THROUGH THE GRAPEVINE: NETWORK EFFECTS ON THE DESIGN OF EXECUTIVE COMPENSATION CONTRACTS

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ABSTRACT

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Effective design of executive compensation contracts involves the choice and weighting of performance measures, as well as the mix between fixed and incentive-based pay components, with a view to fostering talent retention and goal congruence. Despite large variability in firms' characteristics and goals, compensation design is subject to isomorphic pressures, which cannot be completely explained by industry affiliation or peer group membership. Inter-firm professional network connections, such as board interlocks and compensation consultants, provide means and opportunities to observe and imitate organizational behavior across firms. Using information disclosed in proxy statements of publicly traded companies, I predict and find that firms connected through board interlocks or common compensation consultants display a higher degree of isomorphism in the design of executive compensation contracts. However, consultants with larger customer base and greater expertise mitigate these isomorphic tendencies. Additionally, interlocks and compensation consultants exert different influences on different aspects of the compensation design.

I dedicate this work to my family.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Boards of directors, and, in particular, the members of the compensation committee, have primary responsibility over the design of the compensation package for the CEO. This is a complex task, fraught with considerable uncertainty regarding the appropriate choice of performance measures and their weighting, as well as the mix between fixed and incentive compensation. Additionally, CEO compensation attracts significant public attention, which pressures the board to adopt compensation packages that are in line with the expectations of external stakeholders. Professional network ties, including board interlocks and compensation consultants, define an informational and normative context for board decision processes. On the one hand, network connections provide board members, who often lack technical training in compensation contracting, with information about compensation design of other firms, beyond the content of public disclosures. On the other hand, networks represent a source of legitimacy for controversial practices, which may incentivize imitation of observed behaviors (Davis 1996), leading to isomorphic design of compensation contracts across firms. In this study I explore the influence of interlock networks and compensation consulting networks on the degree of similarity of compensation contracts adopted by connected firms.

Identifying determinants of isomorphism in compensation design practices is important to the extent that it may induce firms to implement suboptimal contracts. Organizations greatly vary across economic and governance characteristics, as well as other important dimensions, such as mission, strategy, operations, and technology. Optimal compensation structure should reflect the characteristics of the organization and foster goal congruence. Adopting popular models of compensation (i.e. isomorphic design) may sustain or improve the legitimacy of the board in the eyes of the CEO and the external stakeholders (Meyer and Rowan 1977; Deephouse 1996). Nonetheless, it may also cause departures from compensation design that would provide better fit with the strategic objectives of the organization, thus distorting managerial incentives and reducing shareholder value (Gerhart et al. 1995; Bebchuk et al. 2002).

A rich body of literature in economics and accounting suggests criteria for choosing optimal contractual mechanisms (Hemmer et al. 2000; Holmstrom and Milgrom 1987; Lambert 2001), and for selecting and assigning optimal weights to performance measures (Banker and Datar 1989; Feltham and Xie 1994; Holmstrom and Milgrom 1991). Deviations from theoretical optimal contracts documented in literature have been explained as the effect of managerial power to extract rent (Bebchuk et al. 2002; Lambert et al. 1993), labor market dynamics, governance issues, and other complex aspects of the employment relationship (see Edmans and Gabaix (2009) for a review). Theories of optimal compensation predominantly approach the problem of compensation design as a phenomenon entirely situated within an individual firm, and, for the most part, ignore external social, political and relational influences on compensation design (Barkema and Gomez-Mejia 1998; Murphy 2012). On the contrary, firms are embedded in multiple networks of interfirm relationships (i.e. supply chains, markets, industry associations, consortia, etc.), which operate as sources of information and influence on internal choices (Granovetter 1985).

Observed similarity in organizational behaviors, however, is not always the effect of network influences (Shalizi and Thomas 2011). Participation in network relationships is, in many cases, an endogenous decision. Firms have significant discretion over the types of relations they want to enter and maintain, as well as over the choice of their counterparts. Firms may establish relationships with similar organizations, *because* of their similarity, a phenomenon defined in the sociology literature as *homophily* (McPherson et al. 2001). In these cases it may not be possible to disentangle the role of pre-existing similarity of the partners from the contagion effect exerted by the relationship (Aral et al. 2009). Alternatively, organizations might be driven toward similar decisions by contextual factors, including economic and market conditions, technological developments, regulatory provisions, etc. Nonetheless, in those cases where homophily and contextual drivers can be isolated or ruled out, network ties might operate as conduits for the diffusion of organizational practices, and influence the decisional process of connected firms.

Network connections impact the development of organizational practices in multiple ways. On the one hand, they facilitate the transfer of individual knowledge by providing opportunities for sharing and internalizing others' expertise (Beckman and Haunschild 2002). On the other hand, they provide opportunities to synthesize and combine individual pieces of information into new knowledge, which then diffuses through the network (Podolny and Page 1998). Board interlocks and compensation consultants are examples of inter-firm networks that are likely to facilitate information transfer and knowledge creation regarding the design of executive compensation packages.

Board interlocks occur when a member of the board of directors of a firm also serves as a director in another firm (Knowles 1973). Firm directors share a fiduciary relationship with the shareholders, whose interest they represent while monitoring and advising top management decisions. This shared commitment, as well as multiple in-person interactions between directors during board and committee meetings, form strong ties within the board, and increase the cohesiveness of the group. While cohesiveness facilitates the transfer of complex and tacit knowledge (Reagans and McEvily 2003), within-board information becomes homogeneous and redundant over time. Interlocked directors provide a connection *between* boards, through which they can broker the information flow between different firms, thus creating the opportunity for either group to obtain novel information (Granovetter 1973; Burt 2001).

A large body of research provides empirical evidence in support of the role of interlocks as conduits of information and sources of influence on organizational behavior (Schoorman et al. 1981; Palmer 1983; Haunschild 1993; Davis 1996; Shropshire 2010; Kraatz 1998; Fich and White 2005; Sanders and Tuschke 2007; Battiston et al. 2008). Several studies in accounting also provide evidence of the effectiveness of board interlocks in the diffusion of accounting practices (Chua and Petty 1999; Brown and Drake 2014; Chiu et al. 2013). Nonetheless, sources of criticism about the role of board interlocks, beyond the strategic intent that originated them, remain (Fligstein 1995; Ornstein 1984; Zajac 1988; Fligstein and Brantley 1992). In their attempt to settle the debate, Haunschild and Beckman (1998) show that corporate interlocks represent valuable sources of information for the connected firms when alternative sources of information are weak or absent. Although data on compensation practices of publicly traded companies is available through official disclosures, information about the internal decision process leading to the disclosed outcomes is not disseminated to the public. Board interlocks provide firms with direct access to detailed private information and facilitate the transfer of tacit knowledge across organizations (O'Hagan and Green 2002). Whether access to these sources of information and knowledge results in higher similarity in the design of executive compensation contracts, is an empirical question that I address in this study.

Compensation consultants represent a second important source of knowledge of compensation contracting. The role of compensation consulting firms is two-fold. On the one hand, compensation consultants lend their technical expertise to support the board in optimizing the incentive structure for the CEO (Bebchuk et al. 2002). Compensation consulting firms have, in general, access to detailed proprietary information about pay practices of multiple clients, in addition to publicly available data. On that basis, they can provide current assessments of the "pulse of the market" and compensation trends, and advise the firm on the recommended pay structure (Conyon et al. 2011). On the other hand, in their capacity of external and autonomous sources of expertise and advice, by endorsing the adopted compensation structure, compensation consultants contribute to the legitimacy of the board's stipulations, both in the negotiations with the CEO (internal legitimacy), as well as toward external stakeholders (external legitimacy) (Bebchuk et al. 2002; Meyer and Rowan 1977).

Compensation consultants have been identified in prior literature as potential sources of inefficiency in the CEO labor market, due to their tendency to focus the attention of their clients toward compensation comparability, instead of optimality (Finkelstein and Hambrick 1988). Extant research supports the conclusion that compensation consultants facilitate the homogenization of compensation contracts (Conyon et al. 2011). From an alternative viewpoint, their peculiar structural position in the network allows compensation consultants to synthetize information about many individual pay practices and create new knowledge (Podolny and Page 1998). Access to a large repository of information may allow the compensation consulting firm to leverage its professional expertise and tailor the design of compensation contracts to the needs of individual clients, in line with contracting theory predictions (Cadman et al. 2010). Nonetheless, developing individualized solutions for each client entails higher costs and requires greater resources, which may not be equally available to all consulting firms. In this study I address the empirical question of whether compensation consultants facilitate homogenization of compensation contracts. I also identify attributes of compensation consulting firms that influence the propensity to develop customized solutions for their clients.

Both interlocking directorates and compensation consulting networks facilitate the transfer of information about compensation contracting practices. However, these two networks exhibit important structural differences, which are likely to influence the type of information transferred, as well as the speed and efficiency at which it is transferred (Hanneman and Riddle 2005). Consequently, it is opportune to analyze the relative influence of the two networks on the degree of similarity between compensation contracts. Additionally, the effectiveness of the information transfer through network connections might be impacted by the existence of alternative sources of similar information (Haunschild and Beckman 1998). If interlocks and compensation consulting networks transfer similar information between connected firms, their combined effect on compensation contract similarity might be reduced. Alternatively, if the two networks convey different information, the contemporaneous presence of both network ties might amplify the effect on compensation design.

Designing a compensation contract involves several important decisions, including the selection and weighting of a set of performance measures, as well as the choice of mix between fixed and incentive-based pay components. These decisions are not independent from each other. Furthermore, there are possible complementarity or substitution effects within the element of the pay mix (Anderson et al. 2000), as well as among the relative weights associated with performance measures. Insofar, research on compensation design has analyzed each component of the compensation package as a separate predicted variable (Skantz 2012; Armstrong et al. 2012; Conyon et al. 2009, 2011; Miller et al. 2005; Core et al. 1999). Departing from prior literature, in this study I utilize a vectorial representation of each compensation contract, which allows me to compare entire compensation packages, and proxy the measure of similarity between contracts as the distance between the corresponding vectors.

Measuring contract similarity as the distance between vectors proposes an additional methodological complication, in that the unit of analysis in this study is a dyad. Similarly to many studies of network relations, network data cannot be assumed to consist of independent observations (Krackhardt 1987, 1988), due to two main reasons. First, relationships between the members of the dyad are in general consequences of endogenous decisions facilitated by contextual circumstances (e.g. an interlocking directorate between two firms is, in general, the consequence of a consensus in the strategic approach of both parties, facilitated by each party trusting the common board member). Second, each member of each dyad can appear in multiple other dyads, thus creating an autocorrelation problem, which cannot be addressed with fixed effects models, generalized least squares (GLS) estimation methods, or standard error clustering procedures. In my analyses I apply the Quadratic Assignment Procedure (QAP), a non-parametric permutation approach to testing the null hypothesis that two, or more, networks are uncorrelated (Krackhardt 1988).

Using compensation and board composition data of publicly traded companies, I find that interlocking directorate networks and compensation consulting networks play different roles in the diffusion of compensation contracting design. In particular, firms connected via board interlocks or by sharing a compensation consultant exhibit higher similarity in the structure of pay mix (relative weights assigned to fixed pay and forms of incentive pay) than do unconnected firms. The influence of board interlocks on the similarity of pay mix is even stronger in those cases where the interlocking directors are compensation committee members. Additionally, I find a partial substitution effect between the interlocking and compensation consulting networks, indicating some degree of redundancy in the information transferred by the two networks. With respect to the choice and weighting of performance measures, interlocking directorates do not appear to be relevant sources of isomorphic behavior, whereas, instead, shared compensation consultants are associated with a higher degree of similarity in incentive design. In addition, the imitative tendency is mitigated when consultants have greater expertise and access to a larger customer base.

This study provides new insights on the operation of boards of directors and, in particular, compensation committees, in the generation of a very important decision for the firm. The empirical evidence documented in this paper make several contributions to the literature. First, it extends the academic knowledge of executive compensation by providing examples of compensation drivers that are external to the firm, and by documenting their influence on two of the main design decisions, namely the mix of compensation components and the mix of performance measures. Second, it contributes to the literature on organizational isomorphism by showing that access to information about particular organizational practices gives opportunity to imitative behaviors. Third, it provides additional support to the relevance of interlocks and other interfirm connections for the diffusion of business practices. Fourth, this study extends our knowledge of the relative effects of different interfirm network connections by analyzing the interaction between interlocking and compensation consulting networks, in addition to documenting individual effects. Finally, by representing compensation contracts with multidimensional vectors, this study makes a methodological contribution, which allows for analyses and comparisons of compensation contracts as integrated systems.

The next chapter reviews the existing theoretical and empirical literature that informed the formulation of the hypotheses tested in this study. Chapter 3 provides information about the empirical settings, the data and the statistical analyses. Chapter 4 describes the findings and the related inferences. The last chapter concludes.

CHAPTER 2: LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Two of the key elements of executive compensation design are the mix between base salary and incentive pay, as well as the selection of performance measures and relative weights for the determination of incentive compensation (Banker and Datar 1989). These decisions are not independent from one another as they influence the behaviors of executives in the short and long term (Baker et al. 1988). The composition of the pay mix for the CEO depends on the choice of measures of current performance, as well as other factors, such as entrepreneurial ability, managerial responsibility, past performance, and general economic determinants (Murphy 1985).

Performance measurement systems are complex and multifaceted. Because executives' responsibilities include multiple tasks, and their performance is measured along many dimensions (Holmstrom and Milgrom 1991), compensation contracts include multiple performance measures. A rich body of research in economics and accounting has theorized optimal relations between performance measure properties and design of efficient compensation contracts in presence of uncertainty (Feltham and Xie 1994; Artz et al. 2012; Banker and Datar 1989; Dutta 2008; Arya et al. 2005; Merchant 2006). However, empirical tests of these models have, insofar, provided only partial explanation for the observed variability in the composition and weighting of performance measures in compensation packages (Ittner et al. 1997; Ittner et al. 2007; Indjejikian and Matějka 2012; Anderson et al. 2000; Core et al. 2003). While these theories consider the relations between features of the performance measure, characteristics of the task at hand, and the information asymmetry of the environment, they do not explicitly model economic, social and political forces that influence the design of compensation contracts (Murphy 2012).

Characteristics of the firm and its economic environment, as well as governance variables, impact the design of executive compensation. Empirical research has identified a number of economic determinants of executive compensation, including firm size, complexity, investment opportunities, and variability in financial performance (Core et al. 1999; Armstrong et al. 2012; Baber et al. 1998; Chalmers et al. 2006). The amount of executive pay is also influenced by the ability of the CEO to extract rent, which is mitigated by the monitoring role of the board of directors. The effectiveness of corporate governance is lower when the board is larger, includes a lower portion of independent members, and when directors are less committed to the firm due to involvement in multiple boards or low attendance to board meetings (Armstrong et al. 2012; Core et al. 1999; Bebchuk et al. 2002; Boyd 1994). Additionally, CEOs can exercise stronger pressure on the board when they are more experienced and capable, serve also as Chairman of the board, own a material portion of the company' shares, or are well connected with other companies and/or politically (Fich and White 2003; Bebchuk et al. 2002; Hallock 1997; Hwang and Kim 2009; Larcker et al. 2005; Engelberg et al. 2012). Weaker governance is also associated with fixed pay representing a larger portion of the pay mix (Mehran 1995; Core et al. 1999). The ultimate goal of efficient compensation contract design is to incentivize behaviors that are congruent with organizational goals, while retaining talent and minimizing compensation costs (Bebchuk et al. 2002).

Economic theories of compensation design suggest criteria for choosing efficient weight distribution among compensation components (Hemmer et al. 2000; Lazear 2000) and performance measures (Nalebuff and Stiglitz 1983; Demski 1972; Feltham and Xie 1994; Banker and Datar 1989; Lambert 2001), based on the characteristics of the environment and the relationship between organizational goals and the tasks required for their fulfillment. Identifying tasks and their characteristics, as well as the informational value, sensitivity and precision of the related performance measures, is often an assignment fraught with great uncertainty and complexity.

The design of CEO compensation is, in general, delegated to a compensation committee, formed within the independent members of the board and tasked with setting and reviewing performance goals for the CEO, as well as determining the structure of the compensation package. Board members often lack formal training in compensation contracting. Additional internal and external pressures influence the decisions made by the compensation committee. Internally, compensation committee members are involved in direct negotiations with the CEO, who exercises managerial power to extract rent (Bebchuk et al. 2002; Finkelstein and Boyd 1998). Other complex aspects of the employment relationship, including size and complexity of the operations of the firm, risk aversion of the CEO, level of delegation, tightness of the governance style, may drive the design of compensation contracts away from the theoretical optimal structure (Edmans and Gabaix 2009). Additionally, executive compensation attracts significant attention from external stakeholders (i.e. shareholders, regulators, general public) who expect detailed justifications for the deliberations of the board (Wade et al. 1997).[1] The combination of the uncertainty and complexity of the task, and the pressure to maintain the approval of internal and external stakeholders, may lead organizations to imitate behaviors

[1] Recent regulatory changes, such as the SEC's adoption of items 402-407 of Regulation S-K and of Sections 952 and 953 of the Dodd Frank Act, have increased the disclosure requirements related to the content of the executive compensation package and the characteristics and independence of compensation committee members and compensation consultants. Disclosed information allows external users to compare compensation and performance patterns across companies.

performed by others (Finkelstein et al. 2009; Liberman and Asaba 2006). In particular, extant literature documents evidence of isomorphic tendencies in compensation design (Finkelstein and Hambrick 1996).

Institutional isomorphism, i.e. emulating patterns of behaviors that are accepted by the group of reference, is an important source of organizational legitimacy (DiMaggio and Powell 1983; Deephouse 1996). Legitimacy, defined as favorable appraisal of actions in the context of the norms of acceptable behavior in the social system of reference (Dowling and Pfeffer 1975), is a necessary condition for organizational survival (Baum and Oliver 1991; Meyer and Rowan 1977). Organizations strive to maintain high levels of legitimacy within their external system of reference (i.e. external stakeholders), as well as with respect to the internal institutional environment (Kostova and Zaheer 1999). With respect to structuring executive compensation contracts, boards of directors benefit from high levels of internal legitimacy, in that it facilitates smoother contractual negotiations with the CEO, while external legitimacy protects board members from immediate sanctions (e.g. board members removal) for unfavorable performance results (Meyer and Rowan 1977). The adoption of popular models of executive compensation contracts is likely to sustain board legitimacy both internally and externally.

An important downside of isomorphic compensation design is that it may induce the adoption of a suboptimal contract for the firm. Firms vary significantly along many characteristics, including mission, operations, industry, culture, institutional context, lifetime phase, etc. Firm performance is heavily influenced by the existence of a systematic match between organizational strategies and compensation practices (Gomez-Mejia 1992; Gerhart et al. 1995). Adopting popular models of compensation, while increasing legitimacy for the board in the short term, may cause departures from optimal contracts, which distort the incentives and may ultimately damage the interests of the shareholders (Bebchuk et al. 2002).

Most boards set CEO compensation levels by benchmarking their design choices against those adopted by peer organizations, similar in size, industry, and geography (Larcker and Tayan 2011).[2] However, the choice of peer groups is flexible and endogenous to the firm, often opportunistic and directed at ex-post justification of CEO pay (Bizjak et al. 2008; Bizjak et al. 2011; Albuquerque et al. 2013; Cadman and Carter 2014; Faulkender and Yang 2010). Therefore, peer group membership may not be the only driver of isomorphic compensation design.

Prior research has ascribed observed organizational isomorphism to coercive, mimetic and normative pressures developing within an industry (DiMaggio and Powell 1983). However, subsequent studies have observed a growing rate of isomorphic tendencies even across industries, thus questioning the role of industry as the main driver of imitative behavior (Hambrick et al. 2004). Companies are involved in a number of inter-firm connections, which need not develop within the same industry. Examples include board interlocks and the relationships with compensation consultants.

A network of relationships provides an informational and normative environment for all its participants (Granovetter 1985). Interfirm networks represent an important source of organizational learning, as they provide forums for discussion, stimulate attention to new or different practices, and facilitate efficient information transfer as well as generation of new knowledge as synthesis of existing information (Beckman and Haunschild 2002; Gulati et al.

[2] The compensation peer group indicated in the CD&A consists of a set of firms selected as benchmark specifically for the design of compensation contracts. This group typically differs from the peer group utilized as benchmark for relative performance evaluation purposes.

2000). At the same time, behaviors that develop and diffuse across the network generate normative pressures to conform (Galaskiewicz and Wasserman 1989; Haunschild 1993).

Networks of particular relevance with respect to the definition of compensation contracts include board interlocks and compensation consultants. Connections between board members across firms, such as in interlocking directorates, provide opportunities to access otherwise unavailable information about compensation practices of other firms. By hiring compensation consultants firms import technical expertise on compensation contracting that may not be available within the board. Additionally, consultants provide their clients with indirect access to the compensation practices of a larger group of firms, which can be synthetized into new knowledge (i.e. best practices), or leveraged to develop personalized solutions.

2.1 Board Interlocks

Board interlocks occur when a board member of a firm also sits on the board of a different firm.[3] Extant studies in sociology and organizational theory find that firms participate in board interlocks with the purpose of obtaining specific gains from the interorganizational relationship, such as opportunities for coordination and acquisition of external expertise (Mizruchi 1996; Schoorman et al. 1981).[4]

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[3] Mizruchi (1996) defines interlocks as situations in which an individual affiliated with one organization also sits on the board of another. However, regulatory requirements of independence for the members of the compensation committee (NYSE Listed Companies Manual, Section 303A.02-05) prohibit participation of non-independent directors in the definition of executive compensation packages. The more restrictive definition of board interlocks proposed by Knowles (1973) is, therefore, more appropriate for a study of compensation design.

[4] Regulatory provisions limit firms' discretion in forming interlocking relationships, with a view of reducing opportunities for collusion and violations of fair competition requirements in market economy environments (Mizruchi 1996). The Clayton Act of 1914 expressly prohibits interlocking relationships between firms competing in the same markets. Regulation S-K, Item

Board members share the fiduciary responsibility of monitoring and advising management practices in the interest of the shareholders. Individual tasks are generally assigned to dedicated committees formed within the board. However, the responsibility of the outcomes is shared by all directors. Interlocked directors are embedded in fiduciary relationships with more than one group of shareholders, and are exposed to private information pertaining to each of the organizations they serve. Interlocked directors represent *structural holes* in the interfirm network. Structural holes are weak ties connecting nonredundant sources of information (Burt 2000; Granovetter 1973). This particular network position allows the interlocked director to broker and control the flow of information between the two firms (Burt 2001). Interlocked directors can, therefore, facilitate information flow between different firms and influence the choices of behavior in either organization (Battiston et al. 2008; Haunschild and Beckman 1998; Beckman and Haunschild 2002). Figure 1 presents a small subsample of board interlocks included in the sample used in this study.

Research in accounting provides evidence that interlocks influence the adoption of organizational practices. Chua and Petty (1999) find that interlocking directorates facilitate the diffusion of quality-related strategies. Brown and Drake (2014) show that firms interlocked with low tax counterparts tend to have lower cash ETRs. Chiu et al. (2013) address the role of shared directors in the diffusion of earnings management practices. Prior research also provides evidence that board interlocks participate in the diffusion of practices related to compensation, such as options backdating (Bizjak et al. 2009) and golden parachutes (Fiss et al. 2012). Other studies address interlock ties as opportunities for the CEO to make use of indirect relationships with board members to extract higher rent (Larcker et al. 2005; Hwang and Kim 2009; Hallock

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407(e)(4), adopted by the SEC in 2006, introduces mandatory disclosure requirements for interlocking directorates involving members of the compensation committee.

1997; Engelberg et al. 2012). Wong and Gygax (2009) and Conyon et al. (2011) examine the association between board interlocks and the weight assigned to cash and equity-based components of CEO pay.

The role of board interlocks as sources of influence for organizational decisions has been questioned by Fligstein and Brantley (1992), who posit that the presence of board interlocks does not affect strategic and financial outcomes in large American firms, and that firms' actions are driven primarily by the distribution of powers within the firm and the actions of competitors. In a later study, Fligstein (1995) adds that the interlocking directorate phenomenon should be studied with a view of understanding why and how such relations were initiated, and their consequences on economic interactions between the involved parties. Zajac (1988) raises further doubt about the relevance of board interlocks as active conduits of information exchange and influence, suggesting that board members might choose to join other boards for merely personal motives, and may not be incentivized to share information across firms. This lack of incentive might be might present itself especially in situations where the need for legitimacy is not particularly salient. Haunschild and Beckman (1998) propose a somewhat conciliatory explanation, showing empirically that board interlocks are effective interorganizational carriers of information in the absence of alternative sources.

A significant amount of information about compensation practices is available through mandatory filings of publicly traded companies. The disclosed information, however, is generally limited to the outcome of the compensation design process, with no description of the underlying reasoning. Additionally, compensation data included in official disclosures may serve as ex-post external justification of board decisions, and may deviate from the actual journey leading to the actual compensation paid. Board interlocks are conduits for the transfer of tacit knowledge (O'Hagan and Green 2002), in that they provide access to private information about executive compensation, as well as opportunities to witness the development of the compensation contract throughout the negotiation process.

In summary, board interlocks may or may not be effective mechanisms for information transfer and subsequent imitation of compensation design, above and beyond similarities in economic and governance characteristics. Consequently, in this study I test the following hypothesis, expressed in null form:

H1: There is no association between board interlocks and the degree of similarity in compensation contracts.

Cases of particular interest in the study of the relation between board interlocks and isomorphic compensation design include situations in which the interlocking director (i.e. the director that is a member of the board of two different firms) is also the CEO of one of the connected organizations, or, alternatively, a member of the compensation committee in one of the boards. Due to their direct involvement in the negotiations about compensation, an argument can be made in both cases for a heightened interest in obtaining detailed information about the compensation practices adopted by the counterpart.

The particular network position of the interlocked CEO provides her with the opportunity to observe compensation practices adopted by the counterpart firm, but also with the possibility to control the extent and content of the information transferred between the interlocked firms. The information channel provided by the interlocking tie facilitates the CEO’s comparative assessment of levels and compositions of executive compensation packages across the two organizations. The outcome of such assessment might be favorable to the compensation contract adopted by the firm where the interlocked director is the CEO, or, alternatively, provide the CEO with the opportunity to leverage her knowledge of compensation practices observed elsewhere to extract higher rent (Bebchuk et al. 2002; Fich and White 2003). To examine whether the association between interlocking ties between firms and the degree of similarity in the structure of CEO compensation is influenced by the involvement of a CEO in the interlock, I test the following null hypothesis:

H1a: The relation between board interlocks and the degree of similarity in compensation contracts is not influenced by the CEO's participation in the interlock.

Interlocked directors serving on a compensation committee have a vested interest in benchmarking the content and structure of CEO compensation across the connected firms. In addition to the concerns for internal and external legitimacy relevant shared by any member of the board, the decisions of compensation committee members are subject to an additional layer of evaluation. That is, compensation committees are formed internally to the board of directors and their outcomes are presented to the board for internal approval before being communicated outside. The board at large, therefore, might represents yet another system of reference for the assessment of the legitimacy of the actions taken by the compensation committee. Lack of alignment between the compensation committee's outcomes and the values and norms shared by the board at large might generate sanctions toward the committee members (i.e. changes in the composition of the committee). Since isomorphic behavior is a key driver of organizational legitimacy, participation of compensation committee members in board interlocks might influence the propensity to imitate behaviors observed elsewhere. On the other hand, the board at large is responsible toward the shareholders for the decisions and actions taken with respect to executive compensation contracts. This shared accountability might be insensitive to variations in the internal responsibilities of the interlocked director. I therefore test the following hypothesis, expressed in null form:

H1b: The relation between board interlocks and the degree of similarity in compensation contracts is not influenced by the participation of compensation committee members in the interlock.

2.2 Compensation Consultants

Executive compensation design is a primary responsibility of the board of directors and, in particular, of the compensation committee. However, corporate directors often lack formal training in compensation design and need to supplement their expertise with other sources of knowledge. Although much information about compensation practices is publicly available, compensation committee members may choose not to use their time and resources to collect and process all the information that may be relevant for their decisions (Conyon et al. 2011). Firms hire professional experts, like compensation consultants, to obtain advice and recommendations on issues that require specialized knowledge that is not available within the organization, when the cost of purchasing the information from the consultant is lower than developing the knowledge internally (Bonner 1999). Firms rely extensively on the advice of compensation consultants, both because their recommendations are assumed to be based on superior technical expertise and emotionally detached evaluations, and because they provide legitimation for the adopted compensation practices in the eyes of external stakeholders (Malsch et al. 2012; Meyer and Rowan 1977).

Compensation consultants advise on compensation design and help ensuring equity of the compensation practices by providing adequate benchmarks reflecting market pay levels

(Gendron et al. 2014; Cadman et al. 2010).[5] However, this strong focus on comparability of compensation structures may lead to excessive homogeneity in the compensation practices, thus deviating from the alignment between the incentive structure and the goals of the organization (Finkelstein and Hambrick 1988).

Extant research on compensation consultants has documented the effects of firm-consultant relationships on levels of CEO pay. Armstrong et al. (2012) and Conyon et al. (2009) find that companies that hire external compensation consultants tend to pay higher levels of CEO compensation. Furthermore, the portion of "risky" pay (stock and options) is larger for CEOs of firms hiring compensation consultants, which can be interpreted as a contribution of the consultant to better alignment between CEO and shareholders goals (Conyon et al. 2009). Some studies have focused on the different types of reporting relationships between firms and their compensation consultants. Compensation consultants reporting to management are influenced by the prospect of being retained in the future, which incentivizes them to provide information and advice that benefits the CEO (Bebchuk et al. 2002; Core et al. 1999). On the contrary, Murphy and Sandino (2010) document that CEO pay is higher in firms where the compensation consultant is retained by the board instead of management. Other studies have analyzed the

[5] Compensation consultants may be hired or retained by the compensation committee or by management, and they can provide other services to the company above and beyond advice on the form and amount of executive compensation. The adoption of Regulation S-K (Item 407, e) by the SEC in 2006 introduced mandatory requirements to disclose the identity of the consulting firm, the reporting relationship with the firm, a description of the scope and content of the assignment, fees paid to the firm for compensation consulting and, separately, the amount paid for any other services rendered, if any. These provisions were reiterated and strengthened by the adoption in 2012 of Section 952 of the Dodd-Frank Wall Street Reform and Consumer Protection Act, with the introduction of mandatory disclosure of any actual or potential conflict of interest involving compensation consultants hired by the firm. In future work I intend to analyze the influence of the reporting relationship and the provision of multiple services on the similarity between compensation contracts.

effects on CEO pay of potential conflicts of interest of consultants providing multiple services, and the evidence is somewhat mixed. Conyon et al. (2009) and Murphy and Sandino (2010) find evidence of a positive relationship between provision of multiple services by compensation consultants and overall CEO compensation, while Cadman et al. (2010) do not find any significant association between "conflicted consultants" and executive pay levels. To the best of my knowledge, the relation between sharing a compensation consultant and the degree of similarity in the design of pay mix and performance measures mix has not yet been studied.

Compensation consultants contribute to the design of executive compensation contracts in two ways. First, they provide specialized expertise. Second, they have access to proprietary information on compensation practices of a diverse set of companies, spanning different industries and different types of firms (Cadman et al. 2010). The network of connections created among firms by compensation consultants is a *two-mode network* (Borgatti 2009). Two firms are connected if they share affiliation with the same compensation consultant.[6] This type of connection differs from the interlock tie for the following reasons. First, interlocked directors have *direct* access to information about compensation practices of the counterpart, whereas firms connected through the compensation consultant have only *indirect* access to such information, in most cases synthetized by the consultant into "best practices". Second, when establishing an interlock, a firm chooses its counterpart, while hiring a consultant does not provide full discretion on such connections[7]. Third, connections through consultants provide each client with

[6] A two-mode network generates two bi-partite projections, each connecting actors of the same mode. In this study I focus on the firm-to-firm projection, while I ignore the consultant-to-consultant one.
[7] An argument can be made for firms choosing compensation consultants based on its existing clients. Similarly, a consulting firm might leverage on the composition of its client portfolio to attract additional clients. The analysis of the effect of consultant centrality described later in this section might help to shed some light on some of the related consequences.

access, albeit indirect, to a larger information base, as they allow for numerous interfirm ties, which would often be too costly to maintain with direct connections as in the interlock network case. Figure 2 illustrates a small subsample of interfirm connections generated by hiring a common compensation consulting firm

The combination of higher technical expertise and access to varied information about compensation practices generates an interesting conundrum for the compensation consultants. On the one hand, compensation consulting firms can leverage on their exposure to large and heterogeneous information to develop diverse solutions applicable to clients' individual settings (Cadman et al. 2010). Developing individualized compensation packages is, however, costly for the consulting firm, both in terms of resources that need to be dedicated to the individual client, as well as in terms of "legitimacy costs" deriving from departures from mainstream choices (Meyer and Rowan 1977). On the other hand, compensation consultants can contribute to the homogenization of compensation practices by influencing client firms to adopt common compensation "best practices". Whether compensation consultants contribute to developing individualized compensation contracts or to isomorphic compensation design is an empirical question that I address by testing the following hypothesis, expressed in null form.

H2: There is no association between hiring a common compensation consultant and the degree of similarity in compensation contracts.

I further explore whether the compensation consultants' *centrality* moderates the relation between hiring a common compensation consulting firm and the degree of similarity between contacts of client firms. Centrality is a measure of actors' prominence in the network related to the *number* and *type* of connections they maintain at any given time with clients (Wasserman and

Faust 1994). Highly central compensation consulting firms hold a large portfolio of clients, who are also sophisticated users of compensation consulting services (Figure 3).[8]

The market share of compensation consulting firms is likely dependent upon quality of their services, fees charged, territorial distribution, diversification across client industrial sectors, etc. The size of the sophisticated clientele of the compensation consulting firm might also be correlated with the firm's reputation. Companies might select a particular compensation consulting firm for their effectiveness in producing highly specialized solutions for their clients. Alternatively, the choice of consultant might be driven by the need to ensure high comparability of the compensation contract with respect to market trends. The measure of centrality reflects, to some extent, the type of consulting approach that is most popular among clients. In other words, if client firms tend to hire compensation consultants known for their individualized executive compensation solutions, then higher centrality should be associated with lower degrees of similarity between compensation contracts among clients of the same consulting firm. If, instead, consultant's centrality relates to higher customer demand for comparability, then clients of highly central consulting firms should exhibit higher similarity in their executive compensation structure. To identify the predominant tendency in the demand for compensation consulting services, I test the following null hypothesis:

H2a: The relation between hiring a common compensation consultant and the degree of similarity in compensation contracts is not influenced by the eigenvector centrality of the compensation consultant.

[8] Many measures of centrality are available (Valente et al. 2008). In this particular study, I measure the consultants' eigenvector centrality. The definition of this measure is provided in the third section (Research design and sample selection).

2.3 Interaction Between Network Effects

Firms are typically embedded in more than one network of relationships at the same time. With respect to networks that are relevant for this particular study, interlocked firms might also be clients of a common compensation consultant. Both networks are relevant for the transfer of information about compensation design. Both types of relationships can facilitate imitation in the design of executive compensation contracts. Both represent sources of legitimacy for the decisions of the board. Whether there is redundancy in the information transferred and in the isomorphic pressure generated by the two networks, is an open empirical question. I, therefore, analyze the interaction between interlocking and compensation consulting network effects to assess whether the difference in the network structure leads to complementary or substitute effects on compensation contract similarity.

Complementarity between the effects would be associated with a negative interaction. That is, the effect of one network on compensation similarity would be increased by the contemporaneous connection through compensation consultants, resulting in even smaller distances between compensation vectors. Conyon et al. (2011) finds a direct association between the number of different interfirm relationships for a firm and the degree of isomorphism in the level of CEO pay. On the contrary, a positive interaction would indicate substitution between the two effects, in which case the influence of one network on compensation similarity would be mitigated by the other (Sedatole et al. 2014; Grabner and Moers 2013). Partial or complete substitution between network effects would be in line with the findings of Haunschild and Beckman (1998), who posit that the effectiveness of information transfer of interlocking relationships and their influence of on the choice of organizational behavior is reduced by the presence of alternative sources of information.

Answering this question is important because building and maintaining network ties is costly (Hanneman and Riddle 2005). Board interlocks require significant investment of time and effort by the interlocked director, who shares fiduciary responsibilities towards two sets of shareholders. Additionally, board interlocks expose the firm to potential risks of unwanted information transfer, which could reduce competitive advantages (Davis 1996; Mizruchi 1996). Similarly, providing a compensation consultant with access to private information exposes the firm to the risk of information leakages, in addition to the financial costs incurred for the provision of professional services. Under the assumption that the firm's choice to enter in an interlocking relationship or to hire a compensation consultant is endogenous and directed to pursuing a pre-defined objective, understanding the relation between the different network effects will indicate whether maintaining both relationships is superior to focusing on one type of connection alone. I approach this question by testing the following null hypothesis:

H3: The relation between board interlocks and compensation similarity and the relation between hiring a common compensation consultant and compensation similarity do not influence each other.

2.4 Homophily, Contagion and Contextual Drivers

In studying the relation between network ties and organizational behavior, a note of caution must be considered. Similarities in observed behaviors of network members may result from three distinct causal mechanisms that are easily and often confounded in empirical network studies. These are homophily, environmental drivers, and contagion (Shalizi and Thomas 2011). Homophily is defined as the tendency of actors form relationships with similar counterparts (Golub and Jackson 2012; McPherson et al. 2001). Similar behaviors may, in this case, be driven by the similarity in the individual characteristics of the connected actors, and have very little to do with their relationship (Aral et al. 2009). Similarly to individual relationships, firms select relationships and partners, for the most part, endogenously, and might choose to interact with similar organizations. Another driver of isomorphic behavior within network participants relates to the exposure to common exogenous shocks or environmental characteristics that may drive similar responses independently from the existence of connections between actors. Examples include regulatory changes, technological advances, economic shocks, etc. In order to sustain that network connections are responsible for the diffusion of organizational practices, these confounding effects need to be ruled out.

CHAPTER 3: RESEARCH DESIGN AND SAMPLE SELECTION

The data used in this study are obtained from multiple publicly available sources. Information on compensation paid, compensation components, performance measures and related weights, board composition, as well as firm peer groups and compensation consultants were obtained from the Incentive Lab Academic Dataset, which includes data from the CD&A section of the proxy statements of S&P500 companies, and further integrated with hand collected data.[9] [10] Measures of firms' economic and governance characteristics were extracted from Compustat and Bloomberg. The observations included in my sample refer to company filings for fiscal year 2012.[11] Table 6 describes the sample selection procedure.

I utilize a vectorial representation of each compensation contract. A first vector describes the contract's performance measure mix. Performance measures differ in the output being measured and in the standard used as reference. I first classify each measure as accounting-based, stock-based or nonfinancial. I then combine this classification with the absolute vs.

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[9] The content of the Compensation Discussion and Analysis (CD&A) is heavily regulated by mandatory disclosure provisions, which require concise and clear communication of the criteria and details of compensation paid to the CEOs, CFOs and other high rank officials, as well as elements of governance, such as the independence of directors, the existence of interlocking relationships involving members of the compensation committee, the identity, reporting relationship and potential conflicts of interests involving compensation consultants, as well as the composition of compensation peer groups, if utilized in the determination of the compensation contract. Source: http://www.sec.gov/answers/execomp.htm

[10] Incentive Lab includes information on firms that have been included in the S&P500 index between 1998 and 2013. Information relative to firms that are included in the S&P500 for the first time is backfilled. Information on companies that are dropped from the S&P500 continues to be updated. The sample used in this study, therefore, includes significantly more than 500 firms.

[11] The disclosure regulatory environment is subsequent to the adoption of Regulation S-K (Items 402-407). Future research could compare these results with analyses performed on fiscal years subsequent to the adoption of the Dodd-Frank Act, which is relevant for the influence of compensation consultants on the similarity between compensation contracts.

relative nature of the metric, thus obtaining six possible combinations representing corresponding performance measure types.[12] Next, I estimate the weights assigned to each performance measure type by calculating the percentage of incentive compensation paid to the CEO based on each measure type[13]. The dimensions of the performance measures vector correspond to the six possible types, while the magnitude of each dimension represents the weight of each measure type. A numerical example is included in the Appendix for illustrative purposes (Appendix B, Example 1).

A second vector relates to the composition of the mix of compensation components. Executive compensation packages generally include elements of base pay, annual bonuses, equity-based components, inclusive of stock and options grants, pensions, and other compensation provisions and benefits. I express each of these components as a percentage of total compensation. The dimensions of the compensation components vector correspond to the six components of pay, and the percentages of total compensation related to each component represent the magnitudes along each axis. The Appendix includes a numerical example of this calculation (Appendix B, Example 2).

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[12] Examples of accounting-based performance measures include Sales, ROA, ROE, EBIT or EBITDA, Earnings, Operating Income, etc. Stock-based performance measures refer to desired levels or changes in the stock price (i.e. stock price greater than a certain expected value, or stock price increase of a certain percentage). Nonfinancial performance measures include market share, number of new contracts, repeated sales, as well as individual or subjective operational performance measures, such as quality certifications, number of new product introductions, etc. Performance measures of each kind can be assessed in absolute terms (i.e. relative to a goal set within the individual organization) or relative to a peer group of organizations.

[13] The link is made possible by the details of each compensation grant, which relate performance measures to amounts paid.

3.1 Compensation Similarity

The unit of analysis in this study is a *pair* of firms. I construct pairs of firms by matching each firm with each other firm in my sample (*N*(N-1)/2* pairs).[14] For each type compensation vector (i.e. performance measures mix vs. compensation components mix), I calculate the Euclidean distance between corresponding vectors for each pair of companies in my sample. The Euclidean distance approximates the similarity between compensation contracts, where a shorter distance represents more similar contracts. This calculation yields two measures of contract similarity for each pair of firms. *PM_Dist* represents the measure of similarity in the choice and weighting of performance measures, while *Comp_Dist* measures the similarity in the distribution of compensation components. I then model the influence of network connections and related characteristics on the two measures of contract similarity as follows:

Eq. (1):

$$
\begin{aligned}
Comp\_Simil_{ij,t} = {} & \alpha_{ij,t} + \beta_1 Dir\_Interlock_{ij,(t-1)} + \beta_2 Shared\_Cons_{ij,(t-1)} \\
& + \beta_3 CEO\_Interlock_{ij,(t-1)} + \beta_4 CC\_Interlock_{ij,(t-1)} + \\
& + \beta_5 Cons\_ECent_{ij,(t-1)} + \beta_6 (Dir\_Interlock * Shared\_Cons)_{ij,(t-1)} \\
& + Controls_{ij,(t-1)} + \varepsilon_{ij,t}
\end{aligned}
$$

The dependent variable indicated in the model ($Comp\_Simil_{ij}$) represents each of the two response variables of interest in this study, namely $Comp\_Dist_{ij}$ and PM_Dist_{ij}. The variables of interest for the test of H1 and H2 are $Dir\_Interlock_{ij}$, which is a binary variable equal to 1 if the firms in the pair are interlocked, and 0 otherwise, and $Shared\_Cons_{ij}$, which assumes the value of 1 if the firms in the pair hire a common compensation consultant, and zero otherwise. *H1* states the null hypothesis that interlocked firms do not exhibit more or less similar compensation

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[14] I ignore the ordering of firms within the pair. That is, *(i,j)=(j,i)*. I also ignore the diagonal elements of the firm-by-firm square matrix *(i=j)*.

contracts than non-interlocked firms. Similarly, *H2* states the null hypothesis that firms hiring a common compensation consultant do not display higher or lower similarity in compensation design, compared to firms hiring different consultants. Since the dependent variable in the model is the Euclidean distance between compensation vectors, smaller distances represent greater similarity. Significant negative (positive) values for the estimates of β_1 or β_2 would reject the corresponding null hypotheses and indicate that network connections between firms increase (reduce) the similarity in the corresponding compensation contracts.

H1a states the null hypothesis that the degree of similarity in compensation design among interlocked firms is not influenced by the involvement of the CEO of one of the two interlocked firms. The variable of interest for the test of this hypothesis is $CEO\_Interlock_{ij}$, which is a binary variable assuming the value of 1 if the firms in the pair are connected by an interlocking directorate involving the CEO of one of the two firms, and zero otherwise. The estimated coefficient for this variable measures the moderating effect of involving a CEO in the interlock over the relation between interlocks and compensation similarity. Estimating a positive (negative) significant value for β_3 would indicate that the CEO involvement in the interlock reduces (increases) the similarity in compensation design between the pair of interlocked firms.

H1b states the null hypothesis that interlocks involving members of the compensation committee do not affect the degree of similarity in compensation design between interlocked firms. The variable of interest for this hypothesis is $CC\_Interlock_{ij}$, and it is defined, similarly to the case of the CEO-interlock, as an indicator variable assuming a value of 1 if the pair of firms are interlocked and the shared director serves as a member of the compensation committee in one of the two firms. A positive (negative) significant coefficient β_4 would indicate that the involvement of a compensation committee member in the interlock reduces (increases) the similarity in compensation design between the pair of interlocked firms.

Table 7, Panel A, reports the percentage distribution of compensation consultants retained by the firms in my sample in fiscal year 2012, while Panel B provides some summary measures for the sample of compensation consulting firms included in this study.[15] To test the influence of consultant centrality on compensation design similarity of connected firms (*H2a*), I first estimate the eigenvector centrality for each compensation consultant (Table 7, Panel A). *Eigenvector centrality* is a combined measure of the actor's connectedness and prominence in the network. This centrality measure takes into account the relational patterns of the whole network and the connections with other compensation consultants maintained by the firms that hire the compensation consultant as their primary provider. In other words, the consultant's eigenvector centrality depends on the number of clients that designate such consultant as primary, who also hire several other (non-primary) compensation consultants, which have, themselves, many customers (Figure 3).

Eigenvector centrality is, therefore, not only a measure of relative market share, but it also accounts for the general patterns of connections in the whole network. As reported in Table 7, Panel A, compensation consultants with larger customer base may exhibit a lower measure of eigenvector centrality compared to consultants with smaller market share (as an example, Frederic W. Cook serves as a primary consultant for a number of clients that is more than double

[15] I omit from Table 7, Panel A, any compensation consulting firm that serves as a primary consultant less than 1% of the firms included in my sample. The summary statistics reported in Panel B are based on the entire sample of consulting firms considered in this study. Additionally, while "number of customers" and "share" are calculated based exclusively on relationships involving the consulting firm as primary consultant, the calculation of eigenvector centrality takes into consideration professional relationships as secondary compensation consultant as well, in the spirit of capturing the exposure of consulting firms to all possible sources of information about consulting practices.

the number of clients hiring Towers Watson as their primary consultant. However, the eigenvector centrality score for Towers Watson is higher than the one associated with Cook).

Compensation consultants with higher degree centrality have access to compensation information relative to a larger base of experienced customers. The influence of consultants' centrality on the similarity between compensation contracts is conditional on firms in the pair hiring the same primary consultant. Therefore I define $Cons\_ECent_{ij}$ as a variable that assumes the value of the eigenvector centrality of the shared consultant, if the firms in the pair hire the same consultant, and zero otherwise. If the estimation of the coefficient β_5 yielded a positive (negative) and statistically significant value, then I would infer that the centrality of a compensation consultant reduces (increases) the similarity of compensation contracts between firms that share the same compensation consultant.

To investigate the relation between network effects (*H3*), I estimate the interaction $(Dir\_Interlock*Shared\_Cons)_{ij}$. The sign and statistical significance of the coefficient for this interaction term indicates whether the two networks produce complementary effects ($\beta_6 < 0$) or substitute effects ($\beta_6 > 0$) (Grabner and Moers 2013).

All analyses control for economic and governance characteristics already documented by the compensation literature as drivers of executive compensation (Core et al. 1999; Armstrong et al. 2012; Finkelstein and Hambrick 1989; Murphy 1985). A fundamental assumption underpinning the development of this statistical model is that if certain variables are known to determine levels of compensation or elements of compensation, then similarities in those predictors are likely to drive similarities in compensation contracts.

3.2 Firm Similarity

Firms might be similar along various observable characteristics. Economic characteristics of the firm that have been related to compensation design by prior literature include firm size (measured by the natural logarithm of sales revenues), ROA, market returns, measures of volatility of ROA and market returns (i.e. the standard deviation over the three fiscal years ending with *(t-1)*), and a proxy for the firm's investments opportunities (measured as book-to-market ratio). Governance characteristics of the firm include CEO tenure, the size of the board, the percentage of inside board members, the percentage of female directors within the board, the average age of board members, the duration of the board appointment, the number of board meetings per year, the average percentage of directors' attendance to board meetings, whether the CEO is also the Chairman of the board (CEO duality), and whether the board is staggered (i.e. a portion of the board members is renewed every year).

In order to measure the degree of similarity between firms, I first tabulate the distribution of the continuous variables among the economic and governance firm attributes into quintiles, and create indicator variables corresponding to each quintile. At the pair level, I then create binary variables for each of the economic and governance characteristics, indicating whether the firms in each pair belong to the same quintile (value = 1) or not (value = 0). Additionally, I create indicator variables assuming the value of 1 if the firms in the pair share the same characteristics in terms of CEO duality, and zero otherwise. That is, the indicator variable will be valued at 1 if the CEO is the Chairman of the board in both firms or in neither of the firms in the pair, whereas the value of the indicator variable will be equal to 0 is the CEO is the Chairman of the board in one firm in the pair, but not in the other one. With the same logic, I create a binary variable indicating whether the firms in the pair exhibit the same characteristic in terms of staggered boards (indicator =1) or not (indicator = 0).[16] Firm similarity is then calculated as the number of characteristics shared by the firms in the pair. The higher the number of common attributes between firms, the higher the similarity. I calculate separate measures of pairwise similarity with respect to the economic characteristics ($Econ\_Simil_{ij}$) and governance characteristics (Gov_Simil_{ij}). If similarities in firm characteristics drive similarity in compensation design, then I expect negative signs (smaller Euclidean distances between pairs of compensation vectors) for the estimated values of the regression coefficients associated with each measure of similarity.

Further, compensation design might be influenced by mimetic and normative pressures emerging within an industry or within a particular geographical region. Whether firms in each pair operate in a common industry, is indicated by the binary variable $Same\_SIC_{ij}$ (equal to 1 in the case of same industry, and 0 otherwise), while the variable $Same\_ZIP_{ij}$ indicates whether the firms in each pair are headquartered in a common geographical area (indicator variable equal to 1 in the case of same area, and 0 otherwise).[17]

Finally, I control for the effect of compensation peer groups. The binary variable $Comp\_Peers_{ij}$ indicates whether a firm in the pair is listed in the compensation peer group of the other firm (indicator variable equal to 1 if the firms are compensation peers, and 0 otherwise). Peer group membership is likely to be associated with compensation package similarities (smaller Euclidean distances). I therefore expect a negative sign for the estimated coefficient.

[16] The indicator variables corresponding to the firm level attributes are used as intermediate steps in the process of measuring firm similarity. In the spirit of expositional parsimony, I do not report them in the tables.

[17] Industry classifications are based on 2-digit SIC codes. Geographical areas are identified with 2-digit ZIP codes (or equivalent codification for firms headquartered outside the US).

Consistent with prior research, all predictors are lagged one period. The underlying assumption is that compensation contracts are negotiated *ex-ante*, and incentive compensation paid in fiscal year *t* is based on performance recorded in year *(t-1).* Table 8 provides the definition of all the variables utilized in this study.

3.3 Estimation: Multiple Regression Quadratic Assignment Procedure (MRQAP)

The unit of analysis in this study is a pair of firms. As in many studies of networks, the observations represent values of the relationships of interest between pairs of actors. The data is often organized in squared matrices (*MxM*, where *M* is the number of actors populating the network). Each matrix represents a particular network relationship. Each row (or column) of the matrix represents the values of the relationship between one particular actor and everybody else. Each cell in the matrix represents the value of the relationship (tie) between a pair of actors.

The values in the matrix may be binary, indicating the existence of a tie, or valued, indicating the direction (sign) and magnitude of the relationship. The matrix of tie values may be symmetric (i.e. the value of the tie is the same for both actors), or asymmetric (i.e. each actor assesses the value and direction of the relationship individually). In this study all the matrices representing network relationships are symmetric, while some are binary (e.g. $Dir\_Interlock_{ij}$ or $Shared\_Cons_{ij}$) and some are valued (e.g. $Comp\_Dist_{ij}$ or PM_Dist_{ij}).

The estimation of the model described in Eq. (1) requires regressing the pairwise distance between compensation vectors on the values of network ties between firms, controlling for pairwise levels of similarity. Setting the unit of analysis at the pair level generates an important econometric complication, in that the assumption of independence between observations cannot be satisfied (Krackhardt 1988). Observations reported in the same row (column) of the data matrix are likely to be positively correlated, because they represent dyadic relations involving the same actor. Applying OLS methods to the estimation of the model would yield too small standard errors and, consequently, increase the risk of Type 1 error (Simpson 2001). Additionally, the inclusion of fixed effects in the regression would require adding an indicator variable for each row and each column, which may cause the estimation of the model to be inefficient or, in some cases, impossible. Generalized Least Squares methods require strong assumptions on the form of the covariance matrix, which may be arbitrary in these settings. Finally, adjusting the OLS standard errors by clustering would require clustering on both the rows and the columns at the same time (Simpson 2001; Krackhardt 1988, 1987).

The quadratic assignment procedure (QAP) is a nonparametric estimation method that overcome the limitations of other statistical approaches in the presence of dyadic. QAP tests the null hypothesis of no association between two network variables (Dekker et al. 2007; Krackhardt 1988). The mechanism underlying QAP involves a series of iterations, in which the order of the rows and columns in one of the matrices is randomly altered, while keeping the content of each row and each column unaltered. These random isomorphic permutations (i.e. permutations of the order of the rows and columns within the matrix, while preserving the structural characteristics of the matrix (Dekker et al. 2007)) serve the purpose to “break the link” between the values of the dependent and independent variables as they are observed in the sample, thus creating a random assignment between dependent and independent variables (Appendix C provides an example). The correlation between the matrices of network values is calculated with respect to each iteration, creating a distribution of correlation coefficients. If the correlation originally estimated with reference to the relation between the variables as observed in the sample falls in one of the tails of the simulated correlation distribution, then the null hypothesis can be rejected

(Simpson 2001).[18] This procedure is applicable to multiple regressions (MRQAP) and panel data (Borgatti and Cross 2003; Krackhardt 1988).

[18] In this case the empirical confidence interval calculated by the QAP procedure is around the null, and not around the sample value, which would be the case for bootstrapping. Therefore this approach represents a classic hypothesis testing situation (Simpson 2001).

CHAPTER 4: RESULTS OF HYPOTHESES TESTS

Table 9, Panels A and B summarizes the main descriptive statistics of all variables included in the study. All explanatory and response variables are measured at the dyad level. That is, they refer to differences or similarities within pairs of firms. In my analyses I consider all possible pairs of firms listed in my sample. Pairs are unordered, i.e. pair (*i,j)* is the same as pair (*j,i)*. Additionally, I exclude all pairs where *i=j* (diagonal pairs). The total number of pairs (*N*), therefore, represents the maximum number of connections that are possible with respect to each of the relationships considered in this study, and it is calculated as (*M*(M-1)/2*), where *M* is the number of individual firms considered in my study (refer to Table 6 for additional details on the sample selection procedure). Table 9, Panel C, reports additional information on the frequency of connected firms in my sample. The incidence of connected firms appears to be relatively low with respect to the number of possible connections. However, this is not particularly surprising, considering that maintaining relationships is costly (Hanneman and Riddle 2005). Additionally, some corporations establish limitations for the number of external directorates for their board members, with a view of sustaining the director's high level of commitment and effort in the interest of the shareholders. Furthermore, firms only maintain relations with one or two primary compensation consultants at any time, which mechanically reduces the number of indirect connections considered for this study. On average, as reported in Panel C, Table 9, a firm interlocks with 6.028 other firms (standard deviation: 4.133), and shares a compensation consultant with 80.435 other clients (standard deviation 74.327).

Table 10 reports the correlations between the main variables involved in this study. Because these correlations refer to dyadic relationships, they were calculated using the quadratic assignment procedure (QAP) described in Chapter 3, with 2,000 iterations of random matrix permutations. The reported correlations (all statistically significant at 99% confidence) indicate, for the most part, low likelihood that firms may connect with similar firms. In particular, the probabilities that an interlock is observed between firms operating in the same industry or geographical area, or between firms exhibiting similar economic or governance characteristics, are all smaller than 5.1%. Similarly, the probabilities that similar firms or firms operating in the same sector or geography, are smaller than 2.3%. I can hence conclude that homophily, as an alternative explanation to network influences on similarity in observed behaviors of connected firms is not a significant concern. This assessment is in line with extant work on the mechanisms that drive partner selection in interfirm network relationships. Beckman and Haunschild (2002) posit that connections between heterogeneous partners facilitate greater learning. Additionally, Beckman et al. (2004) find that firms tend to select partners that are less similar to them as a form of exploration, especially when faced with greater firm-specific uncertainty than market uncertainty. Furthermore, legal requirements, such as the Clayton Act of 1914, constrain the choices of interlocks to reduce the likelihood of antitrust violations.

Table 11 reports the results of the statistical tests of my hypotheses. As a preliminary analysis, I estimate a baseline model of Eq. (1) limiting the predictors to the control variables (Model 0). I then estimate the main effects of board interlock networks and compensation consulting networks, including considerations on their interaction (Model 1). Next, I include the measure of centrality for the compensation consultant (Model 2). Finally I estimate a full model of Eq. (1) (Model 3). All estimations are performed using OLS multiple-regression. The statistical significance is assessed using multiple regression QAP (MRQAP) with robust standard errors, with 2,000 random permutations of the dependent variable matrix. Table 11 reports both the unstandardized and standardized estimations for all coefficients.

The purpose of Model 0 is to validate the assumption that if certain economic and governance characteristics of firms are associated with the level of executive compensation and of some of its components, then similarities in those characteristics should drive similarities (i.e. reduce Euclidean distances) in contract design. The estimation of Model 0 with respect to the similarity in the design of pay mix (DV = $Comp\_Dist_{ij}$) provides coefficients that are consistent with this prediction with respect to economic and governance characteristics of the firm, whereas the commonality of geographical area or industry is associated with an increase in the Euclidean distance between compensation vectors (Table 11, panel A). This result might be further evidence of the tendencies assessed by Hambrick et al. (2004), who document a stronger tendency toward organizational behavior differentiation within industries, compared to inter-industry trends. Additionally, firms included in compensation peer groups tend to weigh compensation components in a similar manner. With respect to the choice and weighting of performance measures (DV = PM_Dist_{ij}) the inference based on the estimation of the baseline model is, in general, less intuitive. While significant research has identified many firm-level predictors of executive compensation, the study of the drivers of performance measures weighting has focused more on the characteristics of the measures (i.e. sensitivity, precision and congruence (Feltham and Xie 1994; Banker and Datar 1989)) than economic and governance characteristics of the firm. Nonetheless, higher similarity in the firms' economic attributes, as well as membership in compensation peer groups, is associated with higher similarity in performance measurement mix.

Model 1 reports the estimation results with respect to the test of hypotheses *H1* and *H2*. With respect to the distribution of compensation components (*$Comp\_Dist_{ij}$*), both interlocks and shared compensation consultants are associated with higher similarity in (β_1=-0.012, p<0.001; β_2=-0.048, p<0.001) allowing the rejection of the null hypothesis for both *H1* and *H2* (Table 11, Panel A).[19] However, the effects of the two networks on the degree of similarity in pay mix are statistically indistinguishable (p>0.1).[20] Interestingly, the interaction between the two network effects indicates a partial substitution effect (β_6=0.004, p<0.001), in line with the findings of Haunschild and Beckman (1998), showing a reduced influence of board interlocks on organizational behaviors in the presence of alternative sources of similar information. This result indicates some degree of redundancy between the information transferred through the interlock network and through the compensation consulting network.

With respect to the design of the performance measurement mix, the estimation results fails to reject the null for both *H1* and *H2* (Table 11, Panel B). In this first level of analysis, it appears that network connections do not represent a source of isomorphic compensation design. The estimation of Model 2, however, portrays an interestingly different story. The inclusion of the centrality of the shared compensation consultant uncovers statistical results in support of rejecting the null hypothesis for *H2* and *H2a*. The coefficients reported in Table 11, Panel B, indicate that hiring a common compensation consultant relates, in fact, to higher similarity in the design of the performance measure mix (β_2=-0.081, p<0.05). However, the centrality of the compensation consultant attenuates significantly this isomorphic tendency (β_5=0.092, p<0.05). In the estimation of Model 1, these counterbalancing effects were confounded. Model 2 provides evidence that compensation consultants with larger customer base and more experience design

[19] The values discussed here correspond to the standardized coefficients reported in Table 11.
[20] The comparison between coefficient estimates is performed via Wald test.

more customized compensation solutions. Relatedly, the demand for compensation consulting services with respect to designing a performance measures mix appears to de directed towards more personalized solutions, as opposed to the adoption of "one-size-fits-all" compensation structures. Interlocks continue to be irrelevant.

With respect to the distribution of compensation components (Table 11, Panel A), the centrality of the compensation consultant does not appear to influence the relation between network connections and compensation design similarity. However, the coefficients estimated for the two network effects in Model 2 are statistically different, indicating a stronger influence of the shared compensation consultant on the similarity of the contract.

Model 3 represents the full estimation of *Eq. (1)*, and it includes variables representing particular types of interlocks ($CEO\_Interlock_{ij}$ and $CC\_Interlock_{ij}$) in order to test *H1a* and *H1b*. With respect to the design of pay mix (Table 11, Panel A), while the involvement of a CEO in the interlock does not appear to have a significant influence on the relation between interlock ties and contract similarity, thus failing to reject *H1a*, interlock connections involving a member of the compensation committee appear to amplify this relation (β_4=-0.006, $p<0.001$), which allows for the rejection of *H1b*. None of the particular types of board interlock result to be significant for the design of performance measures mix (Table 11, panel B).

In summary, the estimation of Eq. (1) provides statistical evidence that interfirm network ties are associated with higher degrees of similarity in compensation design. Different networks operate as sources of influence of the adoption of similar compensation contracts. However different networks operate on different aspects of the design of the compensation contract, and, even when they both influence the design, the magnitude of their effects is statistically different.

Finally, consultants with larger customer base and higher expertise mitigate some of the imitative behaviors.

CHAPTER 5: SUPPLEMENTAL ANALYSIS

5.1 Mediation Effects Between Networks

I further analyze, in an exploratory fashion, whether the effect of interlock ties on the similarity between compensation contracts is mediated by the connection through a common compensation consultant. Since board interlocks are conduits for information transfer, it is possible that the choice of compensation consultant is influenced by the interlocking relationship.

To test the mediation effect I follow the process suggested by Baron and Kenny (1986). I limit the analysis to the relations involving the measure of similarity between compensation contracts with respect to the distribution of elements of fixed pay versus incentive pay ($Comp\_Dist_{ij}$). This choice is informed by the results of the estimation of Eq. (1), which failed to reject the null hypothesis about the relation between board interlocks and compensation similarity (*H1*) with respect to the design of the mix of performance measures. The mediation testing procedure described by Baron and Kenny (1986) requires, as pre-requisites for the existence of a mediation effect, that both the predictor ($Dir\_Interlock_{ij}$), and the mediator ($Shared\_Cons_{ij}$) exhibit a statistically significant relation with the dependent variable (Figure 4). This condition excludes the applicability of this test to the estimation of the model where PM_Dist_{ij} is the response variable. The statistical significance of the results of the mediation test is validated using the Preacher-Hayes methodology (Preacher and Hayes 2004; Zhao et al. 2010). The results reported in Table 12 show that the mediation effect of common compensation consultants is not statistically significant, therefore excluding mediation effects of common compensation consultants on the relation between direct interlocks and pay-mix design similarity.

5.2 Indirect Interlocks

Indirect interlocks are observed when two firms are (directly) interlocked with a common partner. That is, if firm Alpha and firm Beta both share a director with firm Delta, then board meetings held at the Delta headquarters offer the opportunity for Alpha and Beta to connect and share information. In much the same way as the compensation consultant creates indirect connections between clients, indirect interlocks represent an additional channel for information transfer between firms. There are, however, some key differences between the interfirm tie facilitated by the compensation consultant and the indirect interlock. First, while clients of common compensation consultants are not likely to meet directly (unless connected in other ways), indirectly interlocking board members share physical space and interactions multiple times each year, in occasion of board or committee meetings. Second, while the compensation consulting firm is bound by confidentiality agreements with its clients, board members are, in general, officially unconstrained (or, at least, unmonitored) with respect of information sharing with other board members.[21]

Extant social networks research has addressed the phenomenon of indirect connections as an example of structural equivalence (Lorrain and White 1971; Sailer 1978). In general terms, two network actors are structurally equivalent if they exhibit similar patterns of connections to the same counterparts (Hanneman and Riddle 2005). Empirical evidence shows that structural equivalence is associated with diffusion of practices and behaviors (Burt 1987; Galaskiewicz and Burt 1991).

[21] Exposure of proprietary information to external access is considered to be one of the main costs associated with interlocking directorates (Bazerman and Schoorman 1983)

I build on the results, estimated earlier, showing that interlocking directorates are associated with similarity in the structure of compensation components, and I extend the model to include an indicator variable ($Ind\_Interlock_{ij}$) that assumes the value of 1 if the firms in the pair are both directly connected to a common counterpart, and zero otherwise. Additionally, I measure the eigenvector centrality of the individual firms in my sample and define Ind_ECent_{ij} as a variable that assumes the value of the eigenvector centrality of the shared firm if the firms in the pair are both interlocked with a common third party, and zero otherwise. The definition of both variables is reported in Table 13, Panel A. Including these variables in the model originally defined with *Eq. (1)*, I estimate the following:[22]

Eq. (2):

$$
\begin{aligned}
Comp\_Dist_{ij,t} = \alpha_{ij,t} &+ \beta_1 Dir\_Interlock_{ij,(t-1)} + \beta_2 Shared\_Cons_{ij,(t-1)} \\
&+ \beta_3 CEO\_Interlock_{ij,(t-1)} + \beta_4 CC\_Interlock_{ij,(t-1)} + \\
&+ \beta_5 Cons\_ECent_{ij,(t-1)} + \beta_6 (Dir\_Interlock * Shared\_Cons)_{ij,(t-1)} \\
&+ \beta_7 Ind\_Interlock_{ij,(t-1)} + \beta_8 Ind\_ECent_{ij,(t-1)} + Controls_{ij,(t-1)} + \varepsilon_{ij,t}
\end{aligned}
$$

Table 13, Panel B summarizes the descriptive statistics for the two variables related to indirect interlocks. The higher incidence of indirect interlocks compared to direct interlocks (16,724 indirectly interlocked pairs vs. 2,763 direct interlocks) is likely a mechanical consequence of the indirect connection (i.e. by directly interlocking with one counterpart, a firm becomes indirectly interlocked to every other firm that shares a director with the same counterpart). Table 13, Panel C reports the QAP correlations between $Ind\_Interlock_{ij}$ and other network variables. Reasonably, the correlation between indirect interlocks and direct interlocks (including special cases, such as interlocks involving members of the compensation committee) is negative. The correlation

[22] Since prior results did not support the relevance of interlocking directorates as drivers of similarity in performance measures mix, for this particular analysis I restrict the model to the estimation of the Euclidean distance between compensation component vectors.

between indirect interlocks and similarity in economic and governance attributes is larger than the correlation between direct interlock and economic and governance similarity (0.029 versus 0.017 for the economic characteristics, and 0.032 versus 0.020 for the governance ones). The probability of being indirectly interlocked with firms operating in the same industry or in the same geographical area are lower than the corresponding probabilities relative to direct interlocks (0.013 versus 0.017 for the industry dummy, and 0.030 versus 0.051 for the geography one).

The results of the estimation of *Eq. (2)* are reported in Panel D of Table 13. Similarly to the estimation of *Eq. (1)* I estimate the regression coefficients using OLS with robust standard errors. The statistical significance of the estimations is assessed using MRQAP with 2,000 random permutations of the dependent variable matrix, and heteroskedasticity robust standard errors. Indirect interlocks are associated with higher similarity in the pay-mix design (β_7=-0.023, $p<0.001$). The statistical significance of the association between direct interlocks and the level of similarity in compensation design becomes borderline, whereas the association between sharing a compensation consultant and the degree of similarity in compensation design remains significant. Additionally, the coefficient associated with sharing a compensation consultant remains statistically larger than the effect of indirect interlocks on compensation design similarity. Centrality does not seem to be a relevant source of influence on these relations. Both centrality coefficients (i.e. related to the centrality of the compensation consultant, as well as to the centrality of the shared interlock) fail to indicate a statistically significant effect on pay-mix design similarity.

CHAPTER 6: CONCLUDING REMARKS

In this study I explore the influence of interfirm network relationships involving members of the board of directors on the degree similarity in the structure of compensation contracts adopted by connected firms. The design of executive compensation is a complex activity, exposed to significant uncertainty. Contracting theory provides several criteria to be used for the design of the optimal compensation contract. However, the definition of the CEO's compensation package is a primary responsibility of board members who, in many cases, lack formal training in contract design. Additionally, executive compensation practices attract significant public attention and often require the board to provide extensive justifications. The combination of the uncertainty and complexity of the task with the external and internal pressures to meet stakeholders' expectations incentivize board members to integrate their expertise with external knowledge. Within the network of interfirm relationships, board interlocks and compensation consultants provide, respectively, direct and indirect access to information about compensation practices of other firms. Networks of relations generate informational and normative environments for their participants (Granovetter 1985). In addition to offering opportunities for information exchange and learning, interfirm network represent a source of legitimacy for those actors whose actions appear to be congruent with behaviors accepted as normal by the social system of reference (Dowling and Pfeffer 1975).

Prior research has documented the influence of networks on several organizational practices, including mergers and acquisitions, quality certification processes, tax strategies, etc. With reference to compensation practices, empirical research provides evidence of the effect of interlock networks on the adoption of option compensation, golden parachutes, etc. Based on existing compensation theories, the design of two of the core elements of executive compensation (pay-mix composition and choice and weighting of performance measures) should be directed to maximize goal congruence within the individual organization, with a view to maximizing shareholder value. Despite substantial cross-sectional variation in firms' missions, strategies, operations, cultures, industries, regulatory environments, etc., prior research has identified isomorphic tendencies in the design of executive compensation packages that cannot be completely explained as the result of industry-level normative and coercive pressures. An important downside of the adoption of popular models of compensation structures is that deviating from the optimal contract may introduce significant distortions in the incentives for the executive, ultimately damaging the shareholders. In this study, I contribute to the identification of drivers of isomorphic compensation design by providing evidence that firms connected through board interlocks or hiring common compensation consultants exhibit greater similarity in the structure of CEO compensation.

To compare compensation packages and measure their similarity I use a vectorial representation of two main structural aspects of compensation design. Each contract is described by two vectors. A first vector describes the distribution of compensation components as percentages of total pay. A second vector represents the weights assigned to performance measures of different nature. To measure the similarity between compensation contracts I consider all unordered pairs of firms. I approximate the measure similarity between contracts by calculating the Euclidean distance between compensation vectors. I then regress contract similarity on indicators of active network ties and characteristics of those relationships, while controlling for pairwise similarities with respect to economic and governance characteristics known to be drivers of compensation design. The results indicate that network ties involving board members contribute to the similarity in the design of compensation contracts. However, different networks influence different aspects of the compensation design. In particular, I find a significant association between similarity in the distribution of elements of fixed and incentive pay and direct interlocks, as well as shared consultants. Additionally, these two networks display partial substitution effects. Direct interlocks, however, do not appear to influence the similarity in the choice and weighting of performance measures, while compensation consultants operate as a mechanism of diffusion of compensation practices. Nonetheless, more experienced consultants tend to provide their clients with more personalized solutions with respect to the design of the performance measures mix.

This study is subject to several limitations. First, although my estimation results are statistically significant, my empirical model yields low explanatory power.[23] The purpose of this research, however, is not to predict distances between compensation vectors, as much as to explain why certain pairs of firms make more similar choices than others. Future research might identify additional predictors of similarity between compensation contracts. Second, the analyses included in this study focus on a contemporaneous relation between network relationships and compensation similarity.[24] My results, therefore, provide evidence of association, and not necessarily causation, between the two constructs. This limitation might be addressed by performing longitudinal analyses, and including considerations about persistence of compensation design over time, as well as lagged effects of network relationships. Third, the current study does not consider the directionality in the relationships (i.e. who selects whom as a

[23] To gauge the severity of this limitation, it would be useful to compare my results with studies in the social sciences that use Euclidean distances between vectors as response variables. However, there is a dearth of studies in this area, which restricts my ability to provide such comparison.

[24] Recall that all economic, governance and network variables are lagged one period with respect to the compensation paid to the CEO.

compensation peer, or who imitates whom in the design of compensation packages), or the effects of the strength of the relationships (i.e. hiring the same consultant for multiple years, sharing more than one director with another firm). Finally, an important dimension of executive compensation design relates to the sensitivity of compensation to performance. Future work might extend these analyses to explore the influence of network connections on measures of pay-performance sensitivity.

Despite its limitations, this study provides important contributions to the literature. First, it extends the knowledge above drivers of executive compensation, above and beyond known economic and governance characteristics of the firm. Second it provides incremental explanations for the observed isomorphic tendencies in compensation design, above and beyond industry institutional pressures and peer group membership. Third it contributes to our understanding of the influence of board interlocks and external consultants on organizational behavior. Fourth, it provides a methodological contribution through the adoption of a vectorial representation of compensation contracts, which allows to comparison compensation packages in their entirety, while accounting for complementarities and substitutions in the elements of their design.

APPENDICES

APPENDIX A

Figures 1 - 3

Figure 1: Example of Board Interlock Network Ties
For illustrative purposes, this figure contains only a partial subsample of the relationships included in the sample for this study. The acronyms in the figure correspond to the firms' stock tickers.

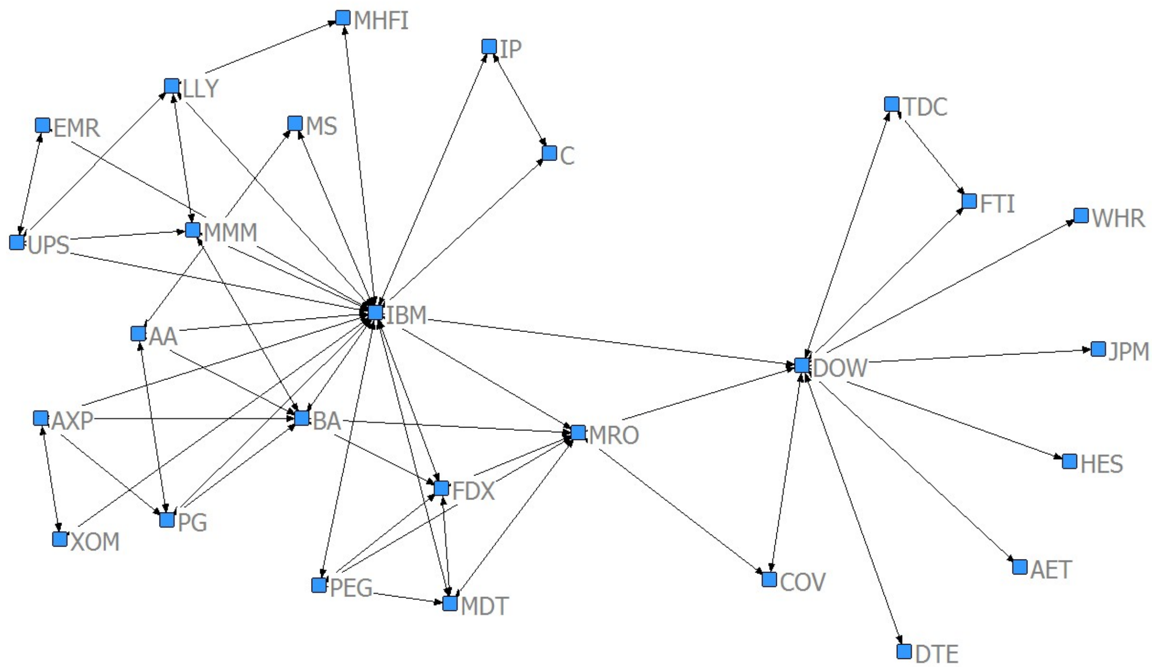


Figure 2: Example of Network Connections in the Compensation Consultants' Network
The red circles represent firms and the blue squares represent the compensation consultants. This figure contains only a partial subsample of the relationships included in the sample for this study. Also, for graphic clarity purposes, I limited the representation to primary compensation consultants. The acronyms associated with the red circles (clients) represent firms' stock tickers. The acronyms associated with the blue squares represent abbreviations of the names of corresponding consulting firms (e.g. AON = Aon Hewitt, PAYG = Pay Governance, TOW = Towers Watson; RAD = Radford, MERI = Meridian, FPL = FPL Associates, COOK = Frederic W. Cook & Co., Inc., TRS = Total Reward Strategies, HAY = Hay Group)

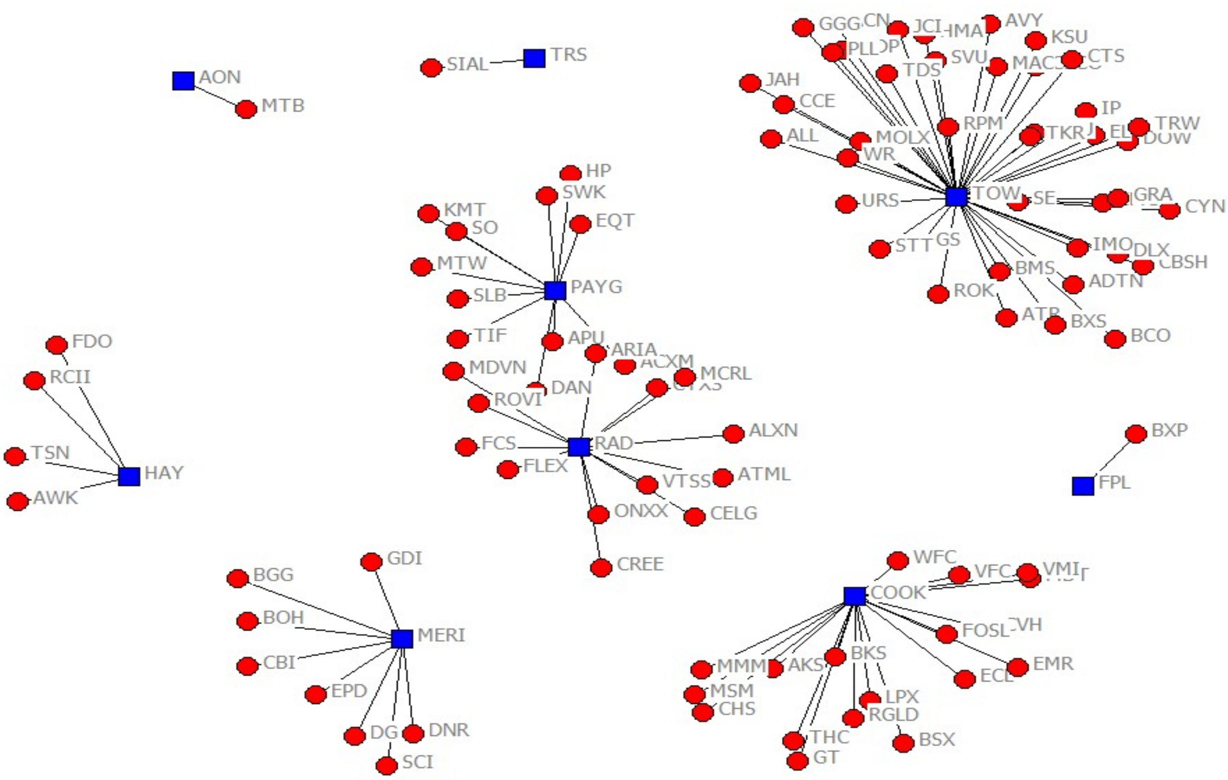
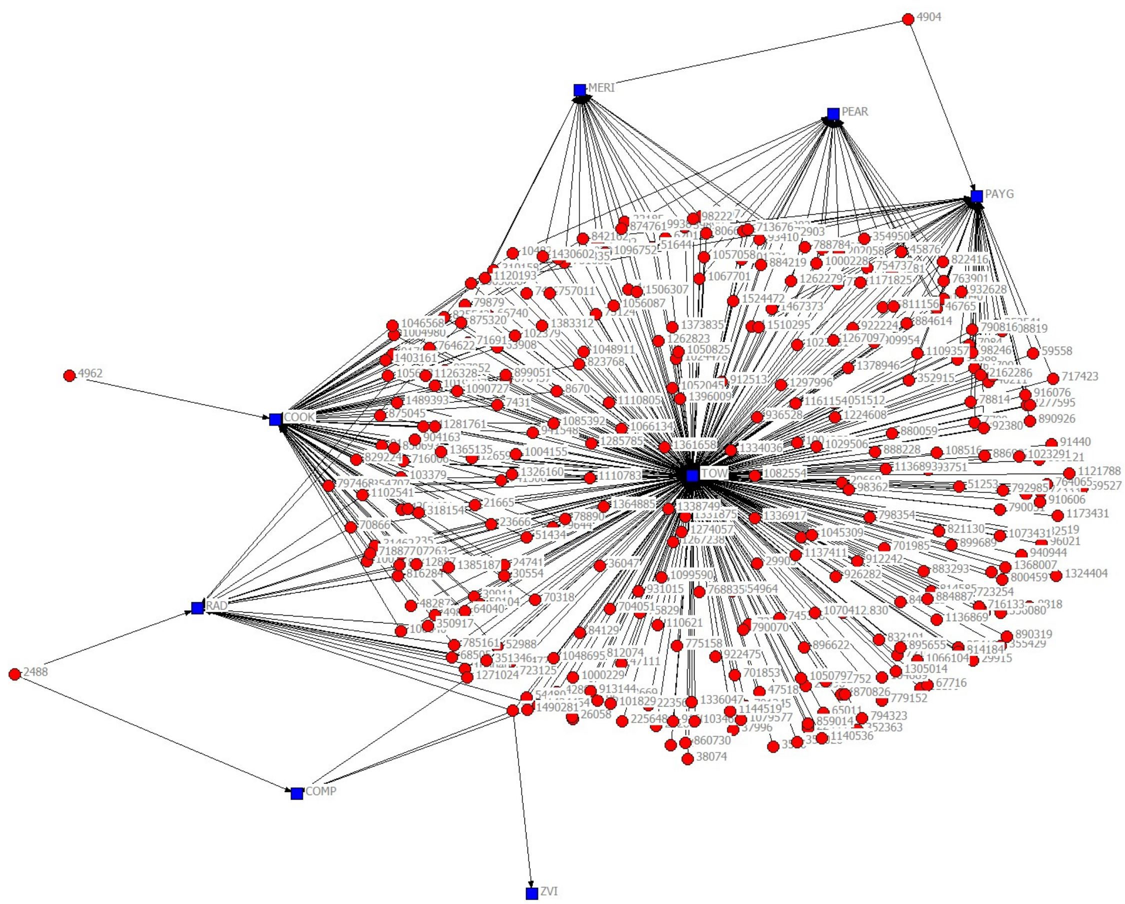


Figure 3: Graphical Representation of Nodes with Different Eigenvector Centrality
The figure includes only a subsample of the compensation consultants' network. The red circles represent client firms (indicated by their CIK) and the blue squares represent the compensation consultants. The consulting firm Towers Watson (TOW) has a large number of clients who also have a relationship with other consultants. Therefore consultant Towers Watson operates, in general, with more experienced customers. Therefore its eigenvector centrality is higher than the competitor Radford (RAD).



APPENDIX B

Examples of Calculation of Distance Between Compensation Vectors

EXAMPLE 1: Euclidean Distance Between Vectors of Performance Measures Mix

The performance measures mix vector, has six dimensions, as indicated in the summary table here below (Table 1). These dimensions result from a double-layered classification of performance measures. First, I classify each measure as an accounting, stock-based or nonfinancial. Then I classify each measure as an absolute or relative performance measure. The interaction of these two classification criteria produces six different types of performance measures used in the design of compensation contracts, as reported in Table 1:

TABLE 1:
Types of Performance Measures Used in the Design of Compensation Contracts

Performance Measure Type	**Accounting-based**	**Stock-based**	**NFPM**
Absolute	Abs_Acc	Abs_Stock	Abs_NFPM
Relative	Rel_Acc	Rel_Stock	Rel_NFPM

For each firm in the dataset I express the amount of CEO compensation linked to each of the above performance measures types as a percentage of total compensation. Table 2 reports some examples for compensation paid in 2012:

TABLE 2:
Examples of Performance Measures Mix Vectors

Firm	x_1 **Abs_Acc %**	x_2 **Rel_Acc %**	x_3 **Abs_Stock %**	x_4 **Rel_Stock %**	x_5 **Abs_NFPM %**	x_6 **Rel_NFPM %**
DOW	0.523	0.127	0.000	0.000	0.160	0.000
ARW	0.247	0.000	0.000	0.185	0.031	0.000
HNZ	0.551	0.000	0.000	0.101	0.101	0.000

The percentages associated with each performance measure type represent the magnitude of each of the dimensions of the compensation component vector. In other words, each row of the above Table 2 lists the performance measures as a row vector for each of the three firms.
I then calculate the Euclidean distance for each pair of vectors as:

$$Comp\_Dist_{ij} = \sqrt{\sum_{n=1}^{6}(x_{ni} - x_{nj})^2}$$

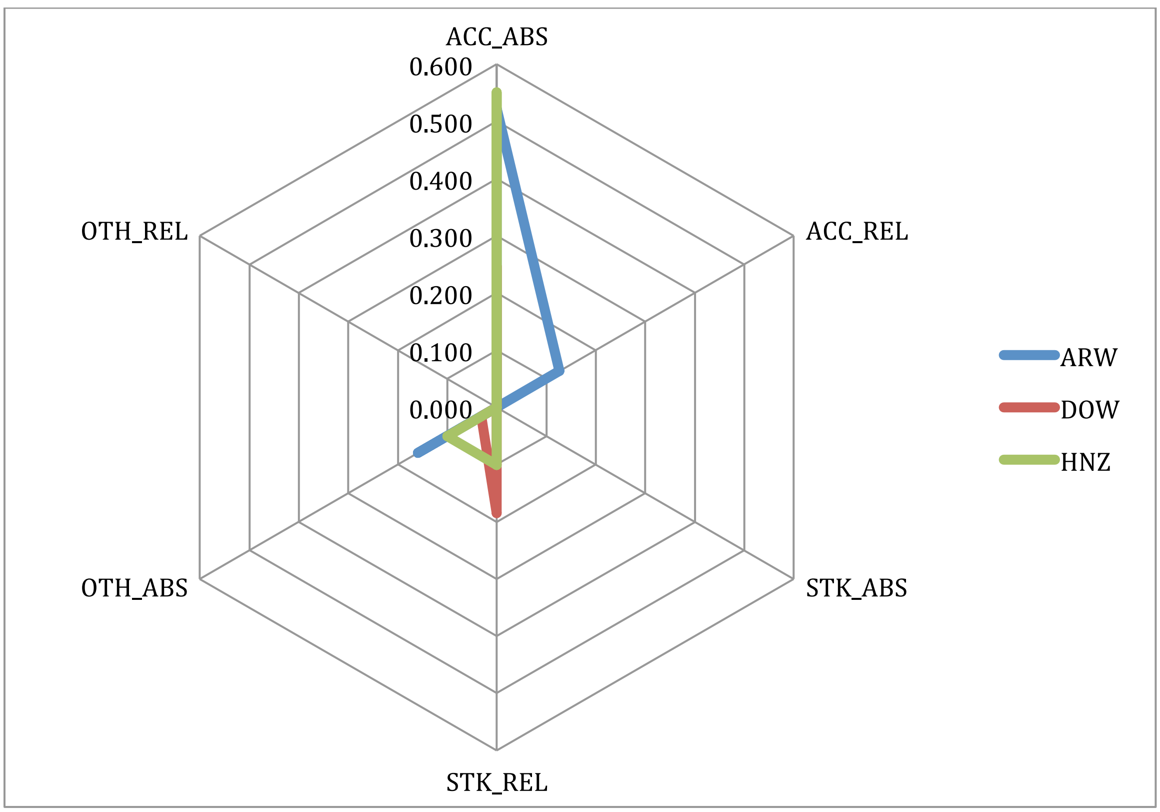
The resulting distances for the three pairs in this example are listed below in Table 3:

TABLE 3:
Examples of Euclidean Distances Between Performance Measures Mix Vectors

Pair (*i,j*)	***Comp_Dist**$_{ij}$*
ARW_DOW	0.378
DOW_HNZ	0.323
ARW_HNZ	0.175

Based on the above calculation, Arrow Electronics and Heinz exhibit higher similarity (smaller Euclidean distance) than any of the pairs including Dow. It is not simple to represent graphically a 6-dimension vector. However, Figure 4 might provide some intuition behind the calculation of the Euclidean distance as a proxy for similarity in compensation contracts.

Figure 4: Graphical Representation of Performance Measure Mix Vectors



EXAMPLE 2: Euclidean Distance Between Vectors of Compensation Components Mix

The compensation component vector has six dimensions: Fixed Pay, Bonus, Stock, Options, Pension, and Other. For each firm in the dataset I express each component of pay as a percentage of total compensation. Table 4 reports some examples of compensation paid in 2012:

TABLE 4:
Examples of Compensation Components Mix Vectors

Firm	x_1 Fixed Pay %	x_2 Bonus %	x_3 Stock %	x_4 Options %	x_5 Pension %	x_6 Other %
DOW	0.113	0.136	0.323	0.108	0.315	0.005
ARW	0.079	0.060	0.367	0.211	0.268	0.016
HNZ	0.099	0.486	0.119	0.198	0.006	0.092

The percentages associated with each compensation component represent the magnitude of each of the dimensions of the compensation component vector. In other words, each row of the above table lists the compensation components as a row vector for each of the three firms.
I then calculate the Euclidean distance for each pair of vectors as:

$$Comp\_Dist_{ij} = \sqrt{\sum_{n=1}^{6} (x_{ni} - x_{nj})^2}$$

The resulting distances for the three pairs in this example are listed in Table 5:

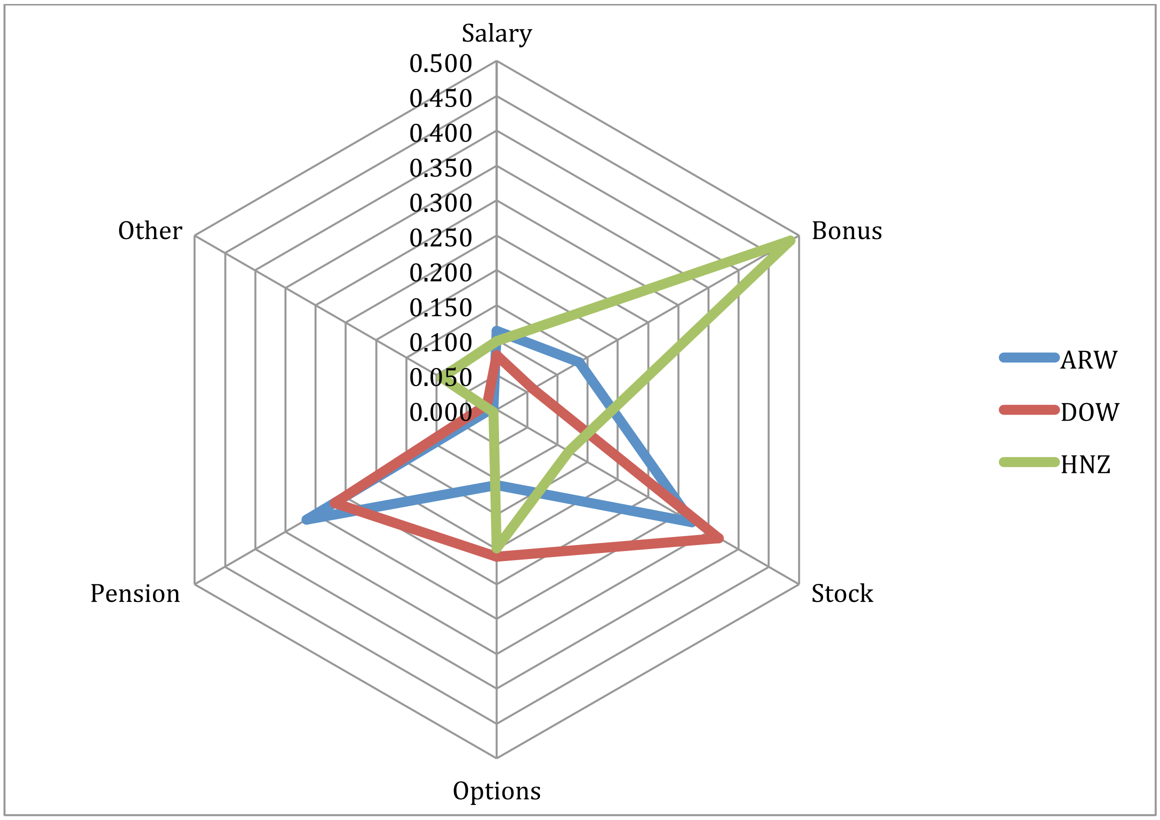
TABLE 5: **Examples of Euclidean Distances Between Compensation Components Mix Vectors**

TABLE 5:
Examples of Euclidean Distances Between Compensation Components Mix Vectors

Pair (*i,j*)	$Comp\_Dist_{ij}$
ARW_DOW	0.148
ARW_HNZ	0.564
DOW_HNZ	0.525

Based on the above calculation, Dow Chemical and Arrow Electronics exhibit higher similarity (smaller distance) than any of the pairs including Heinz. Figure 5 might provide some intuition behind the calculation of the Euclidean distance as a proxy for similarity in compensation contracts.

Figure 5: Graphical Representation of Compensation Components Mix Vectors



APPENDIX C

Quadratic Assignment Procedure

Quadratic Assignment Procedure (QAP)

The Quadratic Assignment Procedure (QAP) is a non-parametric approach to inference in presence of dyadic relations. The QAP includes two steps. In the first step the coefficients of the statistical model are estimated based on the observed relation between response and predictor variables. In the second step, the response variable matrix is permutated isomorphically (that is, without changing the characteristics of the matrix) by changing the position of each row-column combination, while keeping each row (column) vector unchanged. The effect of the permutation is to create a random pairing between cells in the response variable matrix and cells in the predictor variables matrices, thus simulating the null hypothesis of no correlation between the response variable and the predictor variables (see figure 6). These permutations are performed multiple times (2,000 in this study), and the coefficients of the statistical model are estimated in each iteration, thus providing a distribution of coefficients related to the null hypothesis. If the coefficients estimated in the first step of the procedure fall in the tails of the distribution of coefficients calculated in the second step, then the null hypothesis is rejected.

Figure 6: Illustration of the Mechanism Underlying the QAP

Step 1: Observed Relation

	Y_1	Y_2	Y_3	Y_4
Y_1	Y_{11}	Y_{12}	Y_{13}	Y_{14}
Y_2	Y_{21}	Y_{22}	Y_{23}	Y_{24}
Y_3	Y_{31}	Y_{32}	Y_{33}	Y_{34}
Y_4	Y_{41}	Y_{42}	Y_{43}	Y_{44}

	X_1	X_2	X_3	X_4
X_1	X_{11}	X_{12}	X_{13}	X_{14}
X_2	X_{21}	X_{22}	X_{23}	X_{24}
X_3	X_{31}	X_{32}	X_{33}	X_{34}
X_4	X_{41}	X_{42}	X_{43}	X_{44}

Step 2: Permutated Relation (2,000 iterations)

	Y_4	Y_1	Y_3	Y_2
Y_4	Y_{44}	Y_{41}	Y_{43}	Y_{42}
Y_1	Y_{14}	Y_{11}	Y_{13}	Y_{12}
Y_3	Y_{34}	Y_{31}	Y_{33}	Y_{32}
Y_2	Y_{24}	Y_{21}	Y_{23}	Y_{22}

	X_1	X_2	X_3	X_4
X_1	X_{11}	X_{12}	X_{13}	X_{14}
X_2	X_{21}	X_{22}	X_{23}	X_{24}
X_3	X_{31}	X_{32}	X_{33}	X_{34}
X_4	X_{41}	X_{42}	X_{43}	X_{44}

APPENDIX D

Tables

TABLE 6:
Sample Selection Procedure

Sample Selection Step	N	Cumulative N
Incentive Lab Dataset (fiscal year 2012)	1,142	1,142
Less: missing compensation data	(17)	1,125
Less: missing Financial data	(26)	1,099
Number of pairs (N*(N-1)/2)		603,351

Notes: (1) Incentive Lab includes information on firms that have been included in the S&P500 index between 1998 and 2013. Information relative to firms that are included in the S&P500 for the first time is backfilled. Information on companies that are dropped from the S&P500 continues to be updated. (2) Pairs are unordered. That is, pair *(i,j)* is the same as pair *(j,i)*. Additionally, I exclude all *ij* pairs where *i=j* (diagonal pairs).

TABLE 7:
Compensation Consultants Information

Panel A

Cons. Code	Primary Consultant	# Customers	Share	E-cent
102	Frederic W. Cook & Co., Inc.	216	22.22	0.433
274	Towers Watson & Co.	95	9.77	0.797
185	Meridian Compensation Partners, LLC	86	8.85	0.080
208	Pay Governance LLC	82	8.44	0.131
210	Pearl Meyer & Partners, LLC	81	8.33	0.085
184	The Mercer Group, Inc.	62	6.38	0.297
66	Compensia, Inc.	46	4.73	0.018
94	Exequity, Inc.	42	4.32	0.039
232	Semler Brossy Consulting Group LLC	39	4.01	0.037
221	Radford	26	2.67	0.096
61	Compensation Advisory Partners, LLC	25	2.57	0.021
117	Hay Group	19	1.95	0.032
291	Aon Hewitt	19	1.95	0.190
249	S Hall & Partners, LLC	13	1.34	0.010
78	Deloitte	10	1.03	0.018

Panel B

Variable	N	Mean	Std. Dev
Number of customers	57	17.053	23.945
Share	57	1.754	2.464
Eigenvector Centr.	57	0.042	0.116

Notes: *Panel A:* (1) Compensation consulting firms serving less than 1% of the firms in the sample considered for this study have been omitted from the table. (2) The number of customers indicated in the third column, as well as the measure of the share reported in the fourth column are based on the number of clients that hire the related compensation consulting firm as their primary compensation consultant. The calculation of the eigenvector centrality is, instead, based on all consulting relations, including relations with clients as secondary compensation consultants. *Panel B:* (1) The summary statistics are based on the sample of consulting firms (57 firms) that were hired as primary compensation consultants by firms included in my sample during fiscal year 2012.

TABLE 8:
Variables Definitions

Executive Compensation Vectors *(Comp_Simil)*

$Comp\_Dist_{ij}$	Pairwise Euclidean distance between vectors of compensation components. The dimensions of the compensation component vectors are base salary, cash bonus, stock-based pay, option-based pay, pension, and other pay, all expressed as a percentage of total compensation
PM_Dist_{ij}	Pairwise Euclidean distance between vectors of weights assigned to different types of performance measure (PM). The dimensions of the performance measure weight vectors are the percentage of pay driven by absolute financial PM, absolute non-financial PM, absolute stock price-based PM, relative financial PM, relative non-financial PM, relative sotck price-based PM

Variables of Interest

$Dir\_Interlock_{ij}$	Indicator variable equal to one if the firms in the pair share a board member, and zero otherwise
$Shared\_Cons_{ij}$	Indicator variable equal to one if the firms hire the same compensation consultant, and zero otherwise
$CEO\_Interlock_{ij}$	Indicator variable equal to one if the interlock involves the CEO of one of the firms in the pair, and zero otherwise
$CC\_Interlock_{ij}$	Indicator variable equal to one if the interlock involves a member of the compensation committee of one of the firms in the pair, and zero otherwise
Cons_ECent	Variable equal to the value of the compensation consultant eigenvector centrality if the firms in the pair hire the same consultant, and zero otherwise

Controls

$Econ\_Simil_{ij}$	Pairwise coefficient of similarity based on the number of economic characteristics shared by the firms in the pair
Gov_Simil_{ij}	Pairwise coefficient of similarity based on the number of governance characteristics shared by the firms in the pair
$Same\_SIC_{ij}$	Indicator variable equal to 1 if the firms in the pair belong to the same industry sector, based on 2-digit SIC code, and 0 otherwise
$Same\_ZIP_{ij}$	Indicator variable equal to 1 if the firms in the pair belong to the same geographical neighborhood, based on 2-digit ZIP code, and 0 otherwise
$Comp\_Peers_{ij}$	Indicator variable equal to 1 if the firms belong to the same compensation peer group, and 0 otherwise

TABLE 9:
Descriptive Statistics

Panel A: Dependent variables

	N	Mean	Std. Dev	50^{th} perc.	25^{th} perc.	75^{th} perc.
Comp_Dist$_{ij}$	596,378	0.774	0.827	0.547	0.335	0.892
PM_Dist$_{ij}$	24,753	0.475	0.289	0.440	0.300	0.600

Panel B: Explanatory variables

Network Predictors	N	Mean	Std. Dev	50^{th} perc.	25^{th} perc.	75^{th} perc.
Dir_Interlock$_{ij}$	603,351	0.005	0.068	0.000	0.000	0.000
Shared_Cons$_{ij}$	603,351	0.072	0.259	0.000	0.000	0.000
CEO_Interlock$_{ij}$	603,351	0.001	0.029	0.000	0.000	0.000
CC_Interlock$_{ij}$	603,351	0.004	0.062	0.000	0.000	0.000

Controls	N	Mean	Std. Dev	50^{th} perc.	25^{th} perc.	75^{th} perc.
Econ_Simil$_{ij}$	603,351	0.967	0.946	1.000	0.000	2.000
Gov_Simil$_{ij}$	603,351	2.578	1.506	3.000	2.000	4.000
Same_SIC$_{ij}$	603,351	0.041	0.199	0.000	0.000	0.000
Same_ZIP$_{ij}$	603,351	0.026	0.160	0.000	0.000	0.000
Comp_Peers$_{ij}$	603,351	0.021	0.143	0.000	0.000	0.000

Panel C: Additional information

Information about pairs	N	% of total pairs
Number of interlocked pairs	2,763	0.46%
Number of pairs hiring the same consultant	43,713	7.25%
Number of pairs with CEO interlock	486	0.08%
Number of pairs with CC interlock	2,059	0.34%
Number of pairs with the same SIC	24,883	4.12%
Number of pairs with the same ZIP	15,783	2.62%
Number of pairs within a Peer Group	12,531	2.08%

Information about individual firms	**N (Std. Dev.)**
Average number of interlocks per firm (std. dev)	6.028 (4.133)
Average number of connections via common compensation consultants per firm (std. dev)	80.435 (74.327)

Notes: Panels A and B: (1) All variables are measured at the pair level (dyad). (2) The total number of pairs (N) is calculated as (*M*(M-1)/2*), where M is the number of firms in the sample as reported in Table 6. Panel C: (1) The information about the pairs exhibiting network connections is expressed as count of pairs for which the network connection is active, and also as percentages of the total number of pairs. (2) The information about average numbers of network relations is calculated using individual firms are units of analysis.

TABLE 10:
Analysis of Homophily: QAP Correlations

	$Shared\_Cons_{ij}$	$Dir\_Interlock_{ij}$	$Same\_SIC_{ij}$	Gov_Simil_{ij}	$Same\_ZIP_{ij}$	$Econ\_Simil_{ij}$	$Comp\_Peers_{ij}$	$CEO\_Interlock_{ij}$	$CC\_Interlock_{ij}$
$Shared\_Cons_{ij}$	1.000								
$Dir\_Interlock_{ij}$	0.023 ***	1.000							
$Same\_SIC_{ij}$	0.011 ***	0.017 ***	1.000						
Gov_Simil_{ij}	0.023 ***	0.020 ***	0.015 ***	1.000					
$Same\_ZIP_{ij}$	0.011 ***	0.051 ***	0.041 ***	0.002	1.000				
$Econ\_Simil_{ij}$	0.023 ***	0.017 ***	0.048 ***	0.056 ***	0.008 ***	1.000			
$Comp\_Peers_{ij}$	0.022 ***	0.039 ***	0.259 ***	0.046 ***	0.042 ***	0.093 ***	1.000		
$CEO\_Interlock_{ij}$	0.009 ***	0.406 ***	0.015 ***	0.010 ***	0.038 ***	0.014 ***	0.036 ***	1.000	
$CC\_Interlock_{ij}$	0.024 ***	0.790 ***	0.014 ***	0.019 ***	0.045 ***	0.016 ***	0.037 ***	0.321 ***	1.000

Notes: (1) All correlations are calculated using quadratic assignment procedures (QAP). (2) The statistical significance of the estimated coefficients is based on the p-values associated with the estimations. * = ($p<0.10$); ** = ($p<0.05$); *** = ($P<0.01$)

TABLE 11:
Regression Analyses (MRQAP): Determinants of the Distance Between Compensation Vectors

Panel A: Determinants of the Euclidean Distance Between Vectors of Compensation Components (DV = *Comp_Dist*$_{ij}$)

	Model 0			Model 1			Model 2			Model 3		
Predictor	**Unstd.**	**Std.**	**p**	**Unstd.**	**Std.**	**p**	**Unstd.**	**Std.**	**p**	**Unstd.**	**Std.**	**p**
Dir_Interlock$_{ij}$				-0.143	-0.012	0.000 ***	-0.143	-0.012	0.000 ***	-0.082	-0.007	0.006 ***
Shared_Cons$_{ij}$				-0.154	-0.048	0.000 ***	-0.170	-0.053	0.000 ***	-0.170	-0.053	0.000 ***
CEO_Interlock$_{ij}$										-0.028	-0.001	0.306
CC_Interlock$_{ij}$										-0.079	-0.006	0.009 ***
Cons_ECent$_{ij}$							0.047	0.006	0.367	0.046	0.006	0.367
*(Dir_Interlock*Shared_Cons)*$_{ij}$				0.128	0.004	0.006 ***	0.130	0.004	0.006 ***	0.140	0.005	0.004 ***
Econ_Simil$_{ij}$	-0.043	-0.049	0.000 ***	-0.042	-0.048	0.000 ***	-0.042	-0.048	0.000 ***	-0.042	-0.048	0.000 ***
Gov_Simil$_{ij}$	-0.032	-0.059	0.000 ***	-0.032	-0.058	0.000 ***	-0.032	-0.058	0.000 ***	-0.032	-0.058	0.000 ***
Same_SIC$_{ij}$	0.083	0.016	0.002 ***	0.088	0.017	0.001 ***	0.088	0.017	0.002 ***	0.088	0.017	0.002 ***
Same_ZIP$_{ij}$	0.072	0.017	0.003 ***	0.074	0.018	0.003 ***	0.074	0.018	0.003 ***	0.074	0.018	0.003 ***
Comp_Peers$_{ij}$	-0.139	-0.024	0.000 ***	-0.132	-0.023	0.000 ***	-0.132	-0.023	0.000 ***	-0.132	-0.023	0.000 ***
Intercept	0.897	0.000	0.000 ***	0.906	0.000	0.000 ***	0.906	0.000	0.000 ***	0.906	0.000	0.000 ***
R^2		0.007***			0.010***			0.010***			0.010***	
N		596,378			596,378			596,378			596,378	

(Table Continued on Next Page)

TABLE 11 (cont'd):

Panel B: Determinants of the Euclidean Distance Between Vectors of Performance Measures (DV = *PM_Dist_{ij}*)

	Model 0			Model 1			Model 2			Model 3		
Predictor	**Unstd.**	**Std.**	**p**	**Unstd.**	**Std.**	**p**	**Unstd.**	**Std.**	**p**	**Unstd.**	**Std.**	**p**
$Dir\_Interlock_{ij}$				-0.032	-0.010	0.181	-0.032	-0.010	0.175	-0.024	-0.008	0.321
$Shared\_Cons_{ij}$				-0.002	-0.002	0.501	-0.084	-0.081	0.016 **	-0.084	-0.081	0.016 **
$CEO\_Interlock_{ij}$										0.010	0.001	0.410
$CC\_Interlock_{ij}$										-0.012	-0.004	0.419
$Cons\_ECent_{ij}$							0.230	0.092	0.030 **	0.230	0.092	0.030 **
$(Dir\_Interlock*Shared\_Cons)_{ij}$				-0.053	-0.007	0.226	-0.038	-0.005	0.303	-0.038	-0.005	0.297
$Econ\_Simil_{ij}$	-0.009	-0.031	0.020 **	-0.009	-0.031	0.020 **	-0.009	-0.031	0.019 **	-0.009	-0.031	0.019 **
Gov_Simil_{ij}	-0.005	-0.027	0.139	-0.005	-0.027	0.141	-0.005	-0.026	0.143	-0.005	-0.026	0.143
$Same\_SIC_{ij}$	-0.020	-0.011	0.184	-0.019	-0.010	0.201	-0.016	-0.009	0.244	-0.016	-0.009	0.243
$Same\_ZIP_{ij}$	-0.005	-0.003	0.417	-0.005	-0.003	0.417	-0.005	-0.003	0.419	-0.005	-0.003	0.418
$Comp\_Peers_{ij}$	-0.064	-0.038	0.002 ***	-0.063	-0.037	0.002 ***	-0.062	-0.037	0.002 ***	-0.062	-0.037	0.002 ***
Intercept	0.502	0.000	0.050 **	0.502	0.000	0.051 **	0.501	0.000	0.052 **	0.501	0.000	0.052 **
R^2		0.004*			0.004*			0.006**			0.006**	
N		24,753			24,753			24,753			24,753	

Notes: (1) Table 11 reports estimation results for *Eq.(1)*:

$$Comp\_Simil_{ij,t} = \alpha_{ij,t} + \beta_1 Dir\_Interlock_{ij,(t-1)} + \beta_2 Shared\_Cons_{ij,(t-1)}$$
$$+\beta_3 CEO\_Interlock_{ij,(t-1)} + \beta_4 CC\_Interlock_{ij,(t-1)} +$$
$$+\beta_5 Cons\_ECent_{ij,(t-1)} + \beta_6 (Dir\_Interlock * Shared\_Cons)_{ij,(t-1)}$$
$$+Controls_{ij,(t-1)} + \varepsilon_{ij,t}$$

The dependent variable is the pairwise Euclidean distance of all pairs included in the study. The Euclidean distance approximates the degree of similarity between contracts (smaller distance = higher similarity). The predictors are defined in Table 8. (2) Model 0 estimates *Eq (1)* limited to similarities in governance and economic characteristics, as well as geographical areas and industry, which have been documented in the literature as drivers of compensation design. The purpose of Model 0 is to serve as a baseline and to test the fundamental assumption that similarities in those characteristics are associated with the degree of similarity between compensation contracts. Model 1 estimates the main effects of the interlock and compensation consultants' network, respectively, on the compensation design distance, as well as their interaction. Model 2 includes considerations of the centrality of the compensation consultant to estimate the moderating effect of the consultant's centrality on the relation between network ties and compensation design similarity. Model 3 represents the full estimation of *Eq. (1).* (3) All estimations are performed using OLS with robust standard errors, while the statistical significance of the estimations is assessed using MRQAP. (4) The statistical significance of the estimated coefficients is based on the p-values associated with the estimations, as follows: * = (p<0.10); ** = (p<0.05); *** = (p<0.01).

Figure 7: Mediation Effects

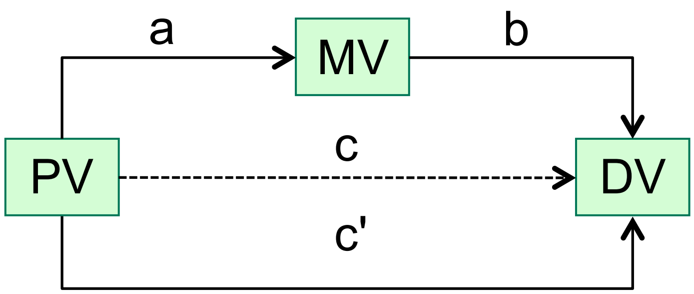


TABLE 12:
Supplemental Analysis: Mediation Effects

		Step 1: (c)		Step 3: (c')		
DV = ***$Comp\_Dist_{ij}$***	**Variable**	**Coefficient**	**SE**	**Coefficient**	**SE**	**Difference**
$Dir\_Interlock_{ij}$	Predictor	-0.135***	0.012	-0.122***	0.013	0.001
$Shared\_Cons_{ij}$	Mediator			-0.153***	0.003	
Controls		Yes		Yes		
Intercept		0.897***	0.003	0.356***	0.004	
R^2		0.007***		0.009***		
N		596,378		596,378		

Notes: (1) The purpose of this analysis is to test whether the effect of board interlocks on the similarity between compensation contracts is mediated by sharing a compensation consultant. (2) The mediation analysis is performed as suggested by Baron and Kenny (1986) and Zhao et al. (2010). The significance of the mediation effect is calculated based on the Preacher and Hayes methodology (Preacher and Hayes 2004). (3) All estimations are performed using OLS with robust standard errors, while the statistical significance of the estimations is assessed using MRQAP. (4) The statistical significance of the estimated coefficients is based on the p-values associated with the estimations, as follows: * = (p<0.10); ** = (p<0.05); *** = (p<0.01).

TABLE 13:
Supplemental Analysis: Indirect Interlocks

Panel A: Variables Definition

$Ind\_Interlock_{ij}$	Indicator variable equal to one if the firms in the pair share a board member, and zero otherwise
Ind_ECent_{ij}	Indicator variable equal to one if the firms hire the same compensation consultant, and zero otherwise

Panel B: Descriptive statistics:

Variable	N	Mean	Std. Dev	50th perc.	25th perc.	75th perc.
$Ind\_Interlock_{ij}$	603,351	0.003	0.024	0.000	0.000	0.000
Ind_ECent_{ij}	468,041	0.036	0.186	0.000	0.000	0.000

Additional Information	N	% of total pairs
Number of indirectly interlocked pairs	16,724	3.57%

Panel C: QAP correlations between indirect interlocks and other network variables

Variable	Correlation	
$Dir\_Interlock_{ij}$	-0.015	***
$Shared\_Cons_{ij}$	0.028	***
$CEO\_Interlock_{ij}$	-0.005	***
$CC\_Interlock_{ij}$	-0.010	***
$Econ\_Simil_{ij}$	0.029	***
Gov_Simil_{ij}	0.032	***
$Same\_SIC_{ij}$	0.013	***
$Same\_ZIP_{ij}$	0.030	***
$Comp\_Peers_{ij}$	0.037	***

(Table Continued on Next Page)

TABLE 13 (cont'd):

Panel D: MRQAP OLS Regression. Association between Indirect Interlocks and Euclidean Distances Between Compensation Components Vectors

DV = ***Comp_Dist**$_{ij}$*	Unstd.	Std.	p	
Dir_Interlock$_{ij}$	-0.053	-0.005	0.106	
Shared_Cons$_{ij}$	-0.141	-0.047	0.002	***
CEO_Interlock$_{ij}$	-0.027	-0.001	0.317	
CC_Interlock$_{ij}$	-0.080	-0.007	0.012	**
Cons_ECent$_{ij}$	0.074	0.010	0.312	
*(Dir_Interlock*Shared_Cons)$_{ij}$*	0.102	0.004	0.026	**
Ind_Interlock$_{ij}$	-0.100	-0.023	0.000	***
Ind_ECent$_{ij}$	0.044	0.002	0.392	
Econ_Simil$_{ij}$	-0.043	-0.050	0.000	***
Gov_Simil$_{ij}$	-0.040	-0.073	0.000	***
Same_SIC$_{ij}$	0.071	0.014	0.014	***
Same_ZIP$_{ij}$	0.079	0.019	0.003	***
Comp_Peers$_{ij}$	-0.094	-0.018	0.001	***
Intercept	0.892	0.000	0.000	***
R2	0.012***			
N	462,962			

Notes: *Panel A*: The variables defined in Table 13, Panel A are added to the model described in *Eq. (1)* to extend the analysis to cases of indirect interlocks between pairs of firms and the eigenvector centrality of the shared firm. *Panel B*: All variables are measured at the pair level (dyad). Panel C: (1) The information about the pairs exhibiting indirect interlocks is expressed as count of pairs for which the network connection is active, and also as percentages of the total number of pairs. (2) The information about average numbers of network relations is calculated using individual firms are units of analysis. *Panel C*: All correlations are calculated using quadratic assignment procedures. *Panel D*: (1) Table 13, Panel D reports estimation results for *Eq.(2)*:

$$\begin{aligned} Comp\_Dist_{ij,t} = {} & \alpha_{ij,t} + \beta_1 Dir\_Interlock_{ij,(t-1)} + \beta_2 Shared\_Cons_{ij,(t-1)} \\ & + \beta_3 CEO\_Interlock_{ij,(t-1)} + \beta_4 CC\_Interlock_{ij,(t-1)} + \\ & + \beta_5 Cons\_ECent_{ij,(t-1)} + \beta_6 (Dir\_Interlock * Shared\_Cons)_{ij,(t-1)} \\ & + \beta_7 Ind\_Interlock_{ij,(t-1)} + \beta_8 Ind\_ECent_{ij,(t-1)} + Controls_{ij,(t-1)} + \varepsilon_{ij,t} \end{aligned}$$

The dependent variable is the pairwise Euclidean distance of all pairs included in the study. The Euclidean distance approximates the degree of similarity between contracts (smaller distance =

higher similarity). Estimates the main effects of the interlock and compensation consultants' network, respectively, on the compensation design distance, as well as their interaction. (2) All estimations are performed using OLS with robust standard errors, while the statistical significance of the estimations is assessed using MRQAP. (3) The statistical significance of the estimated coefficients is based on the p-values associated with the estimations, as follows:
* = ($p<0.10$); ** = ($p<0.05$); *** = ($p<0.01$).

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