates the adverse selection problem. This contention is supported by prior research which documents that the existence of a second largest shareholder can counteract the controlling (largest) shareholder's entrenchment effect (Attig, Guedhami, and Mishra, 2008; Laeven and Levine, 2008). For example, Attig et al. (2008) find the firm's cost of equity capital decreases with the size of the second largest shareholding, suggesting the effectiveness of the monitoring role of the second largest shareholder in mitigating agency costs.

While Kang and Luo (2012) examine the monitoring effectiveness of the largest multiple institutional blockholder in corporate firms, my study focuses on the information network created by multiple large shareholders (defined as those with shareholding of at least 2%) in BHCs and their ownership concentration around seasoned equity offerings (SEOs). My study is premised on the argument that unlike the largest owner whose presence aggravates the adverse selection problem at the SEO, the presence of multiple large owners mitigates the adverse selection problem. Further, my thesis contributes to SEO research for BHCs and network centrality on key elements of SNA in the context of raising equity via an SEO.

The empirical findings in my study contribute to the SEO and network centrality literatures, showing that the abnormal stock returns around SEO announcements are less negative for BHCs which are more central in the large shareholding network. This finding suggests that multiple large shareholders have greater informational advantage than other shareholders and that large shareholding networks allow the transmission of information about the SEO announcements from issuers to other non-issuers belonging to the same network. In this sense, large shareholding networks play an important role in monitoring and controlling management in both announcing and non-announcing BHCs, as evidenced by the announcement spillover effect.

1.5 Thesis Layout

The rest of this thesis is organized as follows. Chapter 2 outlines the institutional framework. Chapter 3 reviews the literature on the SEOs of BHCs, shareholding networks, SNA, and ownership concentration. Chapter 4 develops the hypotheses which are the subject of my empirical tests. Chapter 5 describes the data, research methods employed, measurement of variables, and descriptive analysis. This is followed by empirical results in Chapter 6. I provide a summary of the main findings and conclusions in Chapter 7, which also outlines some limitations of my investigation and suggests future avenues for research.

Chapter 2

Overview of Bank-Holding Companies and Network Centrality

2.1 Introduction

This chapter provides an overview of the institutional framework for BHCs, focusing on their large shareholding network and SEOs. Section 2.2 begins with an overview of BHCs and their capital regulations. Section 2.3 presents the typical ownership structure and the network created by multiple large sharehoders of BHCs. A chapter summary is provided in Section 2.4.

2.2 Overview of BHCs and Capital Regulation

In this section, I describe the identity, characteristics, and complex organizational structure of BHCs. According to U.S. Code Title 12-Banks and Banking, § 1841 of Chapter 17-Bank Holding Companies, a BHC is a company that directly or indirectly owns or controls at least 25% of voting securities of a bank. As large blockholders, BHCs have the power to elect their representatives at bank subsidiaries (Belkhir, 2009) and to exercise a controlling influence, directly or indirectly, over bank management (Larcker et al., 2013). As financial intermediaries, bank subsidiaries are “special” because they play an important role in transferring funds from surplus spending units to deficit spending units and thus serve as a channel of monetary policy. Therefore, the safety and soundness of bank subsidiaries are essential to ensuring the financial stability of BHCs.

Holod and Peek (2010) argue that the ability of BHCs to use external financing to smoothen the impact of debt contraction could be explained by the greater access that their bank subsidiaries have to public equity markets. A BHC is thus useful for the resources that it controls since it can use its subsidiaries as a vehicle to mitigate risk and protect itself from litigation (Ashcraft, 2008). For example, BHCs can issue equity to increase the bank capital of their bank subsidiaries when the subsidiaries face a sovereign debt crisis. One interesting key difference between BHCs and non-banking firms is that BHCs are holding companies. This means that BHCs and their bank subsidiaries are separately chartered with their own board so that the categorization of parent BHC's activities across subsidiaries may well occur through memberships on these boards (Adams and Mehran, 2012). Structural flexibility, which is another characteristic of the BHC formation, enables the conduct of an activity outside the insured depository. This strategy can benefit from the special legal provisions available to BHCs and allows BHCs to protect their bank subsidiaries against liability concerns such as the potential for environmental damage associated with foreclosed properties.

The primary legislation defining the allowable scope of BHC activities is the Bank Holding Company Act of 1956. The Act establishes conditions which limit interstate banking operation by prohibiting BHCs headquartered in one state from acquiring a bank in another state, with the aim of protecting the owners of local banks from competition from larger banks. The Douglas Amendment (early 1980s), the Riegle-Neal Interstate Banking and Branching Efficiency Act-IBBEA (1994), and the Gramm-Leach-Bliley Act (1999) have deregulated interstate branching and banking by allowing BHCs to diversify products (Brewer, Hunter, and Jackson, 2003); to control bank subsidiaries in other states; and to build new branches across state lines (Harjoto, Yi, and Chotigeat, 2012).

By 1994, restrictions on interstate banking were eliminated in a reform of the U.S. banking industry to improve banks' operations.

McLaughlin (1995) examines the impact of interstate branching and banking reform on BHCs. He reports that several BHCs gained immediate benefits with the expansion patterns of BHCs into a neighboring state from the banking reform in the 1980s because of the lagged response of some states to the new Act. Since the 1990s, the Riegle-Neal IBBEA has led to a decline in the ratio of loan charge-offs to total loans.[10] Thus, the low ratio may lead to better performance of banking firms. For example, in periods when both branching and interstate banking were prohibited, the ratio of loan charge-offs to total loans was 0.012. This figure reduced to 0.006 when branching was permitted but interstate banking prohibited. The ratio was 0.004 when both branching and interstate banking were permitted (Jayaratne and Strahan, 1997).

The evidence shows that the reform has played an important role in increasing BHCs' performance, which in turn helped BHCs diversify their assets and liabilities. The reform has allowed BHCs to convert their bank subsidiaries into bank branches and cut repeat overhead costs, thus helping BHCs increase the level of safety and soundness in the banking industry. Today, BHCs can expand interstate banking and branching operations by acquiring an additional bank and operating it as a multi-bank BHC and/or acquiring non-bank subsidiaries and treating them as entities separate from the bank (Tkachenko, 2010). Thus, the reform has created tax efficiencies and expanded businesses into multiple geographies.

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[10] The calculation of loan charge-offs to total loans is retrieved from https://www.federalreserve.gov/releases/chargeoff/calc_method.htm#f2

BHCs have become a dominant form of bank ownership in the U.S. banking industry, as they own a number of bank subsidiaries engaged in deposit-taking and lending (Avraham et al., 2012). At the end of 1997, only 17% of all Federal Deposit Insurance Corporation (FDIC) insured assets were held by independent banks and thrift institutions (Stiroh, 2000). By contrast, 67% were held by multi-BHCs that control or own at least 25% of the voting shares of at least two commercial banks and 16% by single BHCs (Stiroh, 2000). In 1991, approximately 30% shares of BHCs were controlled by the top 10 largest shareholders – that figure has more than doubled over the past two decades (Avraham et al., 2012). Recent estimates show that BHCs represent 20.51% of domestic financial sectors assets and the largest five BHCs account for approximately 50% of U.S. GDP as well as 50% of total BHC assets.[11]

To enhance banking operations and financial stability, BHCs are regulated and supervised by the Federal Reserve System (FED), the Comptroller of the Currency (OCC), and FDIC. Regulators allow large shareholders of a subsidiary to be blockholders in the parent BHC. Thus, subsidiary directorships play an important role in BHC activities. BHCs are also regulated by Bank for International Settlements (BIS) through the Basel requirements developed by the Basel Committee on Banking Supervision (2011), which aims to bolster the regulation, supervision, and risk management of the banking sector through the minimum capital requirement. The total capital ratio is measured by the amount of core capital divided by risk-weighted assets.

[11] See Federal Financial Institutions Examination Council-National Information Center: https://www.ffiec.gov/npw/Institution/TopHoldings

To establish the minimum satisfactory capital level, the FED defines three zones from the most satisfactory level to the least satisfactory level based on the total capital ratio: zone 1 has a total capital ratio of at least 0.65; zone 2 has a total capital ratio from 0.55 to under 0.65; and zone 3 has a total capital ratio of less than 0.55. The minimum capital requirements for BHCs under Basel II 2004 differ from those under Basel I 1988. In Basel I 1988, a bank and a BHC must hold at least 8% of its risk-weighted assets implemented as of 1992. Basel I focuses on only credit risk and the risk-weighting of assets. In Basel II 2004, a BHC must reach at least 0.06 in Tier 1 capital ratio, and at least 0.1 in Tier 1 and Tier 2 capital ratios[12] in combination, suggesting that BHCs need more equity capital to meet the capital adequacy requirements. Unlike past studies which focus on a period when Basel I was in effect, my study covers the period 2010-2015 where banks and BHCs were regulated by Basel II.

BHCs engage in a range of activities that is much broader than the narrow limit set out in the Bank Holding Company Act 1956 (Omarova and Tahyar, 2011). For example, as at 31 December 2014, 81 out of 85 commercial banks with assets valued at least USD 10 billion (approximately 95%) were fully owned by BHCs, and the 93 largest Peer 1 BHCs (using the Federal Reserve System and the FDIC stratification on consolidated asset size) with consolidated assets equal to or greater than USD 10 billion have total consolidated assets of approximately USD 15,000 billion.

[12] Tier 1 capital is a bank's core capital (shareholders' equity and retained earnings) whereas tier 2 capital is a bank's supplementary capital (revaluation reserves, hybrid capital instruments, subordinated debt, general loan-loss reserves, and undisclosed reserves). The tier 1 capital ratio is the comparison between a banking firm's core equity capital and its total risk-weighted assets whereas the tier 2 capital ratio is the comparison between a banking firm's supplementary equity capital and its total risk-weighted assets.

The 2008 global financial crisis has resulted in undercapitalized banks with impaired debt values. According to International Monetary Fund (2010), the severe erosion of bank capital in the U.S. was approximately USD 800 billion, in which the top 10 largest BHCs were required to increase at least USD 185 billion via common equity offerings to maintain the minimum capital (Board of Governors of the Federal Reserve, 2009). These BHCs were required to participate in the CPP program to remove problem assets from their balance sheets (Khan and Vyas, 2015). Therefore, like non-banking firms, BHCs can increase the equity capital for bank subsidiaries by issuing an SEO.[13] The reason BHC raise external equity capital is thus to help them maintain minimum capital requirements at both the bank and BHC levels (Polonchek et al., 1989).

The FED conducted the Supervisory Capital Assessment Program (SCAP) in 2009 with the aim of determining whether BHCs had sufficient capital to safeguard against the recession. To be precise, the program assessed the capital level of the 19 largest BHCs based on whether their Tier 1 common capital ratio exceeds 0.04. This has resulted in the U.S. FED requesting the 19 BHCs in February 2009 to raise additional capital to meet the credit needs of their customers, and to ensure that there was sufficient capital to buffer any losses (Board of Governors of the Federal Reserve System, 2009). Further, the CPP, which is sponsored by the U.S. Treasury, was used to improve troubled capital to commercial banks and BHCs which faced a debt overhang problem. Thus, BHCs that

[13] There are two stages for stock filing in the stock market – registering the offering with the U.S. Securities and Exchange Commission (SEC), and marketing the offering. BHCs have the option of using either the traditional registration method or the shelf registration method. In the former, each offering is registered with the SEC immediately prior to the offering. In the latter, BHCs obtain SEC's pre-approval for all future offerings up to two years in advance, and then simply takedown the pre-approved offerings when going to the market. Generally, both BHCs and non-banking firms can complete an offering within six weeks of deciding to issue an SEO (Gao and Ritter, 2010).

did not meet the capital adequacy requirements are expected to use SEOs to increase their equity capital.

Table 2.1 describes the frequency distribution of my sample over the period from 2010 to 2015. The sample consists of 148 SEO announcements made by 113 listed BHCs, retrieved from the Federal Reserve System's National Information Centre and the Savings and Loan (SNL) finance database, and 32,682 non-issuing BHCs which share the same large shareholders as the announcing BHCs. [14] The need to increase equity capital due to the financial crisis has resulted in a significant increase in the number of SEOs issued by BHCs. In the year closest to the crisis (i.e., 2010), the table shows there were 44 SEOs issued by BHCs compared to 18 to 24 in subsequent years, from 2011 to 2015.

[14] To be included in the final sample of announcing BHCs, they must meet the following requirement: have a large shareholder that also serve as the large shareholder for at least one non-issuing BHC. The sample construction procedure and data sources are described in Chapter 5-Data and Research Methods.

Table 2.1: Frequency Distribution of Sample by Year

Distribution of issuing and non-issuing BHCs by year		
Year	Number of issuing BHCs	Number of non-issuing BHCs sharing the same large shareholder as issuing BHCs
2010	44	10,419
2011	22	4,350
2012	19	3,968
2013	21	5,282
2014	18	3,780
2015	24	4,883
	148	**32,682**

Figure 2.1 presents the annual number of SEOs conducted by BHCs and banks from 1994 to 2010, which I reproduce from Khan and Vyas (2015). The frequency of SEOs by BHCs, excluding and including recipients of the Capital Purchase Program (CPP), are presented in Panel A and Panel B, respectively. The figures show the number of SEOs has increased by about 27% in the 2009-2010 period compared to that in the 1994-2008 period; this increase in the frequency is driven mainly by CPP. There is also an increase in the number of SEOs in the aftermath of the GFC in 2009 and 2010; approximately 100 and 80 SEOs were issued by CPP recipients in 2009 and 2010, respectively.

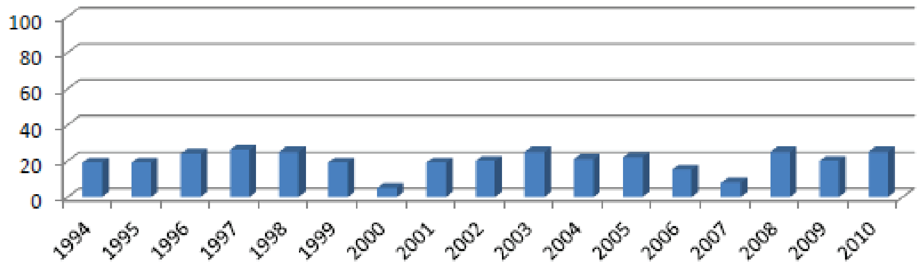
2.3 Ownership Structure and Network Centrality

The corporate finance literature shows that highly concentrated ownership is prevalent around the world, particularly in emerging economies with weak investor protection and poor institutions. La Porta et al. (1999) report that concentrated ownership is also observed in the U.S., departing from the typical corporate America painted by Berle and Means (1932).

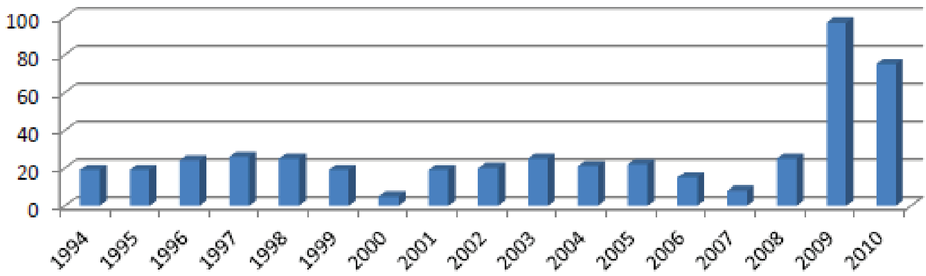
Holderness (2009) illustrates the ownership concentration and structure of non-bank firms, as summarized in Table 2.2. The table reports four types of investors, being family (which consists of individuals); financial institution (including banks, mutual funds, and pension funds); corporations (both public and private); and others (including nonprofits, profit-sharing plans, and venture capitalists). There is a marked difference in the percentage of firms with family, financial institution, corporation, and others as the largest shareholder (53%, 29%, 11%, and 7%, respectively) and of stocks held by each of them (32%, 12%, 39%, and 22%, respectively).

Figure 2.1: The annual number of SEOs by U.S. Banks from 1994 to 2010

Panel A: Excluding recipients of the Capital Purchase Program



Panel B: Including recipients of the Capital Purchase Program



Source: The plot is taken from Khan and Vyas (2015)

Table 2.2: The identity and ownership of the largest shareholder

This sample is sourced from Holderness (2009).

	Type of investor			
	Family	**Financial**	**Corporate**	**Others**
Percentage of firms	53	29	11	7
Average ownership of category (%)	32	12	39	22

The reported diversity in the identity of the largest owner concurs with the evidence in La Porta et al. (1999), who identify the largest owner as a family, an individual, or the state. It is also consistent with Adams and Mehran (2003), who find financial institutions is the typical largest owner. Additionally, Kang et al. (2018) report that the largest shareholder owns on average 69.7% of multiple holding ownership, implying that the average largest investor in a firm also serves as the largest blockholder in five other firms at the same time. Thus, multiple large shareholders plays an important role in shaping the ownership structure of a firm and the size of the large shareholding network is impacted by the number of multiple large shareholders and the ownership held by each multiple blockholder. The ownership structure of BHCs is however different from that of non-banking firms because blockholders in BHCs are often financial institutions. Therefore, large institutional shareholding networks are more prevalent in BHCs than in non-banking firms.

BHCs play a key role in issuing and underwriting securities as well as in propagating monetary and financial shocks to the rest of the economy. Although there are numerous studies showing the rise of firms and commercial banks, there has been little work done on why BHCs prevail in the U.S banking industry. In an important contribution, Ashcraft (2008), Avraham et al. (2012), and Chami et al. (2017) argue that BHCs exist because they create important information networks. The information network, which is created among multiple large shareholders, allows investors to acquire information about the demand for an issue and reveals information on how much investors are willing to pay. This network consists of large-scale investors such as hedge funds, mutual funds, and financial institutions.

Previous studies use SNA to identify information transfers in stock markets (Otte and Rousseau, 2002; Hochberg et al., 2007; Cohen, Frazzini and Malloy, 2008; Larcker and Tayan, 2010; Bajo et al., 2020). The connections between individuals and firms in these networks are channels by which information is communicated and existing relationships are leveraged. For example, the link between mutual fund managers and corporate board members is established using educational institutions as a proxy for the social network (Cohen et al., 2008). Managers who share social connections have more similar levels of capital investments and change their investments overtime more similarly. Furthermore, firms in the same industry have similar preferences and styles of management (Fracassi, 2017).

Larcker et al. (2013) provide evidence on differences in board connectedness in explaining variations in firm performance. They conclude that social networks are an important mechanism for information flow into asset prices. In light of the prevalence of large institutional shareholding networks in BHCs, this thesis aims to shed light on whether and how the presence of such a network is related to the valuation effects of SEO announcements by BHCs. To be precise, the SEO valuation effects are examined not only from the perspective of the shareholders of the issuing BHCs, but also from the perspective of the shareholders of non-issuing BHCs which share the same large shareholding network.

2.4 Chapter Summary

BHCs, which have become a dominant form of bank ownership, play a key role in the U.S. banking industry and economy. BHCs have complicated hierarchical structures through their ownership or control of banks and other subsidiaries. The sheer size of BHCs suggests that their financial stability has significant implications for the safety and stability of the financial market, and the efficiency of the financial system. SEOs are amongst the most important financial decisions that BHCs use to increase bank capital for their bank subsidiaries. Given the important role of large shareholding network centrality in the flow of information, this thesis aims to use SNA to shed new light on the role of large shareholding networks when BHCs announce their intention to raise equity capital in the market.

Chapter 3

Literature Review

3.1 Introduction

This chapter provides a review of prior literature. I begin by reviewing past studies on the SEO announcements of BHCs in Section 3.2. To inform my study, I review the literature on shareholding networks, SNA, and ownership concentration in relation to firm peformance in Section 3.3. Although these studies focus mainly on corporate firms, they can provide useful insights to BHCs. A chapter summary is provided in Section 3.4.

3.2 Seasoned Equity Offerings of BHCs

This section reviews the literature on the SEO performance of BHCs. In contrast to the voluminous work on the valuation effects of SEOs by corporate firms, research on the SEOs of banking firms is rather thin.

There are two main explanations why BHCs seek external equity funding. The first reason is that BHC-parent companies are regulated and supervised by the Federal Reserve System, the OCC, and FDIC, all of which require a minimum capital adequacy to be maintained at their bank subsidiaries. Second, although BHCs may already meet the capital requirements, they may need further capital to launch new investment projects, repurchase their stocks, provide capital support for the growth of subsidiaries, and other general purposes.

The corporate finance literature shows that SEO announcements are on average associated with a drop in the issuing firm's stock price (Scholes, 1972; Myers and Majluf, 1984). An explanation for the negative announcement effect is provided by the price pressure hypothesis. Scholes (1972) argues that the demand curve for a firm's shares is downward-sloping and that an increased supply of shares decreases the stock price, thus explaining why issuing new equity induces a decline in the stock price. Myers and Majluf (1984) explain the negative announcement effect is due to the asymmetric information between managers and shareholders, leading to an adverse selection problem in security issuance. To entice new shareholders to subscribe to the issuance, the shares would have to be offered at a discount since managers are expected to act so as to maximise the wealth of existing shareholders. In this case, the shares are offered only because the managers believe that the shares are overpriced.

Previous empirical research on the SEOs of BHCs tend to focus on the market reaction to the SEO announcement. For a sample of 41 SEOs made by 33 BHCs listed on American Stock Exchange (AMEX) and New York Stock Exchange (NYSE) during the period 1975-1984, Polonchek et al. (1989) analyze the announcement effects of SEOs by calculating the cumulative abnormal returns (CARs) over a three-day announcement period (-1, +1).[15] As capital adequacy requirements have changed over time,[16] this permits them to test the information hypothesis by examining whether the information content of SEO announcements is different in response to the severity of capital adequacy requirements.

[15] Day 0 refers to the date of Securities and Exchange Commission (SEC) registration or the date of publication in Wall Street Journal, whichever is first.

[16] Before December 1981, regulators (e.g., the Federal Reserve, OCC, and FDIC) required different capital ratios for various categories of banks. This has changed since December 1981, where regulators used the same capital to asset ratios to determine the capital adequacy of BHCs. For example, BHCs are now required to maintain a minimum capital to asset of 6.5% in which the minimum primary capital to assets is 5.0%. Primary capital includes common stock, preferred stock, surplus, retained earnings, and other capital reserves.

Polonchek et al. (1989) partition their sample period into two periods (1975-1981 and 1981-1984) due to the different capital ratios for various categories of banks regulated by regulators since 1981. They find significant negative CARs for both time periods but a less negative average announcement effect in the later period due to the high capital adequacy requirements. Specifically, the CAR (-1, +1) is -1.74% for the 1975-1981 period compared to -1.09% for 1981-1984 period. Therefore, they conclude that the increased capital regulation decreases the information content of SEO announcements. This finding suggests that capital regulations are a main factor impacting the announcement effects of equity financing by BHCs.

In a follow up study using a larger sample of SEOs, Slovin et al. (1991) corroborate the finding of Polonchek et al. (1989). Using a sample of 47 SEOs by 33 BHCs for the period 1981-1989, Slovin et al. (1991) examine the market reaction to first and repeat SEO announcements by BHCs and to the adequacy of primary capital.[17] They use the Registered Offering Statistics (ROS) file to identify equity offerings from 1975 to 1981, and then track BHCs that returned to the equity market for a subsequent offering during the period from 1981 to 1989. They select the sample period from December 1981 to 1989 because in November 1981, bank regulators reached a consensus on what constitutes regulatory capital and, at that time, built in minimum capital ratios for BHCs. Although the population of SEOs by BHCs is small relative to corporate firm SEOs, the greater frequency of SEOs by BHCs motivates them to test whether repeat SEOs generate differential signaling content compared to non-repeat SEOs. Thus, they divide

[17] SEOs and repeat issues in BHCs are relatively common. They are however rare in non-BHCs.

the equity offerings into two types: (1) non-repeat offers (first-stage issues);[18] and (2) repeat offers.

Based on adverse selection theory, Slovin et al. (1991) test the hypothesis whether the short-run SEO performance is different between non-repeat issues and repeat issues. Results show the CAR (-1, +1) is -1.01% (significant at the 5% level) for the full sample (47 SEOs). For the sample of 26 repeat issuances, the three-day CAR (-1, +1) is -2.04% and is significant at the 1% level. In contrast, for the sample of 21 non-repeat offerings, the three-day CAR (-1, +1) is 0.27%, but is insignificant. Therefore, there is a significant market reaction to repeat SEOs but not to non-repeat SEOs by BHCs.

Slovin et al.'s (1991) results differ slightly from Polonchek et al. (1989) because they choose a longer sample period (1981-1989 compared to 1981-1984) and a larger sample size (47 SEOs compared to 41 SEOs). Further, Slovin et al. (1991) examine the effects of capital adequacy on CARs of repeat SEOs by BHCs because they want to examine whether capitalized and under-capitalized BHCs impact on the CARs of repeat SEOs. They find that in the case of repeat issues and capital-sufficient BHCs, there is a significantly (1% level) negative CAR (-1, +1) of -2.53%. The result implies that there is no information is revealed in the first SEO, suggesting that investors cannot exploit the quality of first-time seasoned issuers. However, investors are able to extract valuable information from repeat SEOs of well-capitalized BHCs.

Filbeck (1996) corroborates the findings in Polonchek et al. (1989) and Slovin et al. (1991) using a larger sample over a longer sample period. Specifically, he examines the

[18] First-stage issues are made by BHCs which have not previously issued a common stock offering; otherwise, the offerings are repeat issues.

market reaction to the announcement of 53 primary stock issues by BHCs from 1976 to 1992 and finds a two-day abnormal return (CAR (-1, 0)) of -0.82% (significant at the 1% level). These results indicate that the negative share price response to SEO announcements for BHCs is weaker than for non-bank firms because regulators have the ability to mitigate the information asymmetry at the time SEO announcements. Further, regulators can limit the debt level to fulfill capital adequacy, thus reducing the negative impact of SEO announcements on a BHC's common stock price.

Based on information asymmetry theory and capital structure signaling, Cornett and Tehranian (1994) test the effects of capital regulation on the SEO announcements of BHCs. They compute CARs over a 2-day window the SEO announcement, i.e., CAR (-1, 0), for voluntary and involuntary issues.[19] They find a significant negative CAR for voluntary issues but an insignificant negative CAR for the sample of involuntary common stock issuance due to the capital regulatory provision. To be precise, the average abnormal return for the two-day announcement period is -1.56% (at the 1% level of significance) and -0.64% (insignificant) for voluntary and involuntary common stock issuances, respectively. The difference in the abnormal returns between the two forms of common stock issuances is 0.92% (at the 5% level of significance). This result is the similar to Slovin et al. (1991), who find significant negative CARs for capitalized BHCs of repeat SEOs. The difference in the stock price reaction to the SEO announcement between voluntary and involuntary common stocks issues implies that both send

[19] An issue is classified as voluntary if the bank's total capital ratio is equal to or above 7 percent prior to the issue, and involuntary otherwise.

different signals to the market, with voluntary common stock issues delivering a more negative signal about SEO performance.

Cornett and Tehranian (1994) further examine the association between the CAR around the SEO announcement and the relative size of the offering for voluntary and involuntary issues, where relative offering size is measured as the value of the offering divided by total assets. They find a negative relation between the relative size of the offering and the stock price reaction, supporting Asquith and Mullins (1986), for both voluntary and involuntary common stock issuances. However, there is a more significantly negative price reaction for voluntary common stock issues than for involuntary SEOs. The CAR (-1, 0) is -2.16% (significant at the 1% level) for relative offering sizes of more than 0.5% and no more than 1.1%, and -1.84% (significant at the 1% level) for relative offering sizes of more than 1.1%. For involuntary offerings, the two-day CAR is -1.62% and is significant (at the 10% level) only for large involuntary common stock issuances.

Cornett and Tehranian (1994) also analyze whether managerial ownership is related to the two-day abnormal return. For managerial ownership less than 5%, the CAR is -2.92% and -1.6% for voluntary and involuntary common stock issuances, respectively. For a medium level of managerial ownership of more than 5% and no more than 20%, the CAR is -0.38% (insignificant) and -0.12% (insignificant) for voluntary and involuntary issuances, respectively. For high managerial ownership of more than 20%, the CAR is 0.32% (significant) for both voluntary and involuntary issuances. Thus, the results imply that the higher the managerial ownership in voluntary issuances, the more positive the stock price reaction to the SEO announcement.

Cornett, Mehran, and Tehranian (1998) examine the short-run SEO performance for a sample of 70 voluntary issues and 80 involuntary issues from 1983 to 1991. They find the average two-day abnormal return for both voluntary and involuntary SEOs is consistent with that of Cornett and Tehranian (1994). To be precise, the CAR (-1, 0) is -1.62% (significant at the 1% level) for voluntary issues and -0.39% (insignificant) for involuntary issues, confirming that voluntary SEOs have more information content than involuntary SEOs. This result is also consistent with the study of Cornett and Tehranian (1994) about the effects of capital regulation on CARs following the SEO announcements by BHCs.

Ergungor, Krishnan, Singh, and Zebedee (2004) test the effects of capital adequacy on the market reaction to SEO announcements by BHCs. Their sample consists of 239 SEOs (174 voluntary SEOs and 65 involuntary SEOs) by 31 banks and 208 BHCs from 1983 to 1999. They examine the difference between voluntary and involuntary issues in the offer price discount, which is calculated as the closing price prior to the offer date minus the offer price, divided by the closing price before the offering date. Their results show the average abnormal return over a three-day announcement period is -1.00% (at the 1% level of significance) and -0.94% (at the 5% level of significance) for voluntary and involuntary issues respectively. They explain that equity issue announcements, whether voluntary or involuntary, are not good news for current shareholders. Thus, this result does not corroborate Cornett and Tehranian's (1994) findings.

To facilitate comparison with Cornett and Tehranian (1994), Ergungor et al. (2004) limit the sample period to 1983-1989, the same time as the former. Their reduced sample consists of 65 voluntary and 60 involuntary SEOs, close to the 61 voluntary and

59 involuntary common stock offers in Cornett and Tehranian (1994). They find that, on average, both voluntary and involuntary issuers are associated with a negative price reaction at the time of SEO announcement, i.e., the CAR over a three-day announcement period (-1, +1) is -1.45% (at the 1% level of significance) and -0.89% (at the 5% level of significance) respectively. Therefore, there is no significant difference in CARs between voluntary and involuntary issues in their findings. Ergungor et al. (2004) also find that involuntary issuers can use other ways to meet the minimum capital adequacy, including increasing the fraction of retained earnings, decreasing growth, and shrinking the bank size. Thus, their findings only support the result of Cornett and Tehranian (1994) about the negative reaction to voluntary offers.

In addition, Ergungor et al. (2004) find no significant difference in the issue-day discount and the one-year abnormal return[20] following voluntary and involuntary issues. They use a cross-sectional regression analysis to examine the effects of undercapitalization in involuntary issuers, voluntary issuers, and a vector of control variables (assets, pre-Basel I, and post-Basel I) on the three-day abnormal return. They find no significant difference in the announcement returns between voluntary and involuntary issues for the full sample and for Cornett and Tehranian's (1994) sample period.

Using a sample of 276 banks and BHCs of which 203 are well-capitalized and 73 are undercapitalized from 1983 to 2005, Krishnan et al. (2010) document how capital regulation determines the timing of the SEOs. They distinguish the difference between

[20] Abnormal returns are calculated based on the market-adjusted model with an event window of (-1, +1) days.

well-capitalized (adequate capitalized) and undercapitalized (inadequately capitalized) BHCs based on the total capital ratio in Cornett and Tehranian (1994). The result shows a CAR (-60, -4)[21] of 4.77% (significant at the 1 % level) for the full sample, implying that there is a significant positive stock price run-up for both well-capitalized and undercapitalized issuers. Their findings for the sample of 65 well-capitalized and 58 undercapitalized from 1983 to 1989,[22] prior to the enactment of the Federal Deposit Insurance Corporation Improvement Act (FDICIA), confirm the result in Ergungor et al. (2004) on the effects of capital regulation on SEO abnormal stock returns. Specifically, they find significant negative abnormal stock returns for both well-capitalized and undercapitalized issues, [23] implying that investors cannot discern the economic difference between these issues. These findings on the effects of well-capitalized issues on CARs support the findings of Ergungor et al. (2004).

In summary, previous studies find mixed results on the market reaction to the SEO announcement of BHCs, with the abnormal returns depending on the characteristics of the BHCs. Results show BHCs with higher managerial ownership have, on average, higher CARs around the SEO announcement whereas BHCs with higher capital ratios have, on average, more negative CARs. Studies also find a negative relation between the relative offering size and the stock price reaction to both voluntary and involuntary common stock issuances.

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[21] The pre-announcement period's market reaction is measured by the ARs cumulated from the 60th day to the fourth day prior to the announcement.
[22] They select the pre-FDICIA (1983-1989) period because there is a significant different in the percentage of well-capitalized and undercapitalized issues before and after 1990. Further, this will make their sample period consistent with that in Ergungor et al. (2004), also from 1983 to 1989.
[23] For example, CAR (-1, +1) is -1.51% and -2.25% (both significant at the 1% level) for the 65 well-capitalized and 58 undercapitalized offers, respectively.

Research on the SEO performance of BHCs seems to predate 2010. Before 2006, the capital requirement for BHCs was regulated by the Basel Committee on Banking Supervision in Basel I. There has been a change in the capital adequacy requirements for BHCs since 2008 under Basel II.[24] The change in the minimum requirements for capital adequacy and TARP motivate my research to investigate whether and how the changed regulatory environment and large shareholding networks impact on the SEO performance of BHCs.

3.3 Shareholding network, SNA, and Ownership Concentration

My literature review in this section focuses mainly on corporate firms due to the thin literature on BHCs. I begin with a literature review on shareholding networks in Section 3.3.1, followed by a discussion of the SNA literature in Section 3.3.2. Since network centrality may serve as a proxy for block ownership dispersion (Bajo et al., 2020), I also extend my literature review to include studies that examine ownership concentration as a determinant of firm performance in Section 3.3.3.

3.3.1 Shareholding Networks

This section reviews the literature on shareholding networks that arise from large shareholders directly or indirectly holding shares in two or more different firms. The extant literature on shareholding networks has concentrated on the empirical

[24] The minimum capital requirements for BHCs regulated by Basel II differ from those by Basel I. In Basel I, a bank and a BHC must hold at least 8% of its risk-weighted assets implemented as of 1992. Basel I focuses on only credit risk and risk-weighting of assets. In Basel II 2004, a BHC must reach at least 0.06 in Tier 1 capital ratio and at least 0.1 in Tier 1 and Tier 2 capital ratios combined, suggesting that BHCs would need more equity capital to meet the capital adequacy requirements.

investigation of the information network arising from this shareholding structure in explaining the performance of corporate firms. Much attention has been paid to the negative aspects of inter-shareholder connections.

For a sample of 223 listed firms on the Milan stock market between January 2004 and December 2004, D'Errico, Grassi, Stefani, and Torriero (2009) use shareholding networks to examine shock transmission effects[25] on firms connected by shareholding networks. Based on the SNA, the connectedness of shareholding is measured by indegree, outdegree, betweenness, and flow betweenness.[26] They find that firms belonging to a shareholding network, particularly if they are central in the network, are more sensitive to bankruptcies. This is because network connections have the potential to cause a contagion effect in that the failure of one or more firms in the network can lead to unexpected adverse effects on other firms in the network.

However, the attention has also been paid to the positive effects of shareholding networks. Shleifer and Vishny (1997), La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998), and Denis and McConnell (2003) argue that large shareholding networks increase firm value in countries with low levels of investor protection because these networks are more necessary to counter managerial agency problems in these countries.

[25] Specifically, they examine how an external shock propagates through the network and its effect on the market performance of controlled and controlling companies.

[26] Indegree of the vertex refers to the number of head ends adjacent to a vertex whereas outdegree refers to the number of tail ends adjacent to a vertex. Betweenness centrality is a measure of centrality in a graph based on shortest paths. The betweenness centrality for each vertex is the number of these shortest paths that pass through the vertex.

Kang et al. (2018) argue that multiple large shareholdings help the large shareholders gain relevant inside information across investee firms, which in turn enhances their capabilities to effectively monitor managers. Additionally, multiple large shareholdings may mitigate agency costs because multiple large shareholders can act as an agent on behalf of residual shareholders to monitor the firm. Hence, large shareholding networks play a key role in facilitating information flows among multiple large shareholders in their investee firms, leading to an increase in firm performance.

Previous studies examine the association between portfolio diversification, ownership structure, and shareholding ownership. Battiston, Garlaschelli, and Caldarelli (2005) study the association between portfolio diversification and the number of multiple controlling shareholders and the number of investee firms held by these controlling shareholders. Their sample consists of 2,053 and 3,063 firms listed on NYSE and NASDAQ, respectively. They find each firm is typically controlled by eight to 10 multiple shareholders, suggesting that networks cannot be decomposed into trees.[27] Although multiple large shareholders may hold shares in different firms, the number of shares held is not always large enough for the shareholders to become blockholders in their network centrality. Thus, the proportion of shares owned and the number of firms monitored by multiple shareholders are important parts of network centrality. This finding is supported by Pecora and Spelta (2015), who measure the centrality of a bank by counting the number of partners that each bank has or, in the weighted case, the proportion of total assets that a bank controls via the shareholding of its partners.

[27] If the firms are controlled by a single shareholder, the network structure can look like a forest.

Almeida and Wolfenzon (2006) examine the association between ownership and control in the pyramidal ownership structure[28] which creates a separation between cash flow rights and control. In a pyramidal ownership structure, there is a top-down chain of control (La Porta et al., 1999) over multiple independent firms located at the lower part of the pyramid (Claessens, Djankov, and Land, 2000). They show that when a large shareholder controls a firm which in turn is a large shareholder of another firm, this gives the large shareholder the right to control the second firm as well. Since pyramidal ownership structure provides greater financing benefits than horizontal ownership structure (Almeida and Wolfenzon, 2006),[29] large shareholders prefer to use the pyramidal structure to control multiple independent firms when the amount of diversion is predicted to be high. However, the pyramidal ownership structure is often used in business groups or family firms where the family owns all firms in the pyramid through indirect shareholding (Almeida and Wolfenzon, 2006). In contrast, the horizontal ownership structure is used in BHCs where large shareholders invest in other BHCs through direct shareholdings (Almeida and Wolfenzon, 2006).

Two recent studies examine the key role of shareholding networks on firm performance. Kang and Luo (2012) examine the SEO announcement effects on non-issuing firms which have the same large shareholders as issuing firms. They argue that due to potential information sharing in a large shareholding network, issuing firms' financing decisions impact the value of both issuing firms and non-issuing firms. For a

[28] This theory explains why the ownership structure of business groups is organized as pyramids, different from the ownership structure of stand-alone firms, thus demonstrating how a single large shareholder can exert significant control over multiple firms in the group.

[29] In a horizontal ownership structure, a large shareholder controls firms by directly owning their shares.

sample of 2,230 SEOs issued by 1,374 industrial firms and 201,895 non-issuing firms from 1991 to 2009,[30] they find the (-1, +1) CAR for both issuing firms and non-issuing firms is significantly negative, with the latter being more negative. They explain that the negative abnormal returns to both issuers and non-issuers are due to the increased adverse selection problem faced by investors stemming from the blockholding network. That is, if investors believe the stock price of issuing firms is overvalued, they would also perceive the stock price of non-issing firms which share the same blockholders as the issuing firms to be overvalued as well.

The authors further explain that outsiders' information asymmetry and institutional style investing are two main factors which increase the adverse selection for both issuing firms and non-issuing firms sharing the same large shareholding network. As both issuing and non-issuing firms have the same large shareholders, investors may infer that the large shareholders will have the same institutional style investing and common characteristics (e.g., book-to-market ratios) so the information spillover effects exist in these firms. They indicate that the abnormal stock returns of non-issuing firms are more negative due to differences in the characteristics between non-issuing firms and issuing firms; specifically, issuing firms tend to be younger, have a higher Tobin's Q[31] and return volatility, and a lower post-issue one-year market-adjusted return than non-issuers.

The second study is by Kang et al. (2018) who examine how the largest institutional blockholder in a shareholding network is related to changes in firm value (Tobin's Q),

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[30] Their sample excludes financial firms (SIC 6000-6999) and utility firms (SIC 4910-4940).

[31] Tobin's Q is calculated as the sum of the market value of common stock and the book value of preferred stock and debt, divided by the book value of total assets.

return on assets (ROA), and CARs around forced Chief Executive Officer (CEO) turnover announcement date for a sample of 26,955 U.S. firm-year observations from 1993 to 2010. They note the evidence in Kang and Luo (2012) that, from 1993 to 2008, the average institutional shareholder served as the largest blockholder in six different non-bank firms at the same time. The market perceives that multiple institutional large shareholders are likely to have more information about investee firms than other investors. Thus, there is a significantly positive association between multiple shareholding and changes in Tobin's Q and ROA. This finding supports La Porta, Lopez-de-Silanes, Shleifer, and Vishny (2000) and Belkhir (2009), who find large shareholdings are significant in explaining corporate firm and BHC performance, respectively.

Kang et al. (2018) also examine the effect of multiple large shareholdings on the CARs surrounding forced CEO turnover announcements. The results support their argument that multiple large shareholders can exploit information benefits arising from information spillovers and impact on monitoring if these large shareholders have prior monitoring experience. They predict that firms with the largest institutional shareholder who has monitoring experience have higher abnormal announcement returns than other firms due to the reduced monitoring costs. Their results support this prediction. They find that the forced CEO turnover sensitivity to performance is significantly higher when the firm has a financial institution as its largest shareholder. Further, firms with a higher institutional shareholding realize higher average abnormal returnaround the forced CEO turnover announcement, especially when the departing CEO has poor past operating performance. The result suggests that firms with a higher institutional shareholding have higher CARs because these shareholders have more opportunities to reduce information search and monitoring costs compared to firms with a more dispersed ownership structure.

Pecora and Spelta (2015) argue that the large shareholding network either helps banks increase their performance or lead banks to simultaneously go into distress due to financial problems faced by the multiple large shareholders. To clarify this argument, they analyze the topology of the large shareholding network of the European banking system with attention to edge weights reflecting how shareholding ownership is distributed among European banks. Data on shareholding of 1,534 Euro Area banks are collected from Bankscope for the year 2012. They assess the role of banks in the financial system with respect to share ownership and control of other credit institutions because the topological properties of the large shareholding network play an important role in robustness against shocks.

In sum, recent studies show the performance of non-issuing firms is affected by the SEO announcement of issuing firms when both non-issuing firms and issuing firms share the same large shareholders. Furthermore, there is a positive association between the largest institutional large shareholding and Tobin’s Q, ROA, and CAR. Although shareholding networks have become increasingly more prevalent amongst U.S. BHCs in recent years, to my knowledge, no studies has examined the effects of shareholding networks on the performance of SEOs issued by BHCs. My thesis aims to fill this research gap by addressing this issue.

3.3.2 Social Network Analysis

This section reviews the broad and growing literature on social network analysis (SNA). A social network is a structure composed of a set of actors, some of whom are connected by one or more relations. Social structure is a description of the relations among individuals in a society and "can be represented as networks—as sets of nodes (or social system members) and sets of ties depicting their interconnections" (Wellman and Berkowitz, 1988, page 4).

Goyal (2011) argues that social structure has intense effects on individual behavior because individuals have an incentive to form connections with others to shape the network in ways that are beneficial to themselves. In practice, a firm is more likely to know about the knowledge and skills of other firms with whom it has had past collaborations. In other words, the network structure can play an important role in shaping the performance of an existing network, suggesting that investors who observe the decision of a large shareholder in a specific firm can predict what his decision is going to be in other firms in which he too is a large shareholder.

SNA takes as its starting point the premise that social life is created primarily and most importantly by relations and the patterns formed by these relations. Social network analysts argue that people with similar attributes and position often have similar social network positions. They also argue that understanding how one's relationships with each other – and with others – can affect one's decisions and views of the economy because of the constraints, opportunities, and perceptions created by these similar network positions. Social scientists explain that a large number of people acting on one another to shape each other's actions in ways that create particular outcomes (Marin and Wellman, 2011).

By using techniques from graph theory and measuring an industry's economic connections to all sectors of the economy between 1983 and 2007, Ahern (2013) finds the stock returns in the highest quintile of centrality are higher by an average of 27 basis points than those in the lowest quintile. This result is statistically significant and meaningful, suggesting that the higher returns are compensation for greater operating risk. There is a positive relationship between stock returns and network centrality, measured by degree, eigenvector, betweenness, and closeness. This result is consistent with the idea that higher returns are earned by more central industries.

3.3.3 Ownership Concentration

This strand of literature examines how ownership concentration and structure is related to firm value and SEO performance. The corporate governance literature has identified countless ways of calibrating firm ownership. Morck, Shleifer and Vishny (1988) consider the percentage of outstanding shares owned by officers and directors. McConnell and Servaes (1990) use the percentage of shares owned by blockholders and institutions. Hermalin and Weisbach (1991) consider the percentage of shares owned by the CEO. Denis and Denis (1994) focus on the percentage of shares owned by insiders.

The study of ownership concentration has a long history in the corporate finance literature. Berle and Means (1932) report that the ownership structure of U.S. firms at the beginning of the 20th century was highly dispersed, although this ownership structure has somewhat changed, becoming more concentrated, in recent times.[32] Nonetheless, the separation of ownership and control continues to be a source of tension in U.S. corporate governance. The tension arises because the shareholders (owner-principal) are unable to directly govern the managers (agent) whose interest may not be closely aligned with those of shareholders. Berle and Means (1932) are among the first to highlight this potential conflict of interest between the principal and the agent of a corporation, arguing that too much power in the hands of managers (agents) could present serious agency problems. The *agency* theory is later expounded by Jensen and Meckling (1976), who suggest governance mechanisms to address the agency problems.

Morck et al. (1988) provide the first evidence of a non-monotonic relationship between ownership and firm value, an association which is replicated by subsequent studies, including Hermalin and Weisbach (1991) who use Tobin's Q to proxy firm value. Similar findings are reported by McConnell and Servaes (1990). They examine the association between the shareholding of insiders 33 and firm performance in two cross-sectional samples: 1,173 firms in 1976 and 1,093 firms in 1986. They report that insider ownership was 13.9% in 1976 and 11.84% in 1986, and that the association between insider ownership and firm performance is curvilinear – the slope of the positive relation between insider ownership and Tobin's Q decreases as ownership increases, indicating

[32] Individual ownership still makes up a substantial investor base in the U.S. capital markets but over 70% of the top 500 U.S. corporations are now held by institutional investors (Dai, 2016).
[33] Insiders are defined as individuals (such as managers) who manage the firm's operations and have exclusive voting rights.

there is an incentive for managers to adopt investment and financing decisions that benefit themselves at a high ownership level.

Ownership concentration is one such mechanism through which large shareholders can directly influence the managers by threatening managers of their positions by using concentrated voting rights to protect shareholders' interests (Shleifer and Vishny, 1986; Hu and Izumida, 2008). Theory suggests that large shareholders accumulate large positions in firms to offset the cost of monitoring. Monitoring costs decrease and the benefits of monitoring increase as shareholders accumulate large ownership blocks within firms. Apart from being able to leverage on the economies of scale in monitoring, large shareholders are also incentivized by their significant ownership stakes in the firm to oversee and monitor managers (Szewczyk et al., 1992; Shleifer and Vishny, 1986; 1997; Hartzell and Starks, 2003). The changing landscape of the ownership structure of corporate firms in recent years (Dai, 2016) suggests a greater monitoring role of large investors, particularly large institutional investors.

Based on ownership structure theory, [34] McConnell and Servaes (1990) hypothesize four ownership variables, i.e., insider ownership, institutional ownership, blockholders' ownership, and the largest shareholder's ownership, are related to firm performance, measured by Tobin's Q. Interestingly, they report institutional ownership was only 4.65% in 1976 but it increased substantially to 37.6% in 1986. According to the efficient-monitoring hypothesis, institutional investors have greater expertise and are able to monitor management at a lower cost than can small atomistic shareholders. The

[34] Ownership structure theory argues that the ownership structure of a firm is an endogenous variable. It refers to the effects of diffused and concentrated ownership structure on firm performance.

hypothesis thus predicts a positive relation between institutional ownership and firm performance (Pound, 1988). Hence, McConnell and Servaes (1990) find the proportion of shares owned by insiders and institutional investors are positively related to firm performance. However, they do not find evidence of a positive relation between large shareholding and firm performance. Large shareholders have greater expertise and are able to monitor management at a lower cost than minor shareholders can due in part to the information network they create among firms in which they are also large shareholders. Further, large shareholders are effective monitors as they are privy to internal information because of their sheer size and superior valuation skills compared to other shareholders (Jennings et al., 2002). Their large size gives large shareholders economies of scale in resources and expertise in analyzing firm information (Shleifer and Vishny, 1997). The ownership structure theory thus predicts a positive relation between ownership concentration and SEO announcement returns.

The results in McConnell and Servaes (1990) are supported by Holdemess and Sheehan (1988) and Thomsen, Pedersen, and Kvist (2006). For a sample of 489 U.S. firms from 1990 to 1998, Thomsen et al. (2006) regress Tobin's Q on its lagged value, large shareholding ownership and its lagged value (one period), the change in sales, the change in sales to assets, and the change in equity to assets. Their result shows large shareholding and its lagged value are not related to firm value due to high investor protection in the U.S. (La Porta et al., 1998).

Other authors find mixed associations between large shareholding and firm performance. For example, some authors find there is a negative association between large share ownership and corporate value (Zeckhauser and Pound, 1990; Agrawal and

Knoeber, 1996; Demsetz and Villalonga, 2001; Jennings, 2005) because large shareholders are likely to sell their stocks when the share price is high.[35] Others find large shareholding is positively related to firm performance (La Porta et al., 2000) because large shareholders want to increase ownership stake to improve their voting powers; thus the stock price increases, leading to increased firm value.

Gao and Mahmudi (2008) investigate whether large shareholding is related to the short-run performance of SEOs. They argue that large shareholding ownership is positively related to SEO performance because large shareholders can reduce agency (monitoring) cost (Kang et al., 2018). Using a sample of 6,950 completed deals[36] in the U.S. from 1980 to 2004 and drawing on agency theory, they test whether CARs are related to the top 5 shareholdings.[37] The top five largest institutional shareholders own an average of 15% of the shares in their sample. They further note that multiple large shareholding is an increasingly common trait of institutional ownership.

Gao and Mahmudi (2008) find the proportion of shares owned by the top five largest institutional shareholders is statistically significantly (at 1 % level of significance) related to CARs over a three-day period of days (-1, +1) surrounding SEO announcements. These results imply higher stock returns around the SEO announcement of firms with a greater proportion of shares owned by the top five largest institutional investors. This evidence suggests that large institutional ownership can

[35] This implies a negative association between large shareholding ownership and firm value.
[36] After an SEO is announced, the firm will determine whether the SEO should be canceled or completed based on whether shareholders receive the shock of exogenous cash flow about the project's return. Shareholders are likely to agree to the SEO plan if the perceived net present value (NPV) of the transaction is positive, and reject it otherwise.
[37] The top 5 shareholding is measured by the proportion of the firm's common shares owned by the top five largest shareholders.

mitigate agency problems. Their result differs from Filbeck (1996), who finds that there is no relationship between institutional ownership and the share price response to the announcements of new equity issues for a sample of 53 primary stock issues by BHCs from 1976 to 1992. The difference in results may perhaps be due to differences in the sample size, the type of institutions, and the sample period examined. For example, Gao and Mahmudi's (2008) sample consists of bank trusts, insurance companies, mutual funds, brokerage firms, pension funds, and endowments whereas Filbeck's (1996) sample consists of BHCs only.

Drawing on ownership structure theory, Demsetz and Villalonga (2001) hypothesize that the percentage of shares owned by the five largest shareholders and management are related to firm performance (Tobin's Q) differently. The five largest shareholders are likely to be representative of shareholders because they can supervise management whose interests are likely to be in conflict with those of shareholders (agency problems). Their sample consists of 223 U.S. firms from all sectors from 1976 through 1980. For 138 of the 223 firms in the sample, the percentage of shares owned by management as a group is less than 3%. For 195 of the 223 firms, the percentage of shares owned by management as a group is less than 10%. Therefore, it is hard for managers to exert full control over the firm. In comparison, the percentage of shares held by the five largest shareholders for 116 of the 223 firms is 20% and more, enabling them to more effectively monitor corporate managers such as in voting more actively on antitakeover amendments (McConnell and Servaes, 1990).

Using OLS and 2SLS models, Demsetz and Villalonga (2001) compare the effects of management shareholding and outside investors' shareholding on firm performance.

They find firm performance is associated with both the fraction of shares held by management and by the five largest outside shareholders. Their result is interesting in that insider ownership positively affects firm performance whereas the five largest shareholding negatively affects it. This result supports McConnell and Servaes' (1990) finding that management stock ownership is positively related to firm performance.

Several studies examine the role of institutional and managerial ownership in explaining the short-run SEO performance of BHCs and non-banking firms (Cornett and Tehranian, 1994; Demsetz and Villalonga, 2001; Jennings, 2005). For a sample of 19,359 firm-year observations from 1982 to 1991, Jennings (2005) studies the association between institutional ownership and firm value, measured by Tobin’s Q. Following Demsetz and Villalonga (2001), he uses the number of shares owned by institutional investors rather than by the five largest shareholders as a fraction of total outstanding shares as an independent variable. The reason is that he wants to compare the effects of the various types of institutional investors (i.e., banks, insurers, mutual funds, investment advisors, and pensions and endowments) on firm performance. Using the OLS model, he finds there is a negative association between institutional ownership and firm value (significant at the 1% level), similar to Demsetz and Villalonga (2001) who find a significant negative association between the fraction of shares owned by the five largest shareholders and firm performance. In a further analysis, Jennings (2005) finds banks’ share ownership is significantly positively related to Tobin’s Q but no statistically significant association is found between the share ownership of insurers, pensions, and endowments and firm performance. He explains that insurers, pensions, and endowments have lower liquidity needs and longer investment horizons that encourage greater monitoring.

Institutional ownership affects not only firm performance but also the co-movement in stock prices in Pirinsky and Wang (2004). For a sample of 2,797 common stocks traded on AMEX/NASDAQ/NYSE [38] (excluding Real Estate Investment Trust (REITs), closed-end funds, American Depositary Receipts (ADRs), and penny stocks) from 1980 to 2000, they find the co-movement of stock prices with the market is positively associated with the level of institutional ownership. They explain "institutional investors pay more attention to market-wide information than individual investors and as a result, their trading incorporates more systematic information into security prices" (page 2). The co-movement of stock prices is measured by the beta coefficient (the time series sensitivity) of stock returns to the corresponding stock portfolio returns.[39]

The association between institutional ownership and operating performance is examined by Cornett, Marcus, Saunders and Tehranian (2007), where institutional ownership includes the proportion of share owned by institutional investors and the number of institutional investors. Operating performance is measured as operating cash flow return[40] on assets (ROA). Using a sample of S&P100 firms as of November 1993, they find institutional blockholders can effectively monitor managers to act in the best benefits of the shareholders. Blockholders have more incentives and opportunities than the board of directors to oversee managers since board members may have little or no

[38] AMEX: American Stock Exchange; NASDAQ: the National Association of Securities Dealers Automated Quotations; and NYSE: the New York Stock Exchange.
[39] The latter is calculated as the percentage of shares held by institutions relative to total shares outstanding at the end of each quarter.
[40] Operating cash flow return is annual earning before interest and taxes plus depreciation (EBITD).

wealth tied to the firm. As expected, they find both the proportion of shares owned by institutional investors and the number of institutional investors are positively associated with the firm's operating performance (ROA).

Prior research on the relation between ownership composition and firm performance focuses on differences in the motivations of the various types of institutional investors. For example, Brav et al. (2008) find that the filing of a Schedule 13D, which reveals an activist fund's investment in a target firm, results in large positive average abnormal returns, in the range of 7% to 8%, during the (-20, +20) announcement window. They find there are four characteristics of hedge funds: (i) they pool capital from accredited individual and institutional investors to invest in a variety of assets; (ii) they are managed by investment managers; (iii) they are not widely available to the public; and (iv) they operate outside of securities regulation.[41] Brav et al. (2008) argue that hedge fund managers typically suffer fewer conflicts of interest than managers at other institutions. Therefore, the type of institutional investors may have a different impact on financial outcomes, such as firm performance.

Governance mechanisms are also important in explaining firm and bank performance. For a sample of 260 BHCs and savings-and-loan holding companies (SLHCs) in 2002, Belkhir (2009) hypothesizes five governance characteristics (i.e., insider ownership, blockholder ownership, outside director ownership, board leadership structure, and board size) that are important to banking firm performance (Tobin's Q). He tests the substitution and the optimal use of governance mechanisms hypotheses. The former states that BHCs which use one of the five governance characteristics will

[41] Hedge funds are not currently regulated by the SEC.

have lower levels of other governance characteristics. For example, BHCs with greater levels of insider ownership would have lower percentage shareholdings by blockholders and outside directors. The latter, on the other hand, states that the trade-off between the costs and benefits of governance mechanisms affects using governance characteristics in an optimal way by BHCs. The result shows banking firms with higher insider and blockholder ownership achieve better performance. This result supports the study by La Porta et al. (2000) who find a positive association between large shareholding ownership and firm value. Therefore, large share/block ownership is expected to reduce agency conflicts, thereby enhancing firm performance and SEO performance

Several studies point to the incentive alignment and incentive entrenchment effects of ownership concentration (Jensen and Meckling, 1976; Morck et al., 1988; Bolton, 2009; Cornett et al., 2009; Martin, Wiseman and Gomez-Mejia, 2019). In the case of managerial ownership, Morck et al. (1988) find that firm value increases when managers own up to 5% of outstanding shares, but this benefit to shareholders from managerial ownership is not monotonic. When managers own between 5% and 20% ownership of the firm, there is a reduction in financial performance (Morck et al., 1988), suggesting managerial entrenchment. However, firm value increases again when managerial ownership levels are greater than 20%. The benefit to firm value at high managerial ownership levels (> 20%) suggests that there is an incentive effect to managerial ownership which dominates the entrenchment effect at that point (Bolton, 2009).

The reverse is however predicted by the adverse selection theory. It posits that the information advantage that large shareholders have relative to outside (small) shareholders increases the information asymmetry between these two groups of shareholders. This increased information asymmetry in turn increases the adverse selection problem for market participants, such as when firms make an SEO. Consequently, in the presence of large shareholders, a lower offering price is expected for the SEO as market participants discount the offering (Altınkılıç, and Hansen, 2003), leading to an increase in the cost of capital to the issuing BHC. The adverse selection theory predicts a more negative price response to the SEO announcement of BHCs with higher ownership concentration.

3.4 Chapter Summary

In summary, only few studies have analyzed whether and how large shareholdings and multiple large shareholdings are related to SEO performance, and even fewer on the association between network centrality and SEO performance. These studies typically focus on non-banking firms.

To the best of my knowledge, the latest published work on SEOs by BHCs was conducted in 2010 by Krishnan et al. (2010) and no study has examined how the SEO performance of BHCs is related to large shareholding network centrality. My research thus contributes by providing the first evidence on the association between large shareholding network, calibrated using SNA, and the SEO announcement price effects as well as the spillover effect of the announcements to non-issuing BHCs in the same large shareholding network. The research is timely given the increasing attention that large shareholding networks have attracted in the literature in recent years, with evidence showing that large shareholding networks can reduce information asymmetry and influence corporate governance (Kang et al., 2018), thus mitigating agency problems.

Chapter 4

Hypotheses

4.1 Introduction

This chapter sets out the two main testable hypotheses for the research questions identified in Chapter 1. The first hypothesis, which is developed in Section 4.2, focuses on the association between large shareholders' networks and abnormal stock returns around the SEO announcements of BHCs. The hypothesis on the spillover in the SEO announcement effects on non-issuing BHCs in the presence of a large shareholding network is provided in Section 4.3. This is followed by a chapter summary in Section 4.4.

4.2 Large Shareholding Networks and SEO Announcement Effects

The presence of a large shareholding network that is created by having multiple large shareholders is beneficial to BHCs when they return to the capital market to raise equity for the following reasons.

First, the agency theory (Jensen and Meckling, 1976; Demsetz, 1983) suggests that large shareholders accumulate significant equity positions to offset the cost of monitoring. This is because monitoring costs are expected to decrease and the benefits of monitoring are expected to increase as shareholders accumulate large ownership blocks in BHCs. The monitoring experience obtained by these shareholders who hold significant ownership across multiple BHCs is likely to increase the efficacy of their monitoring and reduce information uncertainties about the firm (Kang et al., 2018). Further, multiple large shareholders can directly influence the managers by threatening managers of their positions by using concentrated voting rights to protect shareholders' interests (Shleifer and Vishny, 1986; Hu and Izumida, 2008). Apart from being able to leverage on the economies of scale in monitoring, multiple large shareholders are also incentivized by their significant ownership stakes in the BHC to oversee and monitor managers (Szewczyk et al., 1992; Shleifer and Vishny, 1986; 1997; Hartzell and Starks, 2003).

The changing landscape of the ownership structure in recent years (Dai, 2016) indeed suggests a greater monitoring role of multiple large shareholders, with research collectively suggesting that multiple large shareholders can affect firms' financing decisions (Kang and Luo, 2012; Ahern, 2013; Kang et al., 2018). Given the role of multiple large shareholders as monitors of managers, I argue that, ceteris paribus, the presence of multiple large shareholders increases the monitoring efficacy of BHCs. Since SEO announcements are largely unanticipated and typically associated with negative stock returns (Polonchek et al., 1989; Slovin et al., 1991; Cornett and Tehranian, 1994; Filbeck, 1996; Cornett et al., 1998; Ergungor et al., 2004) due to adverse selection concerns (Myers and Majluf, 1984), I therefore predict that the valuation effects around the announcement of SEOs are less negative in the presence of multiple large shareholders.

The second reason can be found in the network theory (Allen and Babus, 2009), which explains that a link between two nodes represents a direct relation between them. In the context of my thesis, the nodes represent BHCs which are linked together by a network of shareholders who simultaneously hold large share ownership in the BHCs. The network that is created, whilst bridging the BHCs, provides an information advantage to the multiple large shareholders. The network theory suggests that the network can benefit the nodes (i.e., BHCs in my case) which can exploit their position as intermediaries between other BHCs, i.e., those with greater network centrality (Ahern, 2013). An implication of this suggestion for my research is that BHCs with large multiple shareholders are associated with less negative abnormal stock returns around their SEO announcements.

Social network theory also explains that an information flow occurs through the network, with Larcker et al. (2013) showing evidence of greater firm value for more highly connected firms. When large shareholders simultaneously own stocks in the same industry, as in the banking industry, the information transmitted in the network is likely to be industry-specific. Multiple large ownerships in the same industry provide the large shareholders with information advantages that are important for effective monitoring and financing decisions (Kang et al., 2018). The information network created can help these multiple large shareholders share and respond to new information regarding their investee banking firms in a timely manner. By facilitating the transmission of relevant information from one BHC to another BHC (Kang et al., 2018), the information network formed by large shareholders across multiple BHCs allows these shareholders to more accurately estimate the fair value of the issuance. Information asymmetries between BHCs and the market are also mitigated as the large shareholders are able to extract information from the network, thus enabling them to carry out value-enhancing strategies (Bajo et al., 2020). Multiple large shareholders can also exploit the information derived from their network, which could potentially benefit their investee BHCs.

Through the information network, large shareholders form coalitions to work as a monitoring mechanism (Stulz, 1988). Through cross monitoring, multiple large shareholders can more effectively mitigate agency problems associated with management entrenchment. In this sense, multiple large shareholders can act as agents for residual shareholders in monitoring the BHCs by reducing potential expropriation driven by management, thereby increasing BHC performance (Maury and Pajuste, 2005).

In sum, the network, social network, and information network theories all support the notion of information transmission in the network, allowing both BHCs and their large shareholders to share valuable information about the BHC as well as other BHCs in the same portfolio, thus creating significant operating and financial interdependence across BHCs. Therefore, multiple large shareholders can exploit the information network to improve investee BHCs' performance. The cross-monitoring role of multiple large shareholders and the information network created by them expected to mitigate the Myers and Majluf's (1984) adverse selection problem at the time of equity offerings. I therefore hypothesize a less negative SEO announcement effect for issuing BHCs in the presence of large shareholding networks, ceteris paribus. This prediction has support in Attig et al. (2008), who find lower financing costs and agency cost in firms with large shareholding networks.

H1: The abnormals stock returns around SEO announcements are, on average, smaller (less negative) for BHCs in the presence of large shareholding networks.

4.3 Spillover Effects of SEO Announcements

My second hypothesis predicts that there is a spillover in the valuation effect of SEO announcements to non-announcing BHCs which are connected to the issuing BHC by the large shareholding network. My prediction is premised on the argument that the network created by large shareholders across the BHCs facilitates the transmission of relevant information to other (non-issuing) BHCs in the network. Shares owned by the same large shareholders are subject to similar investment, financing, and liquidation risks, and this similar risk exposure may lead to a comovement in the share prices of investee firms (Kang and Luo, 2012; Bradley and Yuan, 2013; Braverman and Minca, 2018). In this case, the multiple large shareholders could monitor and control their investment and financing decisions to minimize risk because they have an advantage over more diffused owners in terms of the precision and the acquisition cost of their private information. This information advantage in turn manifests itself in BHC-specific component of the stock returns.

Moreover, when multiple large shareholders hold a large number of shares and directly invest in different BHCs simultaneously, they have the opportunities to increase their control in these BHCs (Kang et al., 2018). Thus, the monitoring cost and information uncertainty may be reduced in the presence of large shareholding networks, implying that large shareholding networks play an important role in monitoring and controlling management in both the issuing and non-issuing BHCs. The spillover effect to non-issuing BHCs which share the same large shareholding network as the issuing BHCs can be expected when issuing BHCs plan to issue equity since prior evidence has shown that this corporate event (equity raising) has significant economic consequences on the firm

(Polonchek et al., 1989; Slovin et al., 1991; Cornett and Tehranian, 1994; Filbeck, 1996; Cornett et al., 1998; Ergungor et al., 2004; Krishnan et al., 2010). The presence of a large shareholder network thus suggests a spillover effect of SEO announcements to non-announcing BHCs.

In sum, the potential for information sharing in the large shareholding network suggests that issuing BHCs' financing decisions are likely to impact on the value of non-issuing BHCs which share the same large shareholders as the SEO issuers. As in Kang and Luo (2012), I therefore predict that there is a spillover effect of SEO announcements to non-issuing BHCs when issuing BHCs announce their intention to raise equity for the two reasons. First, if investors estimate that the stock price of SEO issuers is overvalued, they are likely to also perceive the stock price of non-issuers which share the same large shareholder network as the issuers to be overvalued too. Second, since both issuing and non-issuing BHCs have the same large shareholders, investors may infer that the large shareholders will have the same institutional style investing and common characteristics so the information spillover effects exist in these BHCs. I therefore hypothesize:

H2: There is a spillover effect of SEO announcements to non-announcing BHCs which share the same large shareholding network as the issuing BHC.

4.4 Chapter Summary

This chapter presents the theoretical arguments to support two testable hypotheses on the value impact of SEO announcements by BHCs in the presence of a large shareholding network. It posits that large shareholding networks are an important determinant of the abnormal stock returns for both issuing and non-issuing BHCs which share the same network. Based on the network, social network, and information network theories, my first hypothesis predicts that the abnormal stock returns around SEO announcements are, on average, smaller (less negative) for BHCs in the presence of large shareholding networks (H1). My second hypothesis (H2) predicts that there is a spillover effect of SEO announcements to non-announcing BHCs due to the potential for information sharing in the network.

Chapter 5

Data and Research Methods

5.1 Introduction

This chapter presents the data and research methods used for testing the two main hypotheses developed in Chapter 4. Section 5.2 outlines the sample construction procedure and data sources. Research methods are discussed in Sections 5.3, followed by the measurement of test variables in Section 5.4. Section 5.5 provides the descriptive statistics of my final sample. Section 5.6 summaries and concludes this chapter.

5.2 Data

My dataset focuses on the SEOs and large shareholders ($\geq$ 2%) of BHCs for the period from 2010 to 2015. I choose this sample period because SEO activities picked up only after 2009, in response to the severe erosion of bank capital during the GFC. Further, the availability of ownership data required for my research is highly limited prior to 2010. My sample stops in year 2015 because data on ownership and SEO announcements required for my research are available only from this year.

To construct the SEO dataset, I begin by compiling a list of BHCs which were listed on any of the three major U.S. stock markets (AMEX, NASDAQ, and NYSE) over the period from January 2010 to December 2015. I use the Federal Reserve System's National Information Centre and the Savings and Loan (SNL) finance databases as my main data sources. For each BHC, I track its SEO activities using Thomson Reuters and ThomsonONE. From these databases, I collect details of the SEO, including the announcement date, offer size and offering price, and bank-specific characteristics at the time of the issue, including total assets, the number of years since establishment, ROA, and capital adequacy ratio. Data on stock prices are sourced from the Center for Research in Security Prices (CRSP) database. These procedures result in a final sample of 148 SEO announcements made by 113 listed BHCs.

To construct the large shareholders' network, I develop a second dataset on share ownership. I extract ownership data, including the identity and percentage of outstanding shares held by "large" shareholders, from ThomsonONE and Osiris databases.[42] I define large shareholders as those who own at least 2% of outstanding shares. Although this departs from the typical 5% cutoff used in the corporate finance literature (Kang and Luo, 2012, Kang et al., 2018; Bajo et al., 2020), the 2% cutoff is more appropriate for my study due to the sheer size of BHCs. Recent estimates, for instance, show that BHCs represent 20.51% of total assets of the domestic financial sector and that the top-five BHCs account for approximately 50% of U.S. GDP (Federal Financial Institutions Examination Council). Accordingly, a share ownership in excess of 5% is rare in BHCs. The ownership dataset consists of 2,875 large shareholders in 443 BHCs, with a total of 5,635 large shareholding-year observations over my sample period.

Using this ownership datset, I track the large shareholders of each issuing BHCs to see if they too are large shareholders in other (non-issuing) BHCs. I identify a total of 32,682 non-issuing BHCs which share the same large shareholders as the issuing BHCs from 2010 to 2015.

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[42] Osiris is a fully integrated public companies database and analytical information solution produced by via Bureau van Dijk.

5.3 Research Methodology

To examine the market response to the SEO announcements of BHCs, I use the standard event study methodology following past studies, including Polonchek et al. (1989), Cornett and Tehranian (1994), Filbeck (1996), Krishnan et al. (2010), Kang and Luo (2012), Kang et al. (2018), and Bajo et al. (2020). Specifically, I calibrate the price response to the SEO announcement by cumulating the daily abnormal returns over a specified number of days surrounding the announcement (i.e., CARs). I elaborate on how I calculate CARs in Section 5.4 on variable measurement.

To test the association between the valuation effect of SEO announcements and large shareholding networks for the sample of issuing BHCs, I run the following ordinary least squares (OLS) regression:

$$CAR\_issuer_{i,t} = \propto + \beta_1\ Network\ Centrality_{i,t} + \sum_{i=2}^{i=N} \beta_i (Control_i)_{i,t} + \beta_{N+1} Year\ fixed\ effects + \epsilon_{i,t}; \qquad (5.1)$$

where α is the intercept; β is the regression coefficient; and ε is the disturbance term. For each issuing BHC i at time t, *CAR_issuer* is the CAR surrounding the SEO announcement date. *Network Centrality* is represented by the four common measures of network centrality extracted from the social network literature (Bajo et al., 2020). These measures show the position of a BHC in the network and they are *Degree*, *Betweenness*, *Eigenvector*, and *Closeness*. *Control* is the vector of control variables which may impact on the announcement price effect. All these test variables are detailed in Section 5.4.

To test whether there is a spillover in the SEO announcement effect to non-issuing BHCs which share the same large shareholding network as the announcing BHCs, I run the following regression with the CAR of non-issuing BHCs as the dependent variable:

$$CAR\_non-issuer_{i,t} = \propto + \beta_1 \, CAR_{issuer_{i,t}} + \beta_2 \, Network\ Centrality_{i,t} + \beta_3 \, (CAR_{issuer_{i,t}} x Network\ Centrality_{i,t}) + \sum_{i=4}^{i=N} \beta_i (Control_i)_{i,t} + \beta_{N+1} Year\ fixed\ effects + \epsilon_{i,t}; \quad (5.2)$$

where *CAR_non-issuer* is the CAR of non-issuing BHCs which share the same large shareholders as the issuing BHCs. Since both the issuers' and non-issuers' characteristics are likely to be important in explaining *CAR_non-issuer*, *Network Centrality* and *Control* in the above equation respectively represent the vector of network centrality measures and control variables of issuing BHCs as well as of non-issuing BHCs. This approach is consistent with (Kang and Luo, 2012). As before, all the test variables are detailed in Section 5.4.

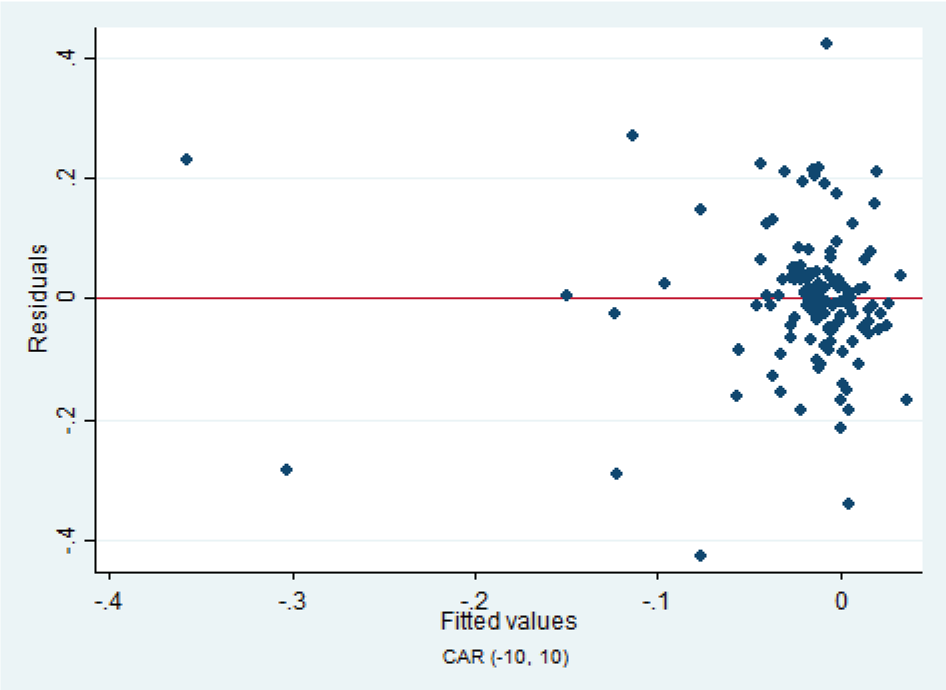
A primary concern in my cross-sectional regression analysis is multicollinearity, which may render the regression model's estimates of the coefficients unstable and inflate the standard errors of the coefficients. To check for the presence of multicollinearity, I compute the correlation coefficients and the variance inflation factor (VIF). The latter measures how much the variance of an OLS regression coefficient is increased due to collinearity. As a rule of thumb, a variable whose VIF value is greater than 10 may merit further investigation. Table 5.1 shows that all VIF values are less than 10, suggesting that multicollinearity is not likely to pose a problem in my analysis.

Table 5.1: Variance inflation factor (VIF) results of test variables

Variables	VIF				
	(1)	*(2)* *Degree*	*(3)* *Betweenness*	*(4)* *Eigenvector*	*(5)* *Closeness*
Network centrality		1.17	1.01	1.17	1.10
Ownership	1.27				
Price run-up (-10, -4)	1.07	1.07	1.07	1.07	1.07
Repeat Issues	1.14	1.08	1.03	1.07	1.03
Capital Adequacy	1.19	1.19	1.14	1.15	1.15
Offering price	1.31	1.33	1.29	1.29	1.29
Relative Offering size	1.43	1.41	1.43	1.41	1.42
Log(Size)	1.62	1.61	1.61	1.70	1.67
Log(Age)	1.18	1.14	1.14	1.14	1.15
ROA	1.11	1.11	1.11	1.11	1.11
Mean VIF	1.26	1.24	1.20	1.23	1.22

A key assumption of OLS regressions is homogeneity in the variance of residuals. To check whether the model is well-fitted, I plot the residuals on fitted (predicted) values of *CAR_issuer* for the (-10, 10) and (-1, 1) windows in Figure 5.1. Both indicate some evidence of heteroscedasticity. Table 5.2 shows the results from White's test on the null hypothesis that the variance of the residuals is homogenous. The results show that the variance of the residuals is homoscedastic only for *CAR_issuer (-1, 1)*. To be sure, my regression analysis reports White-Huber (heteroskedasticity) robust standard errors. I therefore focus on the tests using this shorter event window, which also ensures that the SEO announcement effect is less likely to be confounded by other events vis-à-vis the longer window. Results from tests using the longer window are also presented (Chapter 6), for robustness.

Figure 5.1: Graphical method for detecting heteroscedasticity for *CAR_issuer (-10, 10)* and *CAR_issuer (-1, 1)*



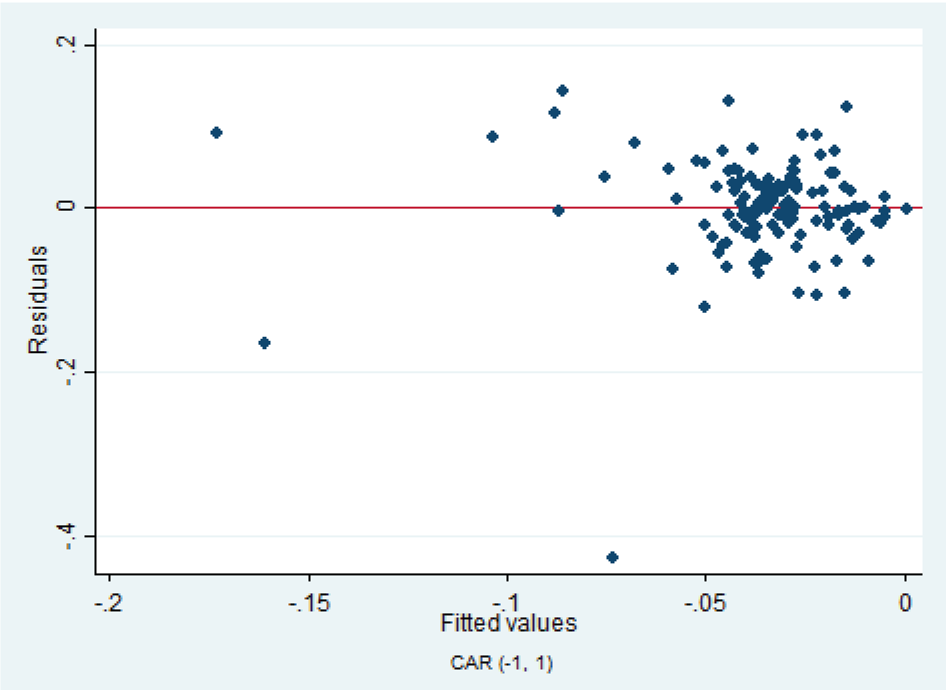


Table 5.2: Checking Homoscedasticity of Residuals for *CAR_issuer*

	Heteroskedasticity		
	Chi-squared	df	p-value
CAR_issuer (-10, 10)	55.11	34	0.012*
CAR_issuer (-1, 1)	46.85	34	0.070

* denote significance at the 5 percent level.

5.4 Measurement of Variables

In this section, I detail how the test variables are measured and the notations used to represent them. Table 5.3 provides a summary.

5.4.1 Dependent Variables

The dependent variables in my analysis are *CAR_issuer* and *CAR_non-issuer*, respectively measured by the cumulative abnormal returns (CARs) around the SEO announcement for the issuing BHCs and non-issuing BHCs which share the same large shareholders' network.

To measure *CAR_issuer*, I cumulate the daily abnormal returns (ARs) over different window lengths surrounding the SEO announcement date (event), t=0. For robustness purposes, the window length ranges from a short 3-day (t=-1 to t=1) window to a long 21-day (t=-10 to t=10) window. While a long window allows the information content of the SEO announcement to be fully captured, it is prone to other confounding events. Using a shorter event window will help overcome the problem that the SEO announcement effect may be confounded by other events but, at the time, may not fully capture the valuation effect of the announcement.

The AR for stock *i* on event day *t* is calculated as follows:

$$AR_{it} = R_{it} - (\widehat{\alpha_i} + \widehat{\beta_i} x R_{mt}); \quad (5.3)$$

where on event day *t*, R_{it} is the rate of return on stock *i*, calculated based on closing prices of consecutive days; and R_{mt} is the rate of return on the market for the corresponding time period. I proxy the latter using the CRSP equally and value-weighted indexes.

The coefficients $\widehat{\propto_i}$ and $\widehat{\beta_i}$ estimate the intercept and slope of the market regression model, respectively. CAR is the sum of the daily abnormal returns (AR) from day 1 to day T, as shown in the following equation:

$$CAR_{it} = \sum_{t=1}^{T} AR_{it}. \tag{5.4}$$

To measure *CAR_non-issuer*, I first identify non-issuing BHCs which share the same large shareholding network as the issuing BHCs. For each of these non-issuing BHCs, I measure the ARs and CARs over the different windows surrounding the day when the issuing BHC in their network of large shareholders make an SEO announcement.

5.4.2 Independent Variables

Network Centrality:

I represent large shareholding network centrality using the following four widely used measures of network centrality:

1. **Degree:** This is the most intuitive, straightforward, and important centrality measure. It counts the total number of connections that a large shareholder has in the network. Given the adjacency matrix X, degree (d_i) for agent *i* is the sum of the row (or column) of the adjacency matrix:

$$d_i = \sum_j x_{ij}.$$

Degree measures the total number of multiple large shareholders in a given BHC. As it proxies for the capacity of a BHC to extract information, the higher the number of ties (*Degree*), the greater the information flow. The degree centrality measure, being dependent on the number of the existing nodes in the network, makes it difficult to compare network of different node size. So, I calculate the normalized degree using the total number of possible neighbors, N-1, as a scaling factor. This indicator ranges from 0 to 1; the closer to 1 is the degree centrality, the more the large shareholder is directly connected to the rest of the network via common ownership. BHC centrality is measured by Degree which calculate the average of each centrality measure for the set of large shareholders in each BHC (Bajo et al., 2020).

2. **<u>Betweenness:</u>** It provides a measure of the ability of a BHC to serve as a link between two (or more) disconnected (or not directly connected) groups of other BHCs. Betweenness of a BHC in a network is measured by making use of the concept of geodesic paths, which are the shortest chains or ties through which two BHCs are connected in a given network. *Betweenness* is also calculated by estimating the number of (shortest) paths passing through that BHC. In other words, given the total number of possible paths between two other BHCs, the higher the number of cases in which the shortest path passes through a given BHC, the higher the agent's betweenness. Formally, *Betweenness* (b_i) for agent i is represented as follows:

$$b_i = \sum\nolimits_{j<k} \frac{p_{ijk}}{p_{jk}}$$

where p_{ijk} is the number of geodesic paths between agents j and k passing through agent i. p_{jk} is the total number of geodesic paths between agents j and k.

If a BHC stands on every shortest path between any pair of other BHCs, the BHC's betweenness would be at the maximum. Intuitively, the highest betweenness is achieved when two subnetworks are linked only through a single BHC who acts as a bridge between them.

3. **<u>Eigenvector:</u>** One of the limitations of the *Degree* measure is that the simple count of connections does not necessarily capture the prominence of a BHC within the network. If a BHC has a high degree of centrality but most of its connections are linked to other BHCs which themselves are not well connected, the power exercised by this BHC over the network would be somewhat limited. If the BHC is tied to other BHCs which themselves are well connected (more central), this BHC would have a greater influence in the network. A higher eigenvector indicates that a BHC can extract information more efficiently as the information flows through other BHCs that are more central and informed. Formally, *Eigenvector* (v_i) for BHC_i is calculated as follows:

$$v_i = \lambda \sum_{k=0}^{N} x_{ij} v_j$$

where λ is a constant represented by the biggest eigenvalue of the adjacency matrix and *v* is the eigenvector centrality score.

4. **Closeness** of a node is a measure of centrality in a network, which reflects how close (shortest path) a BHC is to all other BHCs in the network (Horton, Millo, and Serafeim, 2012). The lowest possible *Closeness* centrality score is equal to 1, which would indicate a BHC is directly connected to every BHC in the network. In this research, *Closeness* is calculated as the reciprocal of the sum of the length of the shortest paths between the node and all other nodes. This indicator ranges from 0 to 1, with a higher *Closeness* centrality indicating the more central a node is, being closer to all other nodes. The formula is given below:

$$C(x) = \frac{1}{\sum_{y}^{x} d(y,x)}$$

where *d(y,x)* is the distance from one node to all other nodes.

Network Centrality is predicted to have a more influential effect on *CAR* because multiple large shareholders central in the network are more able to capitalize on their position in the network to mitigate agency cost and information asymmetries (Kang et al., 2018). This is because these central multiple large shareholders can derive a greater information advantage from the social network created (Ahern, 2013). Therefore, the more central the multiple large shareholders are in the network, the lower the shock of the SEO announcement, suggesting a negative eatimated coefficient for the network centrality measures. As in past studies (e.g., Bajo et al. (2020)), I compute the average of each network centrality measures (*Degree*, *Betweenness*, *Eigenvector*, and *Closeness*) for each BHC to get a BHC-level measure of network centrality of its multiple large shareholders.

Ownership Concentration:

This variable is computed as the sum of the percentage shareholdings of the large shareholders, where large shareholders are defined as those who own at least 2% of outstanding shares. For robustness, I use *Ownership Concentration* in place of the large shareholding network centrality measures an alternative way of capturing the information enviroment and the efficacy of agency conflict mitigation.

I draw on several theories expounded in the corporate finance literature to rationalize my choice of this variable: agency theory, ownership structure theory, and adverse selection theory. I argue that the relationship between ownership concentration and SEO performance for BHCs is non-linear, similar to Morck et al. (1988) for corporate firms. Although they focus on managerial ownership, it is conceivable that their argument would equally apply to the ownership concentration of shareholders other than manager-owners. I therefore predict an alignment of interest at low ownership concentration, and an entrenchment effect at high ownership concentration which exacerbates adverse selection problem at the equity offering. I rerun the main regression tests, replacing the network centrality measures with Ownership Concentration.

<u>Control Variables</u>

I control for a number of BHC-level characteristics which may impact on the way the market responds to the SEO announcement, i.e., CAR. I discuss the control variables below, with justifications for their inclusion as well as how they are measured.

Price run-up:

Past studies document that managers have incentives to time the market when they return to the equity market for capital raising (Droms, 1989; DeAngelo, DeAngelo, and Stulz, 2010; Krishnan et al., 2010; Bolton, Chen, and Wang, 2013). In particular, the evidence shows that firms are more likely to make an SEO following a pre-announcement price run up, suggesting that investors can somewhat predict what the issuers' stock returns would be based on the observed price run-up in the period leading to the SEO announcement. I measure the pre-announcement period's market reaction by cumulating the abnormal returns starting from the 10^{th} day to the fourth day prior to the SEO announcement. This variable is denoted by *Price run-up (-10, -4)*.

Repeat Issues:

The next control variable is *Repeat Issues*, which is a dummy variable that takes a value of 1 if the BHC has made more than one equity offerings during from the period of my investigation (2010 to 2015), and 0 otherwise. To develop an effective strategy for examining share price reactions to sequences of equity issues, I classify SEOs into two categories: repeat and non-repeat issues. This strategy is related to the hypothesis of Gale and Stiglitz (1989), which argues that an adverse selection problem may be associated with a repeat issue of common stock, and that a pooling equilibrium may apply to non-repeat issues.

From a market reaction perspective, repeat issues of common stock are expected to be accompanied by more negative market reactions than non-repeat issues. The market reaction to non-repeat issues appears to be consistent with the existence of a pooling equilibrium, as suggested by Gale and Stiglitz (1989). In announcing a non-repeat SEO, the BHC would have exhausted a valuable element of potential financing flexibility. The existence of a prior stock issue thus worsens the terms on which the BHC can gain access to future equity financing (Gale and Stiglitz, 1989), suggesting that the valuation effect of repeat issues on stock returns is significantly more negative than for non-repeat issues (Slovin et al., 1991). Gale and Stiglitz (1989) also provide supporting evidence for this association, suggesting that repeat issues of common stock may reveal unfavorable private information that could not be discerned in earlier issues.

Capital Adequacy:

The next control variable is *Capital Adequacy*. The capital adequacy ratio is a measurement of a bank's available capital. It is expressed as the percentage of a bank's risk-weighted asset exposures, calculated by dividing a bank's capital by its risk-weighted assets at the end of the quarter prior to the SEO announcement date.

Capital regulation is one of the factors affecting the abnormal stock returns around SEO announcements.[43] BHCs raise equity to increase the ratio of equity to assets in order

[43] Since equity offering decisions of BHCs are somewhat constrained by capital regulations (Polonchek et al., 1989), regulators thus interfere with the market's ability to discern high quality issuing BHCs from poor quality ones. This problem is heightened by the difficulty for the market to estimate the cash flows of non-

to meet regulatory capital adequacy requirements as well as for investment purposes. Prior studies gauge issuing BHCs' proximity to meeting capital adequacy requirements by the nature of their SEO, i.e., whether the issue is voluntary or not. Using a continuous variable like *Capital Adequacy* has the advantage over a discrete measure (i.e., voluntary vs involuntary issue) since it informs the proximity (distance) of BHCs to meeting the capital adequacy requirement. I predict that BHCs with a lower capital adequacy ratio have, on average, lower CARs surrounding the SEO announcement.

Offering price:

I also control *Offering price*, which refers to the magnitude of the offering price of the equity issuance. When issuers make their intention to issue more new shares known to the market, investors' concern for the potential dilution of their ownership in the firm may depress the stock price, resulting in a negative price response. It is argued that a price discount is often required to compensate existing shareholders for the potential dilution in their shareholding in the firm (Henry and Koski, 2010), suggesting that a negative association between the offering price and CAR.

Relative Offering size:

Relative Offering size provides another proxy for the extent of potential dilution in the ownership of existing shareholders caused by an equity offering. It is measured by the number of shares issued at the SEO divided by the number of outstanding shares

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bank subsidiaries as information about these subsidiaries is often not publicly disclosed. Regulators however have access to inside information concerning banking firms and their subsidiaries which is necessary for monitoring and controlling purposes (Filbeck, 1996).

after the issuance. Just like the offering price, it is conceivable that, all else equal, the larger the offering size relative to firm size, the greater the price discount on the issuance (Henry and Koski, 2010) due existing shareholders' concerns about the dilution of their holdings. Therefore, a negative association is expected between *Relative Offering size* and CAR.

Log(Size):

I control for the size of BHCs (*Log (Size)*), measured by the natural logarithm of the year-end market capitalization (Bajo, Chemmanur, Simonyan, and Tehranian, 2016). Differences in size amongst BHCs may lead to differences in the SEO performance. For example, firm size has been found to be correlated with information disclosure (Singhvi and Desai, 1971), i.e., the degree of transparency (Merton, 1987) and information asymmetry (Nayyar, 1993), and the degree of diversification of business (Hansen and Wernerfelt, 1989), suggesting that the SEO announcements of larger BHCs are less surprising, having less information content relative those of smaller BHCs. Further, larger BHCs are likely to have a larger shareholdings network, suggesting a richer information transmission, as well as greater abilities to exploit relevant information about the issuance, compared to smaller BHCs.

Log(Age):

I also control for the age of the BHC, denoted by *Log*(*Age)* and calculated by the natural logarithm of the number of years from the year of establishment to the SEO announcement date. The literature suggests that older BHCs tend to outperform and have less uncertainty about their value than younger BHCs due to the greater industry experience (Bajo et al., 2016) and information availability of older BHCs. I therefore expect older BHCs to experience lower CARs.

Return on Assets (ROA):

Finally, I control for BHCs' profitability, as proxied by the return on assets (*ROA*) as it is the most effective and widely available financial measure to assess BHCs' financial performance. *ROA* also captures the fundamentals of business performance in a holistic way, looking at both income statement performance and the assets required to run a business.

Table 5.3: Measurement of test variables

VARIABLES	MEASUREMENT
Dependent variables	
CAR_issuer	CAR measured over windows (-10, +10) and (-1, +1) of issuing BHCs
CAR_non-issuer	CAR measured over windows (-10, +10) and (-1, +1) of non-issuing BHCs which share the same large shareholders as issuing BHCs
Independent variables	
Indicator CAR_issuer <0	A value of 1 if *CAR_issuer* is negative, and 0 otherwise
Network Centrality	Network centrality is measured by *Degree*, *Betweenness*, *Eigenvector*, and *Closeness*
Ownership Concentration	Sum of the percentage shareholdings of large shareholders ($\geq$2%)
Price run-up (-10, 4)	The pre-announcement period market reaction is measured by the ARs cumulated from the 10th day to the fourth day prior to the announcement.
Repeat Issues	A value of 1 if SEO is a repeat issue, and 0 otherwise
Capital Adequacy	The capital adequacy ratio, measured by dividing a bank's capital by its risk-weighted assets
Offering price	The offering price of the SEO
Relative Offering size	The number of new shares issued at the SEO divided by the number of outstanding shares after the SEO
Log(Size)	Natural logarithm of the market value of total assets
Log(Age)	Natural logarithm of the number of years since establishment of the BHC
ROA	Return on Assets

5.4.3 Pearson Correlation Coefficients

Table 5.4 reports the Pearson correlations for the independent variables. The correlation matrix allows me to assess both the strength and direction of the linear relation between two variables. *CAR_non-issuers* and *CAR_issuers* are positively correlated with each other, providing some preliminary evidence of a spillover in the SEO announcement effects within the large shareholders' network.

Network centrality, measured by *Degree*, *Betweenness*, *Closeness*, and *Eigenvector*, is positively correlated with *CAR_issuers*, contrary to my expectations. *Ownership Concentration* is negatively correlated with *CAR_issuers*, showing that BHCs with greater ownership concentration experience lower stock returns on days surrounding the SEO announcement. Further, large shareholders with high network centrality are also more likely to have a greater ownership stake in BHCs, as shown by the positive correlations between the various measures of network centrality and *Ownership Concentration*. This finding supports the use of *Ownership Concentration* as an alternative measure to the network centrality measures in my robustness tests (Chapter 6).

Repeat Issue is negatively correlated with *CAR_issuers*, implying a more negative stock price reaction to the announcement of repeat stock issues (Slovin et al., 1991). Relative offering size is negatively correlated with both *CAR_issuers* and *CAR_non-issuers*; thus larger equity offerings are associated with lower stock price reactions for both the issuers and non-issuing BHCs in the same network. *Log(Size)* has a positive correlation with both *CAR_issuers* and *CAR_non-issuers,* contrary to expectations. Both *Log(Size)* and *Log(Age)* are positively correlated with each other, consistent with

Table 5.4: Pearson correlation coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) CAR_non-issuers	1.000													
(2) CAR_issuers	0.022*	1.000												
(3) Degree	0.003	0.016*	1.000											
(4) Betweenness	0.007	0.029*	0.504*	1.000										
(5) Eigenvector	-0.003	0.032*	0.614*	0.233*	1.000									
(6) Closeness	-0.007	0.026*	0.478*	0.125*	0.921*	1.000								
(7) Ownership Concentration	-0.008	-0.112*	0.664*	0.395*	0.472*	0.364*	1.000							
(8) Repeat Issues	-0.003	-0.034*	0.264*	0.104*	0.191*	0.180*	0.385*	1.000						
(9) Capital Adequacy	-0.010	0.095*	0.279*	0.162*	0.284*	0.205*	0.231*	0.020*	1.000					
(10) Offering price	0.034*	0.081*	0.215*	-0.007*	0.057*	-0.029*	0.091*	0.012*	-0.012*	1.000				
(11) Relative Offering size	-0.026*	-0.226*	-0.125*	0.024*	-0.147*	-0.149*	-0.171*	-0.204*	-0.167*	-0.331*	1.000			
(12) Log(Size)	0.007	0.121*	0.150*	-0.091*	0.234*	0.137*	0.104*	0.076*	0.234*	0.381*	-0.544*	1.000		
(13) Log(Age)	-0.018*	0.032*	-0.194*	0.015*	0.058*	0.050*	-0.289*	-0.203*	0.052*	0.015*	0.065*	0.213*	1.000	
(14) ROA	0.027*	0.140*	0.124*	0.085*	0.086*	0.0425*	0.110*	-0.050*	-0.036*	0.286*	-0.246*	0.088*	-0.076*	1.000

* denotes significance at the 5 percent level.

previous studies (Villalonga and Amit, 2008) showing that larger BHCs tend to be older. Finally, there is a positive correlation between *ROA* and the SEO announcement effect, suggesting that a stronger market response to the SEO announcements of more profitable issuers. Overall, the matrix shows that multicollinearity is unlikely to be of concern in my data.

5.5 Descriptive Statistics

Table 5.5 reports the annual frequency distribution of SEOs issued by the sample of 113 BHCs from 2010 to 2015. The table shows that my sample of 113 BHCs made a total of 148 SEOs in the post-GFC period, suggesting that there are repeat issues in the sample. My sample is much larger than prior studies. For example, the sample in Solvin et al. (1991) comprises 33 BHCs which made a total of 47 SEOs between 1981 and 1989. In response to the severe deterioration in bank capital following the GFC and tightened regulatory requirements as per Basel 3, a significant number of BHCs issued equity to meet their capital adequacy ratios (CARs) in the post-crisis period, with the highest number of SEOs (44) recorded in 2010. As shown in the table, the number of SEOs in subsequent years is much smaller, ranging from 18 to 24 SEOs per year.

Table 5.5: Frequency distribution of SEOs by year

The SEO data are sourced from Thomson One

	2010	2011	2012	2013	2014	2015	Total events	Number of listed BHCs represented
Number of SEO announcements	44	22	19	21	18	24	148	113

Table 5.6: Frequency distribution of SEOs by BHCs

	Number of SEOs issued				
	1	**2**	**3**	**4**	**5**
Number of issuing BHCs	91	12	8	1	1
Total number of SEO announcements conducted by BHCs	91	24	24	4	5

Table 5.6 shows the number of SEOs issued by sample BHCs over the sample period. Repeat issues are frequent, with about 40% of the SEOs falling in this category. Of the repeat issues, two BHCs conducted at least four SEOs, eight BHCs conducted three SEOs, and 12 BHCs conducted two SEOs. The remaining 91 BHCs conducted just one SEO over the sample period. In the previous study of Solvin et al. (1991), 21 BHCs conducted just one SEO whereas the remaining 12 BHCs conducted a total of 26 SEOs, classified as repeat issues. As repeat issues are a valuable signal of firm value, they provide important information cues to the market in valuing an SEO (Slovin et al., 1991).

Table 5.7 lists the top 10 largest shareholders in my sample of BHCs at the beginning (2010) and end of the sample period (2015). The Vanguard Group, Inc., one of the world's largest investment companies which offers a large selection of low-cost mutual funds, Exchange-Traded Funds (ETFs), financial advice, and related services, is a large shareholder in the highest number of BHCs. It held at least 2% share ownership in 253 and 232 BHCs in 2010 and 2015, respectively. The second largest multiple shareholder is Blackrock Inc, which is one of the world's largest asset managers. It is a large shareholder (at least 2% ownership) in 227 and 222 BHCs in 2010 and 2015, respectively. The extensive number of BHCs in which these shareholders hold significant stakes creates a large shareholding network across the investee BHCs. The list of the top 10 largest shareholders is highly stable over time, showing little change to the list between the two years.

Table 5.8 reports the top 10 BHCs ranked by network centrality at the beginning (2010) and end of the sample period (2015). To save space, I report only the list using *Degree*, which is measured by the maximum number of network connections. The table

Table 5.7: Top 10 multi-large shareholders

Large shareholders	The number of BHCs large shareholder hold shares in
2010	
The Vanguard Group, Inc.	253
Blackrock, Inc	227
BlackRock Institutional Trust Company, N.A.	163
Dimensional Fund Advisors, L.P.	141
State Street Corporation	95
Wellington Management Company, Llp	91
State Street Global Advisors (US)	75
The Banc Funds Company, Llc	73
Wellington Management Group Llp	64
FMR Llc	58
2015	
The Vanguard Group, Inc.	232
Blackrock, Inc	222
Dimensional Fund Advisors, L.P.	150
BlackRock Institutional Trust Company, N.A.	90
State Street Corporation	90
Wellington Management Group Llp	89
State Street Global Advisors (US)	74
The Banc Funds Company, Llc	67
Basswood Capital Management, Llc	53
FMR LLC	53

Table 5.8: Top 10 BHCs ranked by degree centrality

BHCs	Degree	BHC Size ($000')
2010		
SVB Financial Group	0.0334	17,534763
Bryn Mawr Bank Corp	0.0310	1,731,768
Lakeland Financial Corp	0.0310	2,682,972
Bank Of The Ozarks Inc	0.0310	3,273,659
City National Corp	0.0286	21,356,479
WSFS Financial Corp	0.0286	3,954
Southwest Bancorp, Inc	0.0263	2,820,541
Pacific Premier Bancorp, Inc	0.0263	826,816
Bofi Holdings, Inc	0.0239	1,661,000
Brookline Bancorp, Inc	0.0239	2,721,000
2015		
Cardinal Financial Corp	0.0096	4,029,921
Bank Of The Ozarks, Inc	0.0096	8,879,459
SVB Financial Group	0.0096	44,698,667
Suntrust Banks, Inc	0.0096	190,989,105
Banc Of California, Inc	0.0088	8,235,555
Bankunited, Inc	0.0088	23,883,467
Bofi Holdings, Inc	0.0088	6,662,000
Cobiz Financial, Inc	0.0088	3,351,767
City National Corp	0.0088	32,610,363
Guaranty Bancorp	0.0088	2,368,525

Source: Osiris

exhibits considerable variation in the list of top 10 BHCs in 2010 and 2015, supposedly weakening the nexus of connections within the shareholding network which depends on the idiosyncratic ability of each large shareholder to take joint shareholding with other large shareholders.

Table 5.9 presents the descriptive statistics on large shareholdings for the sample of BHCs. The average large share ownership is rather stable over the sample period, fluctuating from a low 4.42% to a high 4.77%, whilst the median large share ownership ranges from a low 3.48% to a high 3.66%. The standard deviation of large shareholdings is quite small, ranging from 3.76 to 5.34% across the years. These statistics indicate that although the average ownership of large shareholders is small, which is not surprising given the huge size of most BHCs, these shareholders collectively hold a large chunk of shares in many BHCs, thus creating a shareholding network among the BHCs.

Table 5.10 reports the summary statistics for other characteristics of issuing BHCs. The first four variables are network centrality measures for the issuing BHCs in the network. *Degree* measure is a more intuitive concept about network centrality than the other measures (Bajo et al., 2020). *Degree* has an average of 1.23%, suggesting that of other BHCs via the large shareholders' network. In other words, issuing BHCs have, on average, 1.23 existing nodes in every 100 connnections a large shareholder has in the network. *Betweenness* is calculated by the number of shortest paths passing through that BHC to the total number of possible paths between two other BHCs. It shows that, on average, issuing BHCs have 3.27 shortest paths passing through that BHC in evert 100 posible paths between two other BHCs. *Eigenvector* shows that, on average, issuing BHCs have assigns 4.3% to each BHC in the network based on the premise that connections between well-connected BHCs contribute more to the centrality of the BHC than parallel connections between low-connected BHCs (Bonacich and Lloyd, 2015). Finally, *Closeness* shows that, on average, there is 2.5 shortest paths that a issuing BHC is to other BHCs in the network.

All issuing BHCs appear to have met the capital adequacy requirement, with a reported minimum capital adequacy ratio of 15%, which far exceeds the minimum capital requirement of 8%. Based on this ratio, the average issuing BHC is thus considered financially safe, likely to meet their financial obligations.

The average BHC is about 75 years of age at the date of the SEO, although there is a huge variation, with the youngest being four years old and the oldest being 226 years old. On average, the offering price of the SEO issued by BHCs is $17, with the minimum and maximum prices at $0.5 and $101, respectively. The offering price for my sample SEOs is thus lower in comparison to Koop and Li (2001); they report the average offering price for a sample of 3,771 SEOs issued from 1985 to 1998 is $22.21 with a minimum price of $1.

My sample issuers are also diverse in their size, with *Log(Size)* ranging from 2.55 ($13 million) to 10.53 ($363 billion). Issuers on average experience a pre-announcement price run-up of 3.23% in stock returns. Slightly more than a quarter (26.92%) of the equity offerings in my sample are repeat issues, as indicated by *Repeat issues.* The profitability of issuing BHCs, as measured by *ROA*, ranges from -7.25% to 4.98%, and averages 0.78%.

Table 5.9: Large shareholdings between 2010 and 2015

Year	Average ownership (%)	Median ownership (%)	S.D of ownership	Maximum ownership (%)	Minimum ownership (%)
2010	4.76	3.66	4.07	85.99	2.00
2011	4.77	3.55	5.34	85.96	2.00
2012	4.42	3.48	3.76	73.76	2.00
2013	4.60	3.58	4.29	80.94	2.00
2014	4.64	3.61	4.08	76.78	2.00
2015	4.67	3.61	4.30	73.10	2.00

Table 5.10: Summary statistics of control variables of issuing BHCs

Variables	Mean	Std. Dev.	Min	Max
Degree	0.0123	0.0069	0	0.0286
Betweenness	0.0327	0.0587	0	0.4494
Eigenvector	0.0430	0.0194	0	0.1065
Closeness	0.4040	0.0552	0	0.4593
Price run-up	0.0323	0.1702	-0.42	0.97
Repeat Issues	0.2692	0.4453	0	1
Capital Adequacy (%)	15.0952	3.6887	9.55	34.88
Offering price ($)	16.9872	13.6161	0.5	101
Relative Offering size	0.3097	0.5281	0.01	4.40
Log(Size)	6.3487	1.6543	2.55	10.53
BHC age (Year)	75	56	4	226
Log(Age)	3.9129	0.9874	1.39	5.42
ROA (%)	0.7811	1.3357	-7.25	4.98

Table 5.11 reports the summary statistics for other characteristics of non-issuing BHCs. *Degree* shows that, on average, non-issuing BHCs are connected to 1% of other BHCs via the large shareholders' network. *Betweenness* shows that, on average, non-issuing BHCs have 3.17 shortest paths passing through that BHC in every 100 posible paths between two other BHCs. *Eigenvector* shows that, on average, non-issuing BHCs have 4.1% to each BHC in the network, suggesting that a higher eigenvector indicates that a non-issuing BHC can extract information more efficiently as the information flows through other BHCs that are more central and informed. The reciprocal of the sum of the length of the shortest paths (0.4) between the non-issuing BHC and all other non-issuing BHCs via the large shareholders' network, suggesting, on average, the shortest path (2.5) a issuing BHC is to other BHCs in the network. Overall, the network centrality measures are similar in profile for the issuing BHCs and non-issuing BHCs in the networks.

Some of the non-issuing BHCs do not meet the capital adequacy requirement, as shown by the minimum reported capital adequacy ratio of -2.56%. This negative ratio suggests that some of the non-issuing BHCs are considered to be financially unsafe and thus unlikely to meet their financial obligations. The average non-issuing BHC is about 85 years of age at the time of the SEO, although there is a huge variation, with the youngest being just one year old and the oldest 223 years. My sample of non-issuers have *Log(Size)* ranging from 5.35 ($210 million) to 14.76 ($2,471 billion). The average *ROA* for non-issuing BHCs is 0.58%, which lower than that for issuing BHCs (0.78%). Additionally, the *ROA* for non-issuing BHCs ranges from -6.9% to 4.11%, compared to -7.25% to 4.98% for issuing BHCs.

Table 5.11: Summary statistics of control variables of non-issuing BHCs

Variables	Mean	Std. Dev.	Min	Max
Degree	0.0101	0.0067	0	0.0422
Betweenness	0.0317	0.0687	0	0.8206
Eigenvector	0.0410	0.0360	0	0.5530
Closeness	0.4009	0.0580	0	0.7002
Capital Adequacy (%)	15.9711	4.4468	-2.5600	67.51
Log(Size)	8.1550	1.5140	5.3550	14.7606
BHC age (Year)	85	54	1	223
Log(Age)	4.1256	0.93	0	5.4072
ROA (%)	0.5818	1.0389	-6.9296	4.1118

Table 5.12 provides an overview of the time evolution of large shareholdings and network centrality. Over the period from 2010 to 2015, the large shareholding network has become more intensely populated but less concentrated. The number of large shareholders (column (2)) started high in 2010, with 1,212 large shareholders, before dropping to about half the number in the following two years. It trends upward subsequently, peaking in 2015 with 1,250 large shareholders. This pattern is mirrored by the number of BHCs with large shareholders, as column (1) shows. Despite the increasing number of large shareholders, the shareholding network has become more fragmented with strong clusters since 2010 due to the existence of a handful of strongly connected large shareholders and a large number of shareholders with a very limited spectrum of co-ownership relationships.

Table 5.12: Overview of large shareholdings and network centrality

Year	BHCs with large shareholders (1)	Number of large shareholders (2)	Average Number of BHCs owned by a large shareholder (3)	Degree (4)	Betweenness (5)	Eigenvector (6)	Closeness (7)
2010	420	1,212	10	0.0238	0.0234	0.0361	0.3878
2011	372	503	5	0.0294	0.0443	0.0358	0.3557
2012	380	538	5	0.0340	0.0277	0.0363	0.3619
2013	418	1,082	9	0.0238	0.0263	0.0367	0.4014
2014	419	1,050	9	0.0239	0.0259	0.0359	0.3995
2015	426	1,250	9	0.0190	0.0276	0.0362	0.3811

(1) The number of BHCs that are participated by at least one large shareholder ($\geq$ 2% ownership)
(2) The number of large shareholders
(3) The average number of BHCs whose shares are held by a large shareholder
(4)-(7) The average of each centrality measures

Figure 5.2: Large shareholder network visualization

This figure shows the visualization of the co-ownership network formed by large shareholders of BHCs from 2010 to 2015. Blue circle nodes on individual graphs represent large shareholders.

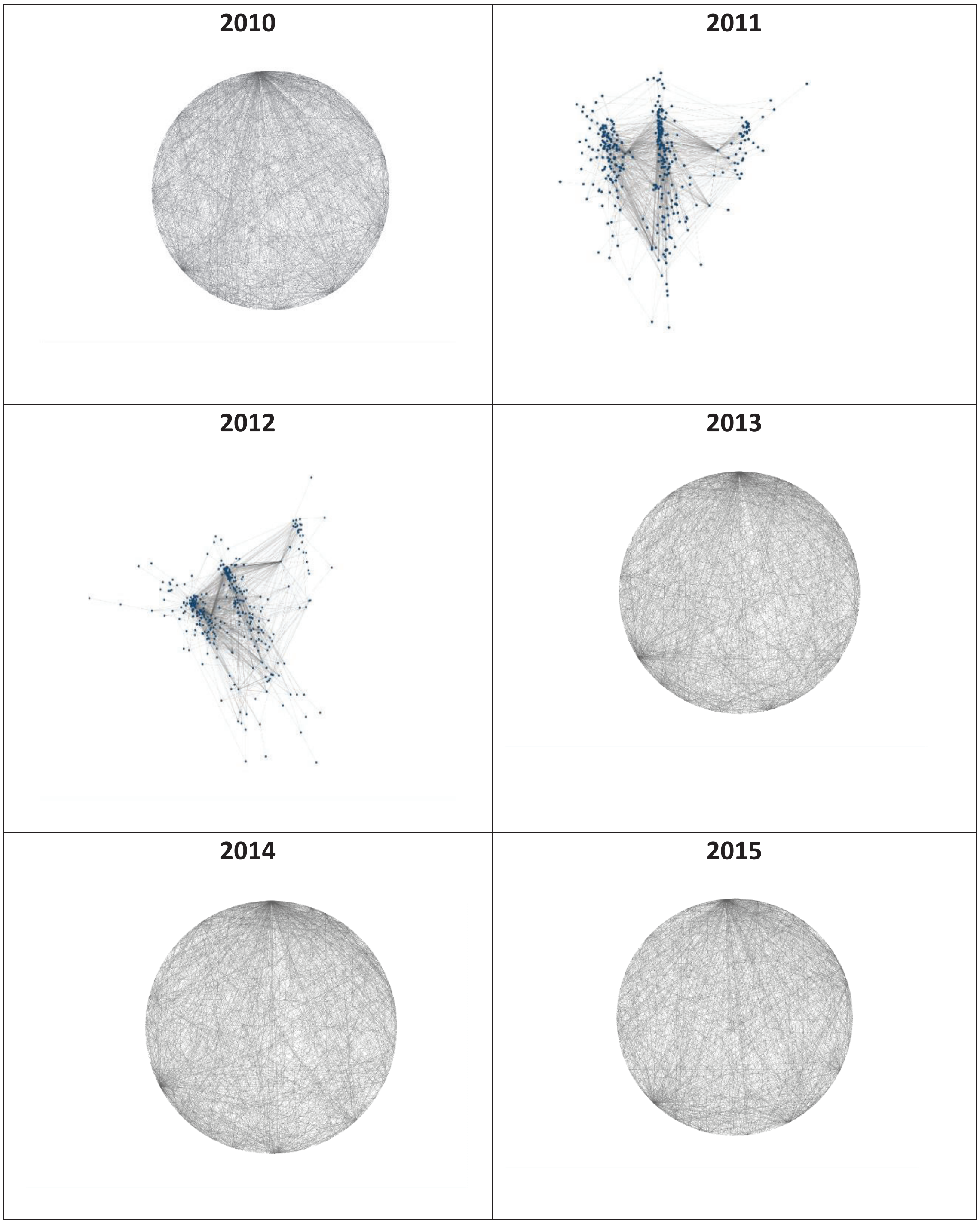


Figure 5.2 displays the large shareholding network, including the full set of links from 2010 to 2015. In these plots, the size of the nodes is proportional to the relative degree. In spite of the large number of edges, the resulting picture conveys some useful information about the presence of large sub-networks as represented by the nodes. In each cluster, central large shareholders show a remarkable number of direct ties (i.e., high *Degree* centrality).

This figure provides an overview of the network structure over the period from 2010 to 2015. A node with very high degree is generally a crucial actor in the social network. The figure shows that the networks in 2010, 2013, 2014, and 2015 have strongly connected large shareholders because the large shareholders in these years were around 1,050-1,250. In contrast, the networks in 2011 and 2012 do not show strongly connected large shareholders, perhaps due to the number of large shareholders in these years dropping to about half that in 2010 and 2013-2015.

5.6 Chapter Summary

This chapter discusses the sample construction procedure, data sources, research methods, and the test variables. The final sample, which spans over the period from 2010 to 2015, is constructed based on two datasets. The first is the SEO dataset, which consists of 113 listed BHCs issuing a total of 148 SEOs, and 32,682 non-issuing BHCs which share the same large shareholding network as the issuing BHCs. The second dataset comprises 2,875 large shareholders who have at least 2% share ownership in 443 BHCs, with a total 5,635 large shareholding-year observations from 2010 to 2015.

I employ the standard event study methodology to calibrate the valuation (price) effects of SEO announcements by BHCs. Regression analysis is used to examine the association between large shareholders' network centrality measures and abnormal stock returns around the SEO announcements of issuing BHCs, controlling for other determinants of the stock returns. To examine the spillover of SEO announcement effects in the large shareholding network, I regress the cumulative abnormal returns (CAR) of non-issuers around the SEO announcement on issuing BHCs' CAR, controlling for other dtereminants of the announcement price effects. My empirical findings are discussed in the next chapter.

Chapter 6

Empirical Results

6.1 Introduction

This chapter discusses the results from the empirical tests of my hypotheses. It begins with a discussion of the results from the standard event study of SEO announcements by BHCs in Section 6.2. I examine the share price reaction (CARs) to the SEO event for both the issuing and non-issuing BHCs sharing the same large shareholding network; results from the latter would indicate the presence of a spillover effect of the SEO announcements in the network. Section 6.3 discusses the results from multiple regression models on the association between large shareholding networks and CARs around the SEO announcement in the presence of control variables. This chapter concludes in Section 6.4.

6.2 SEO Event Study

I perform the standard event study methodology, as outlined in Chapter 5, to calibrate the price effect of SEO announcements by BHCs. Specifically, I compute the CAR for the announcing and non-issuing BHCs in the same large shareholder network. The sample consists of 148 issuing BHCs which made an SEO during the period from 2010 to 2015, and 32,682 non-issuing BHCs that share the same large shareholders as the issuing BHCs. I use Eventus in Wharton Research Data Services (WRDS) to compute the CARs. Since nine issuing BHCs and 13 non-issuing BHCs are missing in Eventus, my event study is run using a reduced sample of 139 issuing BHCs and 32,669 non-issuing BHCs.

For robustness, the mean and median CARs for issuing and non-issuing BHCs are computed over various window lengths: (-1,1), (0, 1), (-1,0), (-5, 5), and (-10, 10), as Table 6.1 shows. The market return is based on CRSP value-weighted returns in Panel A and CRSP equally-weighted returns in Panel B.

Results in Panel A show that BHC issuers earn statistically significantly negative returns for all event windows except for the long window (-10, 10). To allow meaningful comparison with Krishnan et al. (2010) for an earlier time period from 1983 to 2005, I focus on the mean and median *CAR_issuers* over short event windows (-1, 0), (0, 1), and (-1, 1). The average CAR ranges from -3.25% to -1.42%, and are slightly higher than the mean and median values (-1.47% and -1.03%, respectively) reported by Krishnan et al. (2010). Overall, my findings are consistent with prior SEO literature for non-bank firms (Eckbo, 1986; Masulis and Korwar, 1986; Mikkelson and Partch, 1986) as well as for BHCs (Slovin et al., 1991; Krishnan et al., 2010). Therefore, on average, BHCs experience a negative stock price reaction to their SEO announcement. To save space and also in light of these findings, my subsequent tests will focus on the short (-1, 1) window.[44] Using a short event window also has the advantage that the results are less likely to be confounded by other events vis-à-vis a long window.

Panel A also shows that there is a significant SEO announcement effect on non-issuing BHCs which share the same large shareholding network as the issuing BHCs. Not surprisingly, the SEO announcement effect for non-issuers is substantially less negative and lower in magnitude. In fact, the mean CAR for non-issuing BHCs is 0.41%, 0.05%, 0.01%, and 0.07% for event windows (-5, 5), (-1, 0), (0, 1) and (-1, 1) respectively,

[44] Robustness tests using the long window (-10, 10) are discussed in Section 6.3.3.

compared to -2.30%, -1.42%, -2.97%, and -3.25% for the same announcement windows for issuing BHCs. These results suggest that the large shareholding network does create some spillover effect by transmitting information about the SEO announcements to non-issuing BHCs belonging to the same network as the issuing BHCs (Kang and Luo, 2012). However, the economic impact of this spillover is small, contrary to my prediction. I explore this test further in subsequent analyses.

Panel B shows the above results remain intact when the equally-weighted market returns are used as the return benchmark. Specifically, the CARs remain significant statistically for event windows (-5, 5), (-1, 0), (0, 1), and (-1, 1) for both issuing and non-issuing BHCs. For example, the mean CAR for issuing BHCs is -2.31%, -1.40%, -2.96%, and -3.25% for event windows (-5, 5), (-1, 0), (0, 1) and (-1, 1) respectively; the corresponding figures for non-issuing BHCs, which are again economically small, are 0.36%, 0.07%, 0.02%, and 0.06%, respectively. The latter corroborates the presence of some spillover effect of SEO announcements to non-issuing BHCs which share the same large shareholders as the issuing BHCs.

Table 6.1: Cumulative abnormal returns (CARs) around SEO announcements for issuing and non-issuing BHCs that share the same large shareholder network

Panel A. Using the value-weighted CRSP returns as the market return

Event window	Issuing BHCs (n=139)		Non_issuing BHCs	
	Mean	Median	Mean	Median
(-10, 10)	-0.0118	-0.0122	**0.0094*** **	**0.0030*** **
	(0.125)	*(0.125)*	*(0.001)*	*(0.001)*
(-5, 5)	**-0.0230*** **	**-0.0183*** **	**0.0041*** **	**0.0005*** **
	(0.002)	*(0.002)*	*(0.001)*	*(0.001)*
(-1, 0)	**-0.0142*** **	**-0.0088*** **	**0.0005*** **	**0.0000*** **
	(0.001)	*(0.001)*	*(0.001)*	*(0.001)*
(0, 1)	**-0.0297*** **	**-0.0233*** **	**0.0001*** **	**-0.0003*** **
	(0.001)	*(0.001)*	*(0.001)*	*(0.001)*
(-1, 1)	**-0.0325*** **	**-0.0232*** **	**0.0007*** **	**-0.0003*** **
	(0.001)	*(0.001)*	*(0.001)*	*(0.001)*

Panel B. Using the equally-weighted CRSP returns as the market return

Event window	Issuing BHCs (n=139)		Non_issuing BHCs	
	Mean	Median	Mean	Median
(-10, 10)	-0.0136	-0.0093	**0.0066*** **	**0.0020*** **
	(0.174)	*(0.174)*	*(0.001)*	*(0.001)*
(-5, 5)	**-0.0231*** **	**-0.0224*** **	**0.0036*** **	**0.0006*** **
	(0.003)	*(0.003)*	*(0.001)*	*(0.001)*
(-1, 0)	**-0.0140*** **	**-0.0077*** **	**0.0007*** **	**0.0004*** **
	(0.001)	*(0.001)*	*(0.001)*	*(0.001)*
(0, 1)	**-0.0296*** **	**-0.0222*** **	**0.0002*** **	**-0.0001*** **
	(0.001)	*(0.001)*	*(0.001)*	*(0.001)*
(-1, 1)	**-0.0325*** **	**-0.0233*** **	**0.0006*** **	**-0.0002*** **
	(0.001)	*(0.001)*	*(0.001)*	*(0.001)*

The numbers in bracket are p values.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

The above results are mirrored in Figures 6.1 and 6.2, which respectively show the plots of the daily abnormal returns (ARs) and cumulative average abnormal returns (CAARs) for issuing and non-issuing BHCs over the 21-day (-10, 10) window. The market return is based on CRSP value-weighted returns in panel (A) and CRSP equally-weighted returns in panel (B).

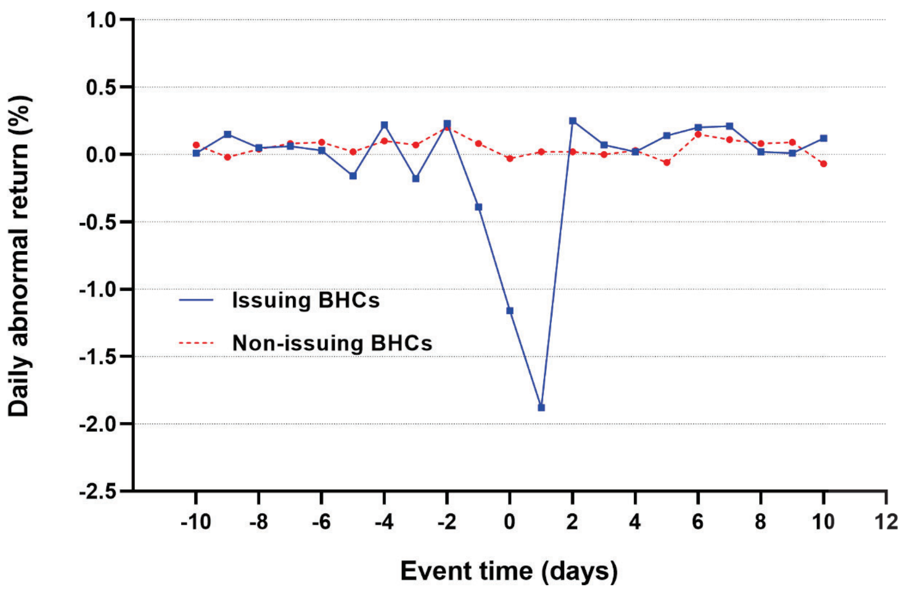
Both panels of Figure 6.1 show that the daily abnormal returns of issuing BHCs drop dramatically around the SEO announcement (event day 0); thus the results are robust irrespective of whether we use a value-weighted or equally-weighted market index. In contrast, the daily abnormal returns of non-issuing BHCs are not as impacted by the SEO announcements, suggesting little spillover of the SEO announcement effects in the large shareholders' network. I will explore the spillover effect further in subsequent analyses.

Both panels of Figure 6.2 show that while the CAAR of issuing BHCs trends downwards in the immediate period following the SEO announcement before bouncing back to the pre-announcement level thereafter, the CAAR of non-issuers shows a gradual increase in the 10 days after the announcement.

To sum up, issuing BHCs experience a negative stock price reaction to their SEO announcements, consistent with the Myers and Majluf's (1984) adverse selection problem. Additionally, large shareholding networks create a spillover effect by transmitting information about the SEO announcements from issuing BHCs to other non-issuing BHCs belonging to the same large shareholder network. Nevertheless, these spillover effects are economically small.

Figure 6.1: Daily abnormal returns for issuing and non-issuing BHCs over the 21-day (-10, 10) window

(A). Using value-weighted CRSP returns



(B). Using equally-weighted CRSP returns

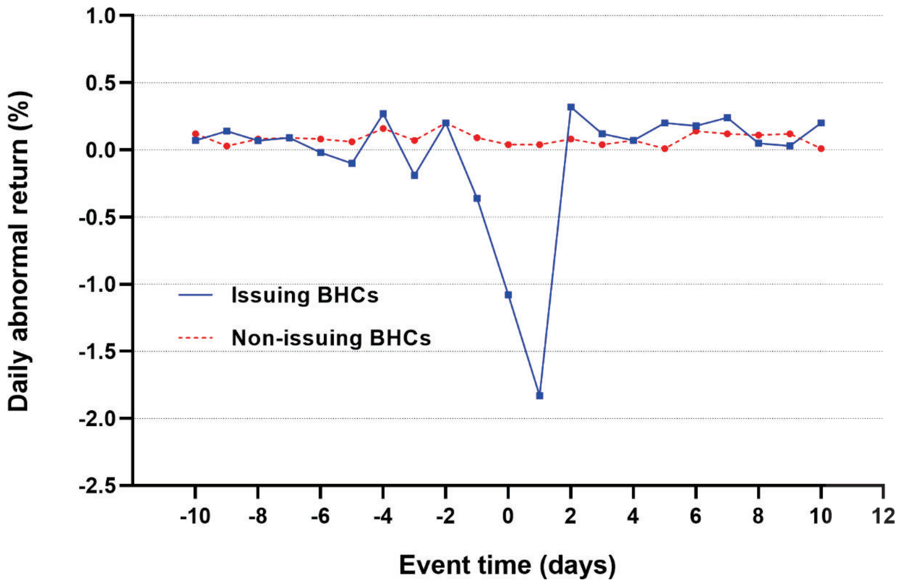
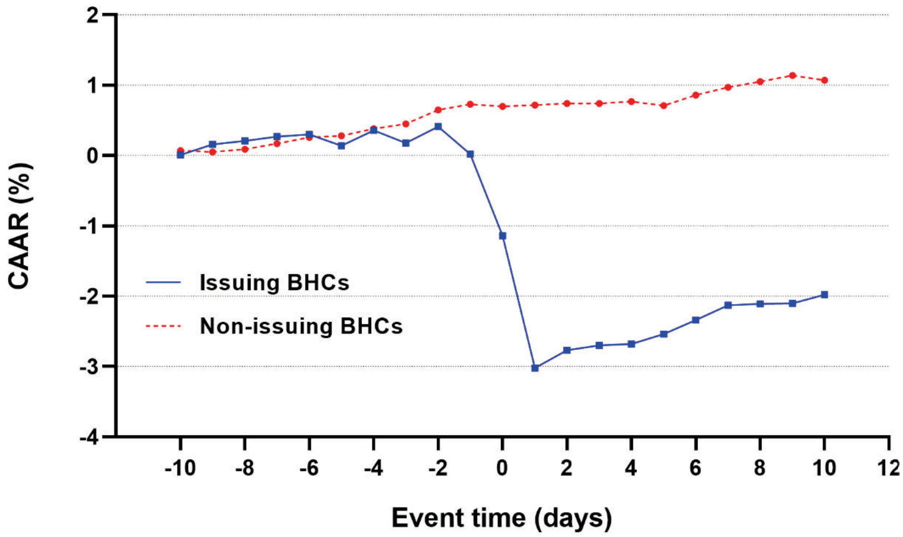
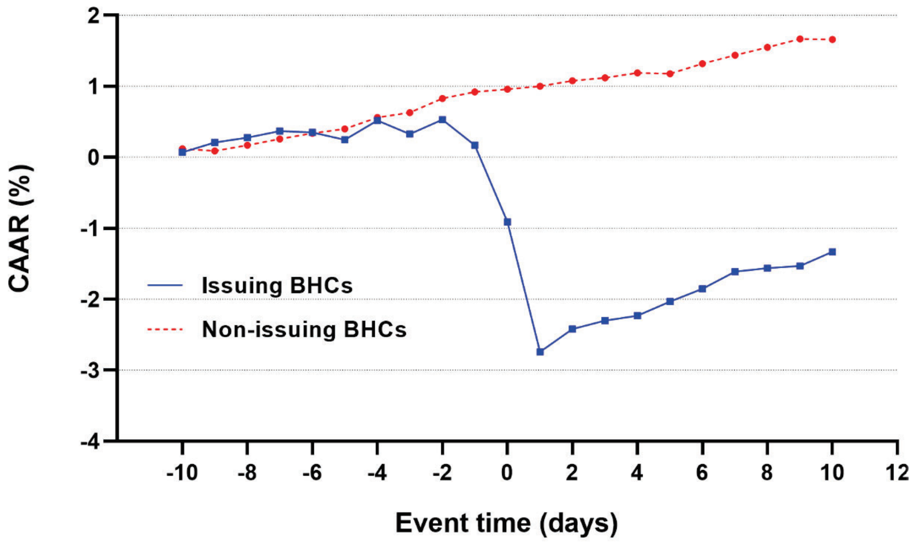


Figure 6.2: Cumulative average abnormal returns (CAAR) for issuing and non-issuing BHCs over the 21-day (-10, 10) window

(A). Using value-weighted CRSP returns



(B). Using equally-weighted CRSP returns



6.3 Regression Results

This section discusses the results from OLS regressions of CARs surrounding the SEO announcements. Regression results for the announcing BHCs are detailed in Section 6.3.1 and for non-announcing BHCs in the same large shareholder network as the announcing BHCs in Section 6.3.2. This is followed by a discussion of the robustness tests in Section 6.3.3.

6.3.1 OLS regressions for *CAR_issuers* surrounding the SEO announcements

To allow meaningful comparison with prior studies and for completeness, I first run the regressions without the network centrality measures, i.e., *Degree, Betweenness, Eigenvector,* and *Closeness*. I use several main characteristics of the issuers measured at the offer year-end as control variables, as discussed in Chapter 5: *Price run-up*, *Repeat Issues*, *Capital Adequacy*, *Offering price*, *Relative Offering size*, *Log(Size)*, *Log(Age)*, and *ROA*. In addition, I also include year fixed effects. These control variables are used in the CAR regressions of past studies (Slovin et al., 1991; Cornett and Tehranian, 1994; Filbeck, 1996; Cornett et al., 1998; Ergungor et al., 2004; Krishnan et al., 2010; Kang et al., 2018). Results from the multiple regressions where the dependent variable is the SEO announcement abnormal returns on issuing BHCs, measured over the short window (*CAR_issuer (-1, 1)*), are reported in Table 6.2.

Table 6.2: OLS Regression of the Three-day Cumulative Abnormal Returns (CARs) for issuing BHCs

		CAR_issuer (-1, 1)			
	(1)	*(2)* *Degree*	*(3)* *Betweenness*	*(4)* *Eigenvector*	*(5)* *Closeness*
Network centrality		**0.6393*** *(0.10)*	-0.1375 *(0.17)*	-0.2996 *(0.34)*	-0.1300 *(0.24)*
Price run-up (-10,-4)	**0.1418*** *(0.10)*	**0.1435*** *(0.10)*	**0.1511*** *(0.09)*	0.1369 *(0.12)*	**0.1414*** *(0.10)*
Repeat Issues	0.0061 *(0.63)*	0.0040 *(0.76)*	0.0057 *(0.65)*	0.0082 *(0.52)*	0.0067 *(0.59)*
Capital Adequacy	-0.0022 *(0.34)*	-0.0024 *(0.15)*	-0.0023 *(0.16)*	-0.0021 *(0.19)*	-0.0022 *(0.18)*
Offering price	-0.0001 *(0.87)*	-0.0001 *(0.77)*	-0.0001 *(0.88)*	-0.0001 *(0.87)*	-0.0001 *(0.89)*
Relative Offering size	**-0.0259**** *(0.04)*	**-0.0257**** *(0.04)*	**-0.0267**** *(0.03)*	**-0.0261**** *(0.04)*	**-0.0260**** *(0.04)*
Log(Size)	0.0036 *(0.39)*	0.0034 *(0.42)*	0.0036 *(0.39)*	0.0047 *(0.29)*	0.0047 *(0.28)*
Log(Age)	-0.0001 *(0.99)*	-0.0003 *(0.96)*	0.0002 *(0.97)*	-0.0001 *(0.99)*	0.0003 *(0.96)*
ROA	**0.0131***** *(0.00)*	**0.0127***** *(0.01)*	**0.0129***** *(0.01)*	**0.0137***** *(0.00)*	**0.0137***** *(0.00)*
Constant	-0.0407 *(0.32)*	-0.0455 *(0.27)*	-0.0366 *(0.37)*	-0.0354 *(0.39)*	0.0045 *(0.94)*
Year Fixed effect	**YES**	**YES**	**YES**	**YES**	**YES**
R Squared	0.2338	0.2365	0.2467	0.2400	0.2430
Observations	130	130	130	130	130

The numbers in bracket are *p* values.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

For the control variables in model (1), I find evidence of managerial timing ability, as indicated by the significant positive association between pre-SEO *Price run-up (-10, -4)* and *CAR_issuer (-1, 1).* Therefore, investors can somewhat predict the valuation effect of SEO announcements on BHC-issuers based on the pre-announcement period's price run-up. The result also shows that issuing BHCs' *Relative Offering size* and *ROA* are statistically significant, at the 10% and 1% level, respectively. The negative coefficient on *Relative Offering size* is as expected, suggesting that the more new shares that are issued at the SEO, the greater is the price discount on the shares that is required to compensate existing shareholders for dilution in their shareholding in the firm (Henry and Koski, 2010). *ROA* is the most effective and broadly available financial measure to assess BHC performance; the result shows that issuing BHCs with lower profitability, on average, experience lower CARs. The remaining control variables are insignificant.

Next, to test my hypothesis on the association between the SEO announcement effect and large shareholding networks for issuing BHCs, I include network centrality measures in the regressions. Results for the various network centrality measures are reported in models (2) to (5). They show that only the coefficient on *Degree* is positive and statistically significant with a *p*-value equals 0.1. This finding suggests that the abnormal stock returns around SEO announcements are, on average, higher (less negative) for BHCs which are more central in the large shareholding network, where network centrality is measured by *Degree*. It is also consistent with hypothesis H1, which predicts that multiple large shareholders are able to capitalize on their position in the network to mitigate agency cost and information asymmetries (Kang et al., 2018). In other words, the presence of a large shareholding network in the issuing BHCs, as captured by *Degree*, can faciliate the reduction in monitoring cost and information uncertainty surrounding the SEO announcements. Specifically, a one standard deviation increase in *Degree* centrality increases the abnomal return on days surrounding the SEO announcement date by an average of 0.012 percentage points.[45] The alternative measures of centrality (*Betweenness*, *Eigenvector*, and *Closeness*) are, however, statistically insignificant.

The results for the control variables are as before. There is a positive association between *Price run-up (-10, -4)* and *CAR_issuer (-1, 1),* suggesting managers' ability to time their equity offerings. In addition, on average, while issuing BHCs with higher profitability experience better SEO performance, those with higher *Relative Offering size* experience lower CARs.

6.3.2 Spillover Effects of SEO Announcements

In this section, I investigate whether there is a spillover in SEO announcement effects in the large shareholding network, flowing from issuing BHCs to non-issuing BHCs. To test this, I run similar regression analyses as above (for issuing BHCs) for non-issuing BHCs which share the same large shareholders as the issuing BHCs. Therefore, I use the cumulative abnormal returns for non-issuers (*CAR_non-issuer (-1, 1)*) as the dependent variable.

Table 6.3 reports the results. The key variable of interest in the test of the spillover effect is *CAR_issuer (-1, 1)*. As before, I control for issuing BHCs' characteristics – *Repeat*

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[45] This figure is computed as 0.012=(0.0123+0.0069)x0.64 based on the average *Degree* of 0.0123, a standard deviation of 0.0069, and the coefficient of degree centrality of 0.64.

Table 6.3: OLS Regression of the Three-day Cumulative Abnormal Returns (CARs) for non-issuing BHCs

	CAR_non-issuer (-1, 1)				
	(1)	*(2)* *Degree*	*(3)* *Betweenness*	*(4)* *Eigenvector*	*(5)* *Closeness*
CAR_issuer (-1, 1)	**-0.0074***	**-0.0073***	**-0.0073***	**-0.0078***	**-0.0082****
	(0.07)	*(0.08)*	*(0.08)*	*(0.06)*	*(0.05)*
Network centrality: Issuer		0.0294	0.0010	-0.0118	-0.0117
		(0.81)	*(0.81)*	*(0.36)*	*(0.14)*
Network centrality: Non-issuer		**-0.1242*****	**-0.0201*****	**-0.0440*****	**-0.0449*****
		(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Repeat Issues: Issuer	**-0.0012****	**-0.0012****	**-0.0012****	**-0.0011***	**-0.0010***
	(0.04)	*(0.042)*	*(0.04)*	*(0.07)*	*(0.08)*
Offering price: Issuer	**-0.0001*****	**-0.0001*****	**-0.0001*****	**-0.0001*****	**-0.0001*****
	(0.01)	*(0.01)*	*(0.01)*	*(0.01)*	*(0.01)*
Relative Offering size: Issuer	-0.0005	-0.0005	-0.0005	-0.0005	-0.0005
	(0.37)	*(0.37)*	*(0.37)*	*(0.38)*	*(0.34)*
Log(Size): Issuer	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(0.45)	*(0.45)*	*(0.50)*	*(0.59)*	*(0.77)*
Log(Size): Non-issuer	**-0.0011*****	**-0.0010*****	**-0.0011*****	**-0.0010*****	**-0.0008*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Log(Age): Issuer	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003
	(0.30)	*(0.317)*	*(0.29)*	*(0.34)*	*(0.32)*
Log(Age): Non-issuer	**-0.0030*****	**-0.0030*****	**-0.0030*****	**-0.0030*****	**-0.0029*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
ROA: Issuer	0.0003	0.0003	0.0003	0.0004	0.0004
	(0.14)	*(0.15)*	*(0.14)*	*(0.12)*	*(0.11)*
ROA: Non-issuer	**0.0074*****	**0.0048*****	**0.0048*****	**0.0048*****	**0.0050*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Capital Adequacy: Issuer	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.34)	*(0.38)*	*(0.38)*	*(0.32)*	*(0.33)*
Capital Adequacy: Non-issuer	**-0.0002*****	**-0.0002*****	**-0.0002*****	**-0.0002*****	**-0.0002*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Constant	**0.0145*****	**0.0148*****	**0.0157*****	**0.0152*****	**0.0332*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*	*(0.00)*
Year Fixed effect	**YES**	**YES**	**YES**	**YES**	**YES**
R Squared	0.0315	0.0318	0.0326	0.0331	0.0350
Observations	28,876	28,876	28,876	28,876	28,876

The numbers in bracket are *p* values.

*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 6.4: OLS Regression of the Three-day Cumulative Abnormal Returns (CARs) for non-issuing BHCs with an indicator negative CAR_issuer

	CAR_non-issuer (-1, 1)				
	(1)	*(2)* *Degree*	*(3)* *Betweenness*	*(4)* *Eigenvector*	*(5)* *Closeness*
CAR_issuer (-1, 1) <0 dummy	0.0009 *(0.16)*	0.0001 *(0.17)*	0.0009 *(0.15)*	0.0008 *(0.20)*	0.0007 *(0.24)*
Network centrality: Issuer		0.0414 *(0.74)*	0.0023 *(0.60)*	-0.0078 *(0.54)*	-0.0091 *(0.26)*
Network centrality: Non-issuer		**-0.1239***** *(0.00)*	**-0.0201***** *(0.00)*	**-0.0440***** *(0.00)*	**-0.0449***** *(0.00)*
Repeat Issues: Issuer	**-0.0012**** *(0.04)*	**-0.0012**** *(0.04)*	**-0.0012**** *(0.04)*	**-0.0011*** *(0.06)*	**-0.0010*** *(0.08)*
Offering price: Issuer	**-0.0001***** *(0.01)*	**-0.0001***** *(0.01)*	**-0.0001***** *(0.01)*	**-0.0001***** *(0.01)*	**-0.0001***** *(0.01)*
Relative Offering size: Issuer	-0.0003 *(0.60)*	-0.0003 *(0.60)*	-0.0003 *(0.57)*	-0.0003 *(0.63)*	-0.0003 *(0.60)*
Log(Size): Issuer	-0.0001 *(0.51)*	-0.0001 *(0.51)*	-0.0001 *(0.60)*	-0.0001 *(0.60)*	-0.0001 *(0.75)*
Log(Size): Non-issuer	**-0.0011***** *(0.00)*	**-0.0010***** *(0.00)*	**-0.0011***** *(0.00)*	**-0.0010***** *(0.00)*	**-0.0008***** *(0.00)*
Log(Age): Issuer	-0.0003 *(0.28)*	-0.0003 *(0.317)*	-0.0003 *(0.25)*	-0.0003 *(0.31)*	-0.0003 *(0.29)*
Log(Age): Non-issuer	**-0.0030***** *(0.00)*	**-0.0030***** *(0.00)*	**-0.0030***** *(0.00)*	**-0.0030***** *(0.00)*	**-0.0029***** *(0.00)*
ROA: Issuer	0.0003 *(0.20)*	0.0003 *(0.23)*	0.0003 *(0.21)*	0.0003 *(0.20)*	0.0003 *(0.20)*
ROA: Non-issuer	**0.0047***** *(0.00)*	**0.0048***** *(0.00)*	**0.0048***** *(0.00)*	**0.0048***** *(0.00)*	**0.0050***** *(0.00)*
Capital Adequacy: Issuer	0.0001 *(0.29)*	0.0001 *(0.34)*	0.0001 *(0.36)*	0.0001 *(0.27)*	0.0001 *(0.27)*
Capital Adequacy: Non-issuer	**-0.0002***** *(0.00)*	**-0.0002***** *(0.00)*	**-0.0002***** *(0.00)*	**-0.0002***** *(0.00)*	**-0.0002***** *(0.00)*
Constant	**0.0141***** *(0.00)*	**0.0143***** *(0.00)*	**0.0152***** *(0.00)*	**0.0148***** *(0.00)*	**0.0319***** *(0.00)*
Year Fixed effect	**YES**	**YES**	**YES**	**YES**	**YES**
R Squared	0.0315	0.0318	0.0326	0.0330	0.0349
Observations	28,876	28,876	28,876	28,876	28,876

The numbers in bracket are *p* values.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 6.5: OLS Regression of the Three-day Cumulative Abnormal Returns (CARs) for non-issuing BHCs with interaction between CAR_issuer and Network centrality

	CAR_non-issuer (-1, 1)			
	(1)	*(2)*	*(3)*	*(4)*
	Degree	*Betweenness*	*Eigenvector*	*Closeness*
CAR_issuer dummy (-1, 1)	-0.0011	-0.0000	-0.0002	0.0058
	(0.36)	*(0.99)*	*(0.88)*	*(0.36)*
Network centrality: Issuer	-0.0636	0.0030	-0.0109	-0.0033
	(0.71)	*(0.60)*	*(0.56)*	*(0.76)*
CAR_issuer dummy x Network centrality_issuer[46]	0.2066	-0.0032	0.0023	-0.0143
	(0.35)	*(0.71)*	*(0.93)*	*(0.35)*
Network centrality: Non- issuer	**-0.1239*****	**-0.0201*****	**-0.0440*****	**-0.0449*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Repeat Issues: Issuer	**-0.0012****	**-0.0013****	**-0.0011***	**-0.0011***
	(0.05)	*(0.03)*	*(0.06)*	*(0.06)*
Offering price: Issuer	**-0.0001*****	**-0.0001*****	**-0.0001*****	**-0.0001*****
	(0.01)	*(0.01)*	*(0.01)*	*(0.01)*
Relative Offering size: Issuer	-0.0003	-0.0003	-0.0003	-0.00025
	(0.55)	*(0.52)*	*(0.61)*	*(0.66)*

[46] To test whether CAR_issuer with high centrality have a bigger impact on non-issuers, I added an interaction term-*CAR_issuer (-1, 1) x Network centrality* in Equation (5.2). As both the *CAR_issuer* and *Network centrality* measures are continuous, I have created an interaction variable where the former is a dummy, using the median CAR_issuer as the cutoff. It takes the value of 1 if *CAR_issuer (-1, 1)* is equal or higher median CAR_issuer (-1, 1) and 0 otherwise. Then, I rerun similar regression analyses as above (Table 6.3) for non-issuing BHCs by adding this interaction term. Interestingly, all the large shareholders' network centrality measures for non-issuing BHCs are significant, in sharp contrast to those for issuing BHCs which are insignificant. The results show that there is no evident to show that whether *CAR_issuer (-1, 1)* with high centrality have a bigger impact on non-issuers. Therefore, the spillover in the SEO announcement effect on non-issuers is associated only with non-issuers' large shareholder centrality measures but not of the issuing BHCs.

Log(Size): Issuer	-0.0002	-0.0002	-0.0001	-0.0001
	(0.41)	*(0.43)*	*(0.50)*	*(0.72)*
Log(Size): Non-issuer	**-0.0010*** **	**-0.0011*** **	**-0.0010*** **	**-0.0008*** **
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Log(Age): Issuer	-0.0003	-0.0003	-0.0003	-0.0003
	(0.34)	*(0.28)*	*(0.33)*	*(0.26)*
Log(Age): Non-issuer	**-0.0030*** **	**-0.0030*** **	**-0.0030*** **	**-0.0029*** **
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
ROA: Issuer	0.0002	0.0002	0.0003	0.000
	(0.29)	*(0.31)*	*(0.28)*	*(0.26)*
ROA: Non-issuer	**0.0048*** **	**0.0048*** **	**0.0048*** **	**0.0050*** **
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Capital Adequacy: Issuer	0.0001	0.0001	0.0001	0.0001
	(0.29)	*(0.32)*	*(0.27)*	*(0.34)*
Capital Adequacy: Non-issuer	**-0.0002*** **	**-0.0002*** **	**-0.0002*** **	**-0.0002*** **
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Constant	**0.0155*** **	**0.0161*** **	**0.01570*** **	**0.0303*** **
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Year Fixed effect	**YES**	**YES**	**YES**	**YES**
R Squared	0.0318	0.0325	0.0329	0.0349
Observations	28,876	28,876	28,876	28,876

The numbers in bracket are *p* values.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Issues, Offering price, Relative Offering size, Log(Size), Log(Age), ROA, and *Capital Adequacy* − and include year fixed effects. In addition, I control for the same characteristics of non-issuing BHCs as they are likely to impact on how non-issuers' shareholders may respond to the SEO announcements of BHCs in the same large shareholding network. I also include the network centrality measures at both the issuing and non-issuing banking firms in the regressions.

The results show the estimated coefficient on *CAR_issuer (-1, 1)* is negative and statistically significant from zero, at least at the 10% level in all the model specifications. However, mirroring the preceding results in Section 6.2, the economic value of the spillover effect of issuers' SEO announcement on the stock returns of non-issuers in the same large shareholders' network is insignificant, less than 1%, as indicated by the size of the coefficient.

Interestingly, all the large shareholders' network centrality measures for non-issuing BHCs are significant, in sharp contrast to those for issuing BHCs which are insignificant. Therefore, the spillover in the SEO announcement effect on non-issuers is associated only with non-issuers' large shareholder centrality measures but not of the issuing BHCs. Results in models (2) to (5) show a significant negative coefficient on non-issuers' *Degree, Betweenness, Eigenvector,* and *Closeness*, suggesting that the more central the non-issuer is in the large shareholding network, the stronger the spillover effect. These results support hypothesis H2 which predicts that there is a spillover in the valuation effect of SEO announcements to non-announcing BHCs which are connected to the issuing BHC by the large shareholding network because the network created by large shareholders across the BHCs facilitates the transmission of relevant information to other (non-issuing) BHCs in the network.

Of the control variable, non-issuing BHCs' characteristcs swamp those of issuers in explaining the spillover effect. To be precise, I find non-issuers' *Offering price*, *Log(Size), Log(Age), ROA,* and *Capital Adequacy* are negative and statistically significant at the 1% level. These results show that, on average, larger, older, and well-capitalized non-issuing BHCs and those with lower profitability and higher offering price experience more negative spillovers. The coefficient on *Repeat Issues* is also statistically significant, suggesting that non-issuers also respond more negatively to the repeat issues of BHCs where both BHCs share the same large shareholding network.

To analyse whether the spillover effect are contingent on the sign of *CAR_issuer (-1, 1),* I replace the *CAR_issuer (-1, 1)* with a dummy variable that takes the value of 1 if *CAR_issuer (-1, 1)* is negative and 0 otherwise, and rerun the tests. The results are reported in Table 6.4, which also controls for the characteristics of both issuing and non-issuing BHCs. I find no association between this dummy negative *CAR_issuer (-1, 1)* and *CAR_non-issuer (-1, 1)*.

Therefore, I find no evidence that the abnormal return for non-issuers is related to the sign of issuers' SEO announcement returns. In sum, the regression results show that non-issuing BHCs' network centrality is the key driver of the spillover effect (as represented by *CAR_non-issuer(-1, 1)*), together with non-issuers' characteristics.

6.3.3 Robustness Tests

The regression analysis I have conducted so far is based on the short event window of (-1, 1) days surrounding the SEO announcement. The results show significant valuation effects on issuing BHCs around the SEO anouncements, and that the valuation effects are associated with large shareholders' network centrality, as measured by *Degree*. Further, there is weak evidence of a spillover in the SEO announcement effect to non-issuing BHCs sharing the same large shareholding network as the announcers. In this section, I conduct a number of robustness tests.

(A) Event Window

First, I test whether the results are robust to the choice of the event window. I repeat the above analyses for a long window, spanning over the 21 days (-10, 10) surrounding the SEO announcement. Tables 6.6 reports the results for the valuation effect of SEO announcements on issuing BHCs. Unlike the results for the short event window (-1, 1) reported in Table 6.2, none of the centrality measures are significant when the long event window (-10, 10) is used, perhaps due to confounding events. Therefore, results for the SEO announcement effects appear to be sensitive to the choice of the event window.

Results for the spillover SEO announcement effects in the large shareholders' network for the long event window (-10, 10) are reported in Tables 6.7. Consistent with the results for the short window (Table 6.3), *CAR_issuer* is significant and positive for this long window. Further, the spillover effect is economically stronger for the long

Table 6.6: OLS Regression of the 21-day Cumulative Abnormal Returns (CARs) for issuing BHCs

	CAR_issuer (-10, 10)			
	(1)	*(2)*	*(3)*	*(4)*
	Degree	*Betweenness*	*Eigenvector*	*Closeness*
Network centrality	1.9328	-0.1774	-0.3884	-0.2188
	(0.22)	*(0.25)*	*(0.81)*	*(0.20)*
Price run-up (-10,-4)	**1.0409*****	**1.0477*****	**1.0294*****	**1.0350*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Repeat Issues	-0.0100	-0.0042	-0.0009	-0.0027
	(0.62)	*(0.83)*	*(0.96)*	*(0.89)*
Capital Adequacy	-0.0033	-0.0028	-0.0027	-0.0027
	(0.20)	*(0.26)*	*(0.29)*	*(0.29)*
Offering price	-0.00010	-0.0008	-0.0008	-0.0007
	(0.19)	*(0.29)*	*(0.29)*	*(0.30)*
Relative Offering size	**-0.0452****	**-0.0469****	**-0.0460****	**-0.0460****
	(0.02)	*(0.02)*	*(0.02)*	*(0.02)*
Log(Size)	0.0049	0.0055	0.0068	0.0074
	(0.46)	*(0.40)*	*(0.31)*	*(0.27)*
Log(Age)	-0.0069	-0.0080	-0.0077	-0.0071
	(0.47)	*(0.40)*	*(0.42)*	*(0.46)*
ROA	**0.0289*****	**0.0300*****	**0.0308*****	**0..0311*****
	(0.01)	*(0.00)*	*(0.00)*	*(0.00)*
Constant	0.0046	0.0245	0.0261	0.0938
	(0.94)	*(0.70)*	*(0.68)*	*(0.27)*
Year Fixed effect	**YES**	**YES**	**YES**	**YES**
R Squared	0.5017	0.5010	0.4979	0.5022
Observations	130	130	130	130

The numbers in bracket are *p* values.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 6.7: OLS Regression of the 21-day Cumulative Abnormal Returns (CARs) for non-issuing BHCs

	CAR_non-issuer (-10, 10)			
	(1)	*(2)*	*(3)*	*(4)*
	Degree	*Betweenness*	*Eigenvector*	*Closeness*
CAR_issuer (-10, 10)	**0.1025***	**0.1025*****	**0.1022*****	**0.1047*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Network centrality: Issuer	1.4973	**0.0449*****	0.0102	**0.0659*****
	(0.00)	*(0.00)*	*(0.72)*	*(0.00)*
Network centrality: Non- issuer	0.0777	-0.0051	0.0041	**0.0253*****
	(0.40)	*(0.51)*	*(0.78)*	*(0.00)*
Repeat Issues: Issuer	**-0.0081****	**-0.0072*****	**-0.0061*****	**-0.0070*****
	(0.00)	*(0.00)*	*(0.07)*	*(0.00)*
Offering price: Issuer	**-0.0003*****	**-0.0002*****	**-0.0002*****	**-0.0009*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Relative Offering size: Issuer	**0.0059*****	**0.0056*****	**0.0063*****	**0.0068*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Log(Size): Issuer	**0.0014*****	**0.0019*****	**0.0015**	**0.0012*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.01)*
Log(Size): Non-issuer	**-0.0015*****	**-0.0014*****	**-0.0014*****	**-0.0016*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Log(Age): Issuer	**0.0017*****	0.0008	**0.0012*****	**0.0010*****
	(0.01)	*(0.18)*	*(0.34)*	*(0.00)*
Log(Age): Non-issuer	**-0.0027*****	**-0.0027*****	**-0.0027*****	**-0.0028*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
ROA: Issuer	**-0.0034*****	**-0.0032*****	**-0.0032*****	-0.0034
	(0.00)	*(0.00)*	*(0.00)*	*(0.11)*
ROA: Non-issuer	**0.0033*****	**0.0033*****	**0.0033*****	**0.0032*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Capital Adequacy: Issuer	**0.0006*****	**0.0006*****	**0.0008*****	**0.0008*****
	(0.00)	*(0.38)*	*(0.32)*	*(0.00)*
Capital Adequacy: Non-issuer	**-0.0007*****	**-0.0007*****	**-0.0007*****	**-0.0007*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Constant	**0.0285*****	**0.0324*****	**0.0314*****	**-0.0008*****
	(0.00)	*(0.00)*	*(0.00)*	*(0.00)*
Year Fixed effect	**YES**	**YES**	**YES**	**YES**
R Squared	0.0349	0.0347	0.0339	0.0346
Observations	28,876	28,876	28,876	28,876

The numbers in bracket are *p* values.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 6.8: OLS Regression of the 21-day Cumulative Abnormal Returns (CARs) for non-issuing BHCs with an indicator negative CAR_issuer

	CAR_non-issuer (-10, 10)			
	(1)	*(2)*	*(3)*	*(4)*
	Degree	*Betweenness*	*Eigenvector*	*Closeness*
CAR_issuer (-10, 10) <0 dummy	**-0.0117*** *(0.00)*	**-0.0116*** *(0.00)*	**-0.0116*** *(0.00)*	**-0.0116*** *(0.00)*
Network centrality: Issuer	**1.4433*** *(0.00)*	**0.0400*** *(0.00)*	**-0.0563** *(0.05)*	**0.0171** *(0.33)*
Network centrality: Non-issuer	0.0706 *(0.44)*	-0.0052 *(0.51)*	0.0030 *(0.84)*	**0.0240** *(0.02)*
Repeat Issues: Issuer	**-0.0070** *(0.00)*	**-0.0061*** *(0.00)*	**-0.0045*** *(0.07)*	**-0.0052*** *(0.00)*
Offering price: Issuer	**-0.0003*** *(0.00)*	**-0.0002*** *(0.00)*	**-0.0003*** *(0.00)*	**-0.0002*** *(0.00)*
Relative Offering size: Issuer	-0.0012 *(0.30)*	-0.0015 *(0.20)*	-0.0008 *(0.48)*	**-0.0007** *(0.51)*
Log(Size): Issuer	**0.0008*** *(0.06)*	**0.0012*** *(0.00)*	**0.0010** *(0.02)*	**0.0008*** *(0.07)*
Log(Size): Non-issuer	**-0.0015*** *(0.00)*	**-0.0014*** *(0.00)*	**-0.0014*** *(0.00)*	**-0.0016*** *(0.00)*
Log(Age): Issuer	**0.0022*** *(0.01)*	0.0013 *(0.18)*	**0.0018*** *(0.34)*	**0.0016*** *(0.01)*
Log(Age): Non-issuer	**-0.0027*** *(0.01)*	**-0.0027*** *(0.00)*	**-0.0027*** *(0.00)*	**-0.0028*** *(0.00)*
ROA: Issuer	**-0.0014*** *(0.00)*	**-0.0012** *(0.02)*	**-0.0011** *(0.04)*	**-0.0012** *(0.02)*
ROA: Non-issuer	**0.0033*** *(0.00)*	**0.0033*** *(0.00)*	**0.0033*** *(0.00)*	**0.0032*** *(0.00)*
Capital Adequacy: Issuer	**0.0007*** *(0.00)*	**0.0008*** *(0.38)*	**0.0009*** *(0.32)*	**0.0008*** *(0.00)*
Capital Adequacy: Non-issuer	**-0.0007*** *(0.00)*	**-0.0007*** *(0.00)*	**-0.0007*** *(0.00)*	**-0.0007*** *(0.00)*
Constant	**0.0365*** *(0.00)*	**0.0401*** *(0.00)*	**0.0399*** *(0.00)*	**0.0254*** *(0.01)*
Year Fixed effect	**YES**	**YES**	**YES**	**YES**
R Squared	0.0233	0.0230	0.0225	0.0226
Observations	28,876	28,876	28,876	28,876

The numbers in bracket are *p* values.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively

window, suggesting that on average about 10% of the issuer's CAR spills over to non-issuing BHCs in the large shareholding network. However, in contrast to the results for the short window, I find that, the issuer's large shareholding network centrality measures are significant for the long window, as the estimated coefficients on *Betweenness* and *Closeness* show. Furthermore, only the non-issuer's network centrality measure of *Closeness* is significant in the long window.

(B) Ownership Concentration as an Alternative Measure

In my second robustness test, I use ownership concentration as an alternative way of capturing the information environment and the efficacy of agency conflict mitigation in BHCs.

Table 6.9 reports the results from multiple regressions where the dependent variable is the SEO announcement abnormal returns measured over the (-1, 1) window. I include the squared term for *Ownership Concentration* in models (2) and (4) to capture the non-linearity in the relationship. While the first two models ((1) and (2)) test the issuing BHCs' announcement effects, the remaining models test the spillover effect in the large shareholding network.

Table 6.9: OLS Regression of the three-day Cumulative Abnormal Returns (CARs) for issuing BHCs with *Ownership Concentration* as an alternative measure

	CAR_issuer (-1, 1)	**CAR_issuer (-1, 1)**	**CAR_non-issuer (-1, 1)**	**CAR_non-issuer (-1, 1)**
	(1)	*(2)*	*(3)*	*(4)*
CAR_issuer (-1, 1)			-0.0063	-0.0057
			(0.14)	(0.18)
Ownership Concentration: Issuer	**-0.0006***	**0.0025***	0.0001	-0.0001
	(0.06)	*(0.10)*	*(0.14)*	(0.68)
Ownership Concentration: Non- issuer			**0.0001*****	**0.0004*****
			(0.00)	*(0.00)*
Ownership squared: Issuer		**-0.0001****		-0.0001
		(0.02)		*(0.47)*
Ownership squared: Non-issuer				**-0.0001*****
				(0.00)
Price run-up (-10, -4)	**0.1421***	0.1324		
	(0.10)	*(0.12)*		
Offering price: Issuer	0.0001	0.0001	**-0.0001*****	**-0.0001*****
	(0.92)	*(0.86)*	*(0.01)*	*(0.00)*
Relative Offering size: Issuer	**-0.0238***	-0.0180	-0.0005	-0.0006
	(0.06)	*(0.14)*	*(0.32)*	(0.27)
Log(Size): Issuer	0.0043	0.0039	-0.0002	-0.0002
	(0.31)	*(0.35)*	*(0.40)*	(0.42)
Log(Size): Non-issuer			**-0.0013*****	**-0.0013*****
			(0.00)	*(0.00)*
Log(Age): Issuer	-0.0029	-0.0042	-0.0002	-0.0002
	(0.64)	*(0.49)*	*(0.47)*	(0.51)
Log(Age): Non-issuer			**-0.0029*****	**-0.0031*****
			(0.00)	*(0.00)*
ROA: Issuer	**0.0138*****	**0.0133*****	0.0003	0.0003
	(0.00)	*(0.00)*	*(0.2)*	(0.18)
ROA: Non-issuer			**0.0047*****	**0.0047*****
			(0.00)	*(0.00)*
Capital Adequacy: Issuer	-0.0016	-0.0015	0.0001	0.0001
	(0.34)	*(0.35)*	*(0.55)*	(0.62)
Capital Adequacy: Non-issuer			**-0.0002*****	**-0.0002*****
			(0.00)	*(0.00)*
Constant	-0.0103	-0.0793	**0.0119*****	**0.0087*****
	(0.81)	*(0.09)*	*(0.00)*	*(0.01)*
Year Fixed effect	**YES**	**YES**	**YES**	**YES**
R Squared	0.2562	0.2810	0.0325	0.0346
Observations	130	130	28,876	28,876

The numbers in bracket are *p* values.
*, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively

Focusing on the issuing BHCs' share price response, model (1) shows a significantly negative coefficient on *Ownership Concentration.* Therefore, there is a more negative average abnormal return for issuing BHCs with a more concentrated ownership structure. This finding is consistent with *adverse selection* theory, which suggests greater information asymmetry and adverse selection problem for market participants in the presence of ownership concentration. Model (2) bears evidence on non-linearity in the relation between the SEO announcement effect and ownership concentration. Specifically, I find *Ownership Concentration* and its squared term, *Ownership Concentration,*^{2} are statistically significant and have opposite signs. Therefore, the SEO abnormal stock returns increase as ownership concentration increases up to a certain level and decrease thereafter, consistent with previous studies for BHCs (Jennings et al., 2002; Altınkılıç, and Hansen, 2003). The point of inflection occurs when ownership concentration is 35%.

Models (3) and (4) report the results from the spillover test. In model (3), I find that there is a positive relation between non-issuers' *Ownership Concentration* and *CAR_non-issuer (-1, 1)*. Therefore, the SEO announcement spillover effect is stronger for non-issuing BHCs with higher ownership concentration. The above non-linear relationship is also observed in the spillover test in model (4), with *Ownership Concentration* and its squared term, *Ownership Concentration,*^{2} being statistically significant and having opposite signs. The results show that the stock returns of non-issuers increase with their (non-issuers') ownership concentration in response to the

SEO announcement made by BHCs in the same large shareholding network. The point of inflection is reached when the ownership concentration of non-issuing BHCs is 15%.[47]

I therefore provide evidence of incentive alignment and incentive entrenchment effects of ownership concentration for the sample of issuing and non-issuing BHCs. My overall conclusion that the information environment and the efficacy of agency conflict mitigation can shape the market's response to the SEO announcements of BHCs is not only robust but is also stronger using ownership concentration in lieu of large shareholders' network centrality measures.

6.4 Chapter Summary

This chapter discusses the results from the SEO event study, regressions of the SEO abnormal returns (*CAR_issuer*) on issuers' large shareholding network centrality measures, and the spillover effect in the SEO announcements on non-issuing BHCs which share the same large shareholding network as the issuing BHCs. I also provide some robustness tests, focusing on the length of the event windows and an alternative way of capturing the information environment and the efficacy of agency conflict mitigation based on ownership concentration.

Results from the event study are overall consistent with the adverse selection (Myers and Majluf, 1984) explanation of SEO value effects, showing that issuing BHCs on average earn statistically significantly negative returns. Regressions results, based on the short event window (-1, 1), show a positive association, which is statistically significant at the 10%, between abnormal stock returns and large shareholder network

[47] The result is calculated from the OLS regression in model (4) in Table 6.9

centrality, only when the latter is measured by *Degree*. Therefore, the SEO announcement effects are less negative for issuing BHCs which are more central in the large shareholding network, consistent with hypothesis H1. However, the economic significance of this association is small. A number of bank-specific variables are significant in explaining the announcement abnormal returns, including the pre-announcement *Price run-up*, *Relative Offering size*, and *ROA*.

In examining the CARs of non-issuers to the SEO announcement of issuing BHCs in the same large shareholding network, I find some support for the spillover effect of hypothesis H2. To be precise, results from the event study show significant CARs for non-issuers, albeit substantially less negative and lower in magnitude than for issuers, around the time when the issuing BHCs in the same large shareholding network make an SEO announcement. My results also show that the more central the non-issuers' multiple large shareholders are in the network, the stronger is the spillover announcement effect, consistent with past studies for corporate (non-banking) firms. In other words, the spillover in the SEO announcement effect on non-issuers is found to be associated only with non-issuers' large shareholder centrality measures but not with those of the issuing BHCs.

Additional tests show that the above results seem to be sensitive to the length of the event window. Using the long event window (-10, 10), I find that none of the centrality measures are significant, perhaps due to confounding events. Tests of the spillover effect using the long window suggest that about 10% of the issuer's CAR spills over to other BHCs in the large shareholding network, with the issuer's large shareholding network centrality measures having greater explanatory power than those of non-issuer's network centrality measures. I also find the issuer's large shareholding network centrality measures (*Betweenness* and *Closeness*) are more significant for the long window than for the short window. My overall conclusion that the information environment and the efficacy of agency conflict mitigation can shape the market's response to the SEO announcements of BHCs is not only robust but is also stronger using ownership concentration in lieu of large shareholder network centrality measures.

Chapter 7

Summary and Conclusions

7.1 Introduction

In this final chapter, I provide a summary of my thesis and concluding remarks, focusing on the key takeaways from my research. It begins with a summary of my empirical findings in Section 7.2, followed by Section 7.3, which highlights the major contributions of my research. This chapters concludes with Section 7.4, which outlines the limitations of my investigation and suggests future avenues for research.

7.2 Summary of Findings

My thesis aims to examine the valuation effects of SEOs by BHCs in the presence of large shareholders' networks. I argue that due to potential information sharing in the network, issuing BHCs' financing decisions impact not only their own value but also the value of non-issuing BHCs which share the same large shareholding network as them. I ask two main research questions. First, for the sample of issuing BHCs, I ask whether the SEO valuation effects are related to large shareholding network centrality measures. In the second question, I ask whether the SEO announcement effects spill over to non-issuing BHCs which share the same large shareholding network as the issuing BHCs. I conduct my tests based on a sample of 148 SEO announcements made by 113 listed BHCs and 32,682 non-issuing BHCs which share the same large shareholders as the issuing BHCs, spanning over a period from 2010 to 2015. My main findings are summarized as follows.

First, results from the standard event study are consistent with the adverse selection (Myers and Majluf, 1984) explanation for the SEO valuation effects, showing that issuing BHCs on average earn statistically significantly negative returns. These results are in line with prior SEO literature for BHCs (Slovin et al., 1991; Krishnan et al., 2010).

Second, OLS regressions show that for the issuing BHCs, cross-sectional differences in the SEO announcement effects are related to large shareholders' network centrality measures. To be precise, I find the SEO announcement abnormal stock returns are, on average, less negative for BHCs which are more central in the large shareholding network but only if the latter is measured by *Degree.* My findings provide evidence about the important role of large shareholding networks in shaping the market's response to the SEO announcements of BHCs. This finding provides some support for hypothesis H1, which predicts that multiple large shareholders are able to capitalize on their position in the network to mitigate agency cost and information asymmetries (Kang et at., 2018).

Third, I find some support for the spillover effect of hypothesis H2. Results show significant CARs for non-issuers, albeit substantially less negative and lower in magnitude than for issuers, around the time when the issuing BHCs in the same large shareholding network make an SEO announcement. The spillover in the SEO announcement effect on non-issuers is found to be associated only with non-issuers' large shareholder centrality measures but not with those of the issuing BHCs.

Robustness tests show that the above results seem to be sensitive to the length of the event window. While none of the centrality measures are significant when a long event window (-10, 10) is used, perhaps due to confounding events, the issuer's large shareholding network centrality measures are more significant than for the short window. My overall conclusion that the information environment and the efficacy of agency conflict mitigation can shape the market's response to the SEO announcements of BHCs is not only robust but is also stronger using ownership concentration in lieu of large shareholder network centrality measures.

7.3 Contributions

Previous corporate finance literature (Scholes, 1972; Myers and Majluf, 1984) shows that SEO announcements are on average associated with a drop in the issuing firm's stock price due to the information asymmetry between managers and shareholders, leading to an adverse selection problem in security issuance.

I too find evidence of adverse selection problem around the SEO announcement of BHCs. My thesis is that large shareholding network, which I analyse using SNA, is a key factor affecting BHCs' financing decision. SNA analysis suggests that BHCs which are more strategically positioned in the network can make more informed decisions due to information diffusing through the network. To the best of my knowledge, my thesis is the first to study the association between large shareholding networks and the SEO valuation effects for BHCs. My thesis thus contributes to the literature on the role of multiple large shareholders in increasing information transparency and in mitigating agency costs in periods surrounding an SEO announcement.

Results from OLS regressions support my first hypothesis (H1) that multiple large shareholders are able to capitalize on their position in the network to mitigate agency cost and information asymmetries. Specifically, I find cross-sectional differences in the abnormal returns surrounding the SEO announcement are related to large shareholding network centrality measures. This finding contributes to the SEO and network centrality literatures by furthering our understanding of the cross-monitoring role of multiple large shareholders and the information network they create.

Additionally, while past studies (Slovin et al., 1991; Cornett and Tehranian, 1994; Filbeck, 1996; Cornett et al., 1998; Ergungor et al., 2004; Krishnan et al., 2010) focus only on the SEO announcement effect on issuers, I examine in considerable detail the SEO announcement effect on non-issuers as well. Since the network created by large shareholders facilitates the transmission of relevant information across BHCs in the network, I develop a second hypothesis (H2), which predicts that there is a spillover in SEO announcement effects to non-issuing BHCs in the presence of large shareholding networks. Therefore, my thesis is the first to examine the relation between large shareholding networks and SEO abnormal returns in non-issuing BHCs which share the same large shareholders with issuing BHCs. My results show significant cumulative abnormal returns (CARs) for non-issuers, albeit substantially less negative and lower in magnitude than for issuers, around the time when the issuing BHCs in the same large shareholding network make an SEO announcement. The spillover in the SEO announcement effect to non-issuers is found to be associated with non-issuers' large shareholder centrality measures but not with those of the issuing BHCs. The evidence I document suggests that the spillover effect of equity offerings is stronger when non-issuers are more central in the large shareholders' network. My results support the second hypothesis (H2), suggesting that the network created by large shareholders across the BHCs facilitates the transmission of relevant information to other non-issuing BHCs in the network. In particular, when investors estimate that the stock price of SEO issuers is overvalued, they are likely to also perceive the stock price of non-issuers which share the same large shareholder network as the issuers to be overvalued too. Second, since both issuing and non-issuing BHCs have the same large shareholders, investors may infer that the large shareholders will have the same institutional style investing and common characteristics, resulting in the information spillover effects in these BHCs. Hence, the monitoring cost and information uncertainty may be reduced in non-issuing BHCs due to the presence of large shareholding networks.

My results contribute to the SEO and network centrality literatures by showing that large shareholding networks can create a spillover effect by transmitting information about the SEO announcements from issuers to other non-issuers in the same large shareholder network. My findings therefore suggest that large shareholding networks play an important role in monitoring and controlling management in both announcing and non-announcing BHCs.

7.4 Limitations and Avenues for Future Research

As with most empirical research, my research is not without limitations. First, the extent of my empirical analysis is limited by the availability of data on the SEOs and large shareholdings of BHCs. As more data become available over time, future studies may re-examine the questions I propose in this thesis. With a longer time period spanning the Covid-19 pandemic, future research may investigate how the exogenous shock caused by the pandemic shapes the relation between the SEO valuation effects and large shareholders' network centrality measures for BHCs.

Another limitation concerns the use of centrality measures (i.e., degree, betweenness, eigenvector, and closeness), which emphasize different topological properties of the network. It is likely that these measures do not fully capture the information flow of the network nor information about the links created in the network. I have investigated ownership concentration as alternative measure in my robustness tests. Other means of capturing the information flow of the network or information about the links are worth exploring, and I leave this for future studies.

My research provides an empirical exposition of the valuation effects of SEOs by BHCs in the presence of large shareholder networks. While my empirical analysis focuses on the network centrality of large shareholders, it is silent on who these large shareholders are. Past studies show heterogeneity in the objective of large owners (Bagwell, 1991; Colpan, Yoshikawa, Hikino, and Del Brio, 2011; Bianchi, Dana, and Jouini, 2019), suggesting that the identity of the large owners may matter to SEO valuation effects. Different types of large shareholders, such as financial institutions, individuals/family, state, and corporations, have different objectives and style investing decisions due to psychological determinants (Jansson and Biel, 2011). For example, financial institutions may seek long-term investment, whilst other large shareholders can prefer to short-term investment. These investors may also have different levels of accessibility to valuable information about the firm. For example, institutional investors have better access to private information concerning BHC value than individuals

(Schnatterly, Shaw, and Jennings, 2007). Since an investigation on the identity of the large owners is beyond the scope of my thesis, I leave it to future research.

Future research may extend the examination of network properties of large shareholders, such as the type and identity of the large shareholder to see if these properties provide valuable information about the SEOs of BHCs.

I have focused on only the short-term SEO valuation effects for BHCs in this thesis. Future research may extend my research to an examination of the long-term performance of BHCs to see if the benefits from having a large shareholders' network is durable. In particular, it will be interesting to examine whether BHCs with large shareholders networks are more resilient and are thus more able to weather the pandemic-induced shock.

In response to the severe deterioration in bank capital following the GFC and tightened regulatory requirements as per Basel 3, all issuing BHCs in the post-crisis period 2010-2015 met their capital adequacy ratios with the minimum ratio 0.0955 whereas several non-issuing BHCs from 2010 to 2015 did not. I have focused on only the values of capital adequacy ratios in both issuing and non-issuing BHCs that share the same large shareholders in the network. Future research may consider extending my research to include well-capitalized and under-capitalized BHCs. This can be done by creating a dummy that takes a value of one for BHCs with a "high" capital adequacy ratio, and zero otherwise, using the minimum capital adequacy ratios as the cutoff.

Finally, large shareholders are key players in corporate governance theory (Villiers, 2014). An avenue for future research is to explore whether large shareholders' networks act as a complement or substitute for other corporate governance mechanisms, including board independence, CEO duality, audit committee size and independence, and managerial ownership, in relation to the share price reaction to BHCs' equity offerings. Other means of capturing the information flow of the network or information about the links have been left for future studies.

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