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Through the Grapevine: Network Effects on the Design of Executive Compensation Contracts

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Working Paper 16-019

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February 2016

Acknowledgments: I gratefully acknowledge my dissertation guidance committee: Ranjani Krishnan (Chair), Karen Sedatole, Anjana Susarla, and Jeff Wooldridge. This study has also greatly benefited from comments and suggestions by Matt DeAngelis, Tyler Thomas, Amy Swaney, Andy Imdieke, Will Demere, Eva Labro, Jace Garrett, Karen Green, Ian Tarrant, Orla Lenihan, Greg Sabin, Zachary Neal, William Jacoby, Kenneth Frank, Marcel Fafchamps, Jennifer Watling Neal, Mario Schabus, participants to the 2014 Michigan State University Brown Bag Series and Accounting Workshops Series, 2014 Ph.D. Summer Research Conference at Indiana University, the Ohio State University Accounting Colloquium Series, and research workshops at the University of Pittsburgh, the University of Miami, the University of Kentucky, the University of Washington, the University of California at Davis, the University of Texas, Arizona State University, Harvard Business School, the University of Southern California, Virginia Tech, Emory University, Temple University, Pennsylvania State University, and the University of Iowa. I also thank Francine McKenna, David Sylvester, and Dennis Beresford for sharing their institutional knowledge, and Kyle Brown, Anthony Marsala, and Mary Maguire for their help with the data collection. I am grateful for the financial support provided by the Department of Accounting and Information Systems at Michigan State University and the Accounting and Management Unit at Harvard Business School.

Through the Grapevine: Network Effects on the Design of Executive Compensation Contracts

Abstract:
Effective design of executive compensation contracts involves choosing and weighting performance measures, as well as defining the mix between fixed and incentive-based pay components, with a view to fostering talent retention and goal congruence. The variability in compensation design observed in practice is significantly lower than it would be predicted by contracting theory. This is likely due to indirect constraining pressures, which cannot be completely explained by industry affiliation or peer group membership. I posit that network connections involving corporate boards operate as a conduit for these pressures. Using information disclosed in proxy statements of publicly traded companies, and a vectorial approach to measure compensation similarity, I predict and find that firms that are connected by board interlocks, hiring the same compensation consulting firm, or sharing a blockholder, exhibit a higher degree of similarity in the design of executive compensation contracts than what would be predicted by similarities in organizational characteristics. The relative prominence of the connectors within the respective networks moderates the network effects on the degree of compensation similarity. Finally, I show that the market responds positively to compensation similarity, although it is associated with excess CEO compensation.

Key words: Compensation design, Board interlocks, Compensation consultants, Blockholders, Network centrality.

Data Availability: the data used in this study is publicly available from sources identified in the paper.

Through the Grapevine – Network Effects on the Design of Executive Compensation Contracts

1. INTRODUCTION

The observed variability in the design of executive compensation contracts is significantly lower than it would be predicted by incentive theory, by which optimal contracting should be specifically tailored to the individual characteristics of the firm, the executive, and the particular strategy the firm intends to pursue. Constraints to the design of executive compensation that might in part explain this reduced variability include political and social pressures (Jensen and Murphy 1990; Hart and Holmstrom 1986). Boards of directors, responsible for defining CEO compensation contracts, are largely exposed to such pressures (Agarwal and Knoeber 2000; Greening and Gray 1994). Corporate boards are also often connected via interlocking directors, or indirectly, either through common investors or by hiring common compensation consulting firms. In this study I explore whether the resulting networks operate as conduits for social and political pressures, and contribute to explain the observed homogeneity in compensation design, above and beyond measurable similarities in the economic characteristics of firms and peer benchmarking practices. Additionally, I explore the implications of these effects on CEO excess pay and firm performance.

Networks define an informational and normative context for their members. On the one hand, network ties provide board members, who often lack technical training in compensation contracting, with information about compensation design adopted by other firms, beyond the content of public disclosures. On the other hand, networks also represent a source of legitimacy for controversial practices (Davis 1996). CEO compensation attracts significant public attention, which pressures boards to adopt compensation plans that are in line with the expectations of external stakeholders.

I define *residual similarity* as the degree of similarity between compensation contracts that is not justified by similarity in the characteristics of the organization, the executive, and firm strategic goals. Identifying determinants of residual similarity in compensation practices is important to the extent that it may induce firms to implement suboptimal contracts (Larcker et al. 2015). 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 may, on one side, sustain or improve the legitimacy of the board's decision in the eyes of the CEO and the external stakeholders (Meyer and Rowan 1977; Deephouse 1996). Nonetheless, it may also cause departures from compensation designs that would provide better fit with the organization, thus distorting managerial incentives and reducing shareholder value (Gerhart et al. 1995; Bebchuk et al. 2002; Larcker et al. 2015). Whether residual similarity in compensation design facilitates rent extraction and whether it represents a positive or negative driver of firm performance are open empirical questions.

To the extent that network connections facilitate the diffusion of common organizational practices, board interlocks, especially if involving members of the compensation committee, shared compensation consultants, and common blockholders are examples of interfirm networks that are particularly relevant with respect to the design of executive compensation contracts. These network connections provide a board with direct or indirect access to another board's private information. Nonetheless, a firm should internalize information about the compensation structure of a counterpart only to the extent that the two firms share common characteristics. Any additional degree of similarity is likely due to external pressures (Jensen and Murphy 1990). In designing executive compensation contracts, a task fraught with considerable uncertainty and complexity, directors are likely to be heavily influenced by information implicit in observed behaviors of others, who are exposed to similar levels of uncertainty (Liberman and Asaba 2006). Additionally, board members often lack specific formal training in compensation design, and rely on the advice of external compensation consulting firms.

Compensation consultants, in their capacity of independent professional advisers, represent a source of both technical expertise and legitimacy for the deliberations of the board with respect to the design of executive compensation (Bebchuk et al. 2002; Meyer and Rowan 1977). In addition to their formal training, having access to detailed proprietary information about pay practices of multiple clients, provides compensation consultants the opportunity to enhance their professional expertise and tailor the design of compensation contracts to the needs of individual clients (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, leading compensation consultants toward proposing popular models of compensation to their clients. Furthermore, the recent introduction of mandatory say-on-pay advisory votes has facilitated an active involvement of shareholders in the decisions regarding CEO pay (Kim and Schloetzer 2013), adding yet another source of indirect pressure on compensation design.

In recent years the relative weight of blockholders (investors that own at least 5% of the outstanding shares of a public firm) has increased dramatically. Holderness (2007) finds that blockholders are present in 96% of U.S. public companies. Due to their fiduciary responsibility toward their own investors, institutional blockholders, who represent the vast majority of blockholders in U.S. public firms, are more likely to seek active engagement with the board and participate to voting processes (David et al. 1998; Shleifer and Vishny 1997). Their portfolios often include a large number of firms, through which institutional blockholders are exposed to a variety of compensation design solutions. On the one hand, this provides an opportunity to develop the institutional investor's ability to evaluate the appropriateness of compensation structures for each individual firm (David et al. 1998). On the other hand, performing detailed assessments of a large number of compensation programs is likely costly (Larcker et al. 2015), thus incentivizing blockholders to outsource such evaluations to proxy advisory firms (ISS and Glass Lewis) or to suggest the adoption of successful compensation structures observed in other firms in their portfolio.

Designing a compensation contract involves several complex decisions, including the selection and weighting of a set of performance measures (performance measures mix), as well as the choice of mix between fixed and incentive-based pay components (pay mix). Complementarity or substitution effects are possible within the elements of the pay mix (Anderson et al. 2000), as well as among the relative weights associated with performance measures. Insofar, research comparing compensation design between firms has treated 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, I compare compensation contracts considering their whole structure. I utilize a vectorial representation of each contract to capture the elements of each compensation package, and I use the Euclidean distance between pairs of compensation vectors as a measure of pairwise similarity.

Using information disclosed in official filings by publicly traded companies, controlling for peer-group benchmarking practices and for the exposure to the generalized influence of proxy advisers, I find that interfirm networks play a significant role in the homogenization of compensation design. In particular, similarity in pay-mix is facilitated by board interlocks, especially if involving members of the compensation committee, as well as by hiring common compensation consulting firms. Common blockholders tend to mitigate the imitative tendencies, as long as the number of connected firms included in the blockholder's portfolio is low. While common blockholders do not appear to influence the similarity in the mix of performance measures, homogeneity in the relative weight of performance measures is positively associated with board interlocks and common compensation consulting firms. Nonetheless, compensation consulting firms with a larger and more sophisticated customer base significantly attenuate the imitative tendencies. Finally, I find that pay-mix similarity appears to be favored by the market, although it is positively related with excess CEO compensation.

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. This study makes several contributions to the literature. First, it identifies some of the sources of indirect pressure operating on the design of executive compensation. Second, it shows that the incentives of prominent actors within a network influence the diffusion of organizational behaviors. Third, it provides empirical evidence of the current shift from separation between ownership and control toward greater involvement of shareholders in the strategic decisions of the firm. Fourth, by representing compensation contracts with multidimensional vectors, this study makes a methodological contribution, which allows for analyses and comparisons of incentive programs as integrated systems.

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

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

While compensation theories model the relations between features of the performance measures, characteristics of the tasks at hand, and the information asymmetry of the environment, they do not explicitly include economic, social and political forces that influence the design of compensation contracts (Murphy 2012). Observed compensation programs exhibit a significantly higher homogeneity than theory would predict, likely due to indirect social and political pressures that operate as constraints on compensation design (Jensen and Murphy 1990; Shleifer and Vishny 1997). Whether these pressures operate through the network of interfirm relations involving actors that take part to the process of defining the structure of the compensation contract for the CEO is an open empirical question.

Networks are known to facilitate the diffusion of many organizational behaviors. On the one hand, networks provide means for sharing and internalizing others' experience (Beckman and Haunschild 2002). On the other hand, they provide opportunities to collect and combine information on a variety of different behaviors and generate new knowledge (e.g. best practices) (Podolny and Page 1998). Networks also represent normative contexts, within which expectations form in terms of acceptable behaviors (Granovetter 1985). The relative prominence of network members moderates their influential power on the formation of such expectations (Bonacich 1987). Board interlocks, compensation consultants, and shareholders are examples of inter-firm networks that are likely to influence information transfer and knowledge creation regarding the design of executive compensation packages.

I define *residual similarity* as the degree of similarity between compensation contracts that is not explained by similarities in firm organizational and environmental characteristics. Whether and to what extent connections within these networks explain the observed *residual similarity* in compensation design is the main empirical question addressed in this study.

2.1 Board Interlocks

Board interlocks occur when a board member of a firm also sits on the board of a different firm (Knowles 1973).[1] Interlocked directors are exposed to private information pertaining to each of the organizations they serve. Interlocked directors can, therefore, facilitate information flow between different boards and influence behaviors in either organization (Battiston et al. 2008; Haunschild and Beckman 1998; Beckman and Haunschild 2002). Figure 1 presents a small subset of board interlocking relationships included in the sample used in this study.

----- Insert Figure 1 about here -----

Research in accounting provides evidence that board interlocks influence the adoption of organizational practices, including quality-related strategies (Chua and Petty 1999), tax strategies (Brown and Drake 2014), or earnings management practices (Chiu et al. 2013). With respect to compensation matters, board interlocks have been associated with the diffusion of options backdating practices (Bizjak et al. 2009), the adoption of golden parachutes (Fiss et al. 2012),

[1] 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.

and the relative weight assigned to cash and equity-based components of CEO pay (Wong and Gygax 2009; Conyon et al. 2011)

Whereas effective compensation design should drive boards to internalize compensation practices adopted by others only to the extent that they correspond to structural, strategic, and organizational similarities, two main factors interfere with the pursuit of this goal. First, board members often lack formal training in compensation design, which is a complex task involving significant uncertainty. In presence of high uncertainty, decision makers tend to imitate behaviors exhibited by others operating in similarly uncertain conditions (Liberman and Asaba 2006). Second, boards of directors benefit from high levels of legitimacy[2] both internally, in that it facilitates smoother contractual negotiations with the CEO, who exercises managerial power to extract rent (Bebchuk et al. 2002; Finkelstein and Boyd 1998), and externally, in that it protects board members from immediate sanctions (e.g. removal from the board, loss of reputation, etc.) in case of unfavorable performance results (Meyer and Rowan 1977). Adopting popular models of executive compensation contracts is likely to sustain board legitimacy both internally and externally (DiMaggio and Powell 1983; Deephouse 1996). If interlocks are drivers of residual similarity in compensation design, then the following null hypothesis should be rejected:

H1: There is no association between board interlocks and residual similarity in compensation contracts.

A case of particular interest is when the interlocked director is a member of the compensation committee in one of the boards. Due to their primary responsibility and accountability in the eyes of the board at large and of the shareholders, interlocked compensation

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[2] Legitimacy is defined as a favorable appraisal of actions in the context of the norms of acceptable behavior in the social system of reference (Dowling and Pfeffer 1975). Legitimacy is found to be a necessary condition for organizational survival (Baum and Oliver 1991; Meyer and Rowan 1977)

committee members are particularly incentivized to leverage on their access to compensation details of other firms to develop their ability to design optimal compensation contracts. At the same time, however, interlocked compensation committee members might also be inclined to adopt a compensation design that has proven to be successful elsewhere, in order to facilitate the negotiations with the CEO and support their choice in the eyes of their stakeholders. I explore whether interlocked compensation committee members are more or less likely to drive compensation design similarity than other types of interlocks, by testing the following null hypothesis:

H1a: The relation between board interlocks and residual similarity in compensation contracts is not influenced by the participation of compensation committee members in the interlock.

2.2 Compensation consultants

Compensation committees rely extensively on the advice of compensation consulting firms, both because their recommendations are assumed to be based on superior technical expertise and emotionally detached evaluations, and because, by endorsing the compensation structure adopted by the firm, compensation consultants contribute to the legitimacy of the board's stipulations (Malsch et al. 2012; Meyer and Rowan 1977). [3]

[3] 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.

Hiring a compensation consulting firm has been associated with higher CEO compensation, and, in particular with higher portions of “risky” pay (stock and options) (Conyon et al. 2009; Armstrong et al. 2012). The study of the influence of reporting relationships between compensation consulting firm and client on the level of CEO pay has yielded, so far, mixed results (Bebchuk et al. 2002; Core et al. 1999; Murphy and Sandino 2010). Similarly, the evidence is mixed with respect to the effect on CEO pay of compensation consultants providing multiple services to the client firm. (Conyon et al. 2009; Murphy and Sandino 2010; Cadman et al. 2010) To the best of my knowledge, the influence of compensation consultants on the observed homogeneity of compensation design has not yet been addressed.

Compensation consultants participate in 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). Figure 2 illustrates a small subset of interfirm connections between firms included in my sample generated by hiring a common compensation consulting firm

----- Insert Figure 2 about here -----

Compensation consulting firms can leverage on their exposure to a large and heterogeneous information set to develop diverse solutions applicable to clients’ individual settings (Cadman et al. 2010). However, developing individualized compensation packages is 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). 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). Whether compensation consultants contribute to developing individualized compensation contracts or to homogenizing compensation design practices 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 residual similarity in compensation contracts.

I further explore whether the compensation consultants' network prominence moderates the effect of compensation consulting firms on the degree of compensation similarity of client firms. Network prominence is approximated by the compensation consulting firms' *eigenvector centrality*, which accounts for the *number* and *type* of active clients in the consulting firm's customer base (Wasserman and Faust 1994).[4] Highly central compensation consulting firms hold a large portfolio of clients, who are also sophisticated users of compensation consulting services.[5] The centrality of a compensation consulting firm is informative of the characteristics of the demand for compensation consulting services.

The measure of centrality reflects, to some extent, the type of consulting approach that is most popular among clients. If client firms tend to hire compensation consultants known for their individualized executive compensation solutions, then higher consulting firm centrality should be associated with *lower* degrees of similarity between compensation contracts among clients of the same consulting firm. If, instead, the prevalent demand is for comparability with respect to

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[4] 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).

[5] Whereas only one consulting firm supports the compensation committee in the design of the compensation contract for the CEO and is designated by the company as "primary", other compensation consulting firms might be hired by the same client to aid in the design of non-CEO management, or to provide survey data. These contemporaneous relationships with consulting firms provide the client with larger information and expertise in compensation design.

market trends and proxy advisory firms' criteria, 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 consulting firm and residual similarity in compensation contracts is not influenced by the eigenvector centrality of the compensation consulting firm.

2.3 Blockholders

Shareholders, especially if owners of large portions of the outstanding shares, represent important sources of pressure on the board and have significant power to influence the board's decision and strategic agendas. Shareholders that own at least 5% of the outstanding shares in a corporation are typically referred to as *blockholders*. According to Holderness (2007), 95% of U.S. firms have at least one blockholder among their shareholders. While many individual blockholders (often founders or members of the founders' families) are still present, a large portion of blockholders is represented by institutional investors, whose role and influence has grown significantly in the past few decades. Blume and Keim (2012) indicate that in 2010 about 67% of U.S. public equities were managed by institutional investors. Firms often have common blockholders among their owners. Figure 4 illustrates a small subset of interfirm connections generated by sharing a blockholder between firms considered in this study.

----- Insert Figure 4 about here -----

Recent regulatory interventions have created mechanisms by which shareholders can review and influence important decisions typically delegated to the board (Kim and Schloetzer 2013). The introduction of a mandatory shareholders' advisory vote on executive compensation programs (say on pay) by the Dodd-Frank Wall Street Reform and Consumer Protection Act, signed into law in 2010, is a fitting example for this study.

Institutional investors, due to their fiduciary responsibility to their *own* investors, have an obligation to participate in the voting process (Larcker et al. 2015), and to actively engage in research and analyses to assess the appropriateness of the compensation program proposed for the individual firms in their portfolio (David et al. 1998). While institutional investors may have the expertise and the incentive to perform detailed assessments of individual compensation programs, investing in the research and evaluation for each of the firms in their portfolio may not be economically advantageous, especially for those institutional investors who hold shares in large numbers of companies. In those cases, investors are likely to rely on the general guidelines issued by proxy advisers, such as ISS and Glass Lewis, or simply support the adoption of "best practices" or, otherwise, "popular" compensation models. In order to determine whether firms that share a blockholder are more or less likely to adopt similar compensation designs, I test the following hypotheses, expressed in null form:

H3: There is no association between sharing a blockholder and residual similarity in compensation contracts

As the cost of performing individual evaluations compensation contract with the number of firms included in the blockholder's portfolio, I further conjecture that the *number* and *type* of firms sharing a common blockholder moderates the degree of compensation similarity observed between those firms. I formulate this hypothesis in null form as follows:

H3a: The relation between sharing a blockholder and residual similarity in compensation contracts is not influenced by the eigenvector centrality of the blockholder where the blockholder's eigenvector centrality measures the number of firms in which the blockholder owns shares, as well as the number of blockholders participating in the ownership of each of those firms.

2.4 Implications of residual compensation similarity

The importance of identifying determinants of compensation design homogeneity is largely dependent on the consequences of imitative behaviors. A concern voiced by prior literature is that compensation homogeneity, by exhibiting a suboptimal fit with the individual firm, might distort the incentives for the executive and, ultimately, hurt the interests of the shareholders (Gomez-Mejia 1992; Gerhart et al. 1995; Larcker et al. 2015). Additionally, compensation design homogeneity might be a driver of the ratcheting effect of CEO compensation levels documented in the literature (Bebchuk et al. 2002; Bebchuk and Fried 2005; Bizjak et al. 2011). Distorted incentives and excess compensation are likely to negatively affect operating performance (Core et al. 1999). I therefore test the following hypotheses, expressed in null form:

H4a: The residual similarity in compensation design is not associated with excess CEO compensation

H4b: A firm's operating performance is not influenced by the residual similarity in compensation design

Additionally, it is important to examine the influence of compensation design similarity on the market performance of the firm. In a study about the economic consequences of the influence of proxy advisers on shareholder votes, Larcker et al. (2015) find that financial markets reacted negatively to those firms who, at the time of the introduction of 'say-on-pay', modified the structure of executive compensation to reflect the recommendations of ISS. Whether the market reaction related to the outsourcing of the voting process, or to its effect on the fit between firm characteristics and CEO compensation, is an open question, which I address by testing the following null hypothesis:

H4c: A firm's market performance is not influenced by the residual similarity in compensation design

3. RESEARCH DESIGN AND SAMPLE SELECTION

The data used in this study are obtained from multiple publicly available sources. Information on compensation amounts, compensation components, performance measures and related weights, board composition, as well as firm peer groups and compensation consultants were obtained from the ISS Incentive Lab dataset, which includes data from the CD&A section of the proxy statements of S&P500 companies.[6] Measures of firms' economic and governance characteristics were extracted from Compustat and Bloomberg. Data about blockholders and institutional investors were obtained from Capital IQ. The observations included in my sample refer to company filings for fiscal year 2012. Because firms' ownership structure, especially with respect to large investors, board composition, and relationships with compensation consulting firms are particularly sticky, in this study I focus on a cross-sectional analysis. Table 1 describes the sample selection procedure.

----- Insert Table 1 about here -----

[6] Incentive Lab was recently acquired by ISS. The data used in this study were collected prior to this acquisition. Incentive Lab includes information on firms that have been included in the S&P500 index between 1998 and 2014. 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. Data on board directors and members of the compensation committee required multiple corrections as many directors were incorrectly categorized. The validation of the data was done using data from the LexisNexis Corporate Affiliation datasets.

I represent each compensation contract with two vectors. 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 interact this classification with the absolute vs. relative nature of the metrics, thus obtaining six possible combinations representing corresponding performance measure types.[7] Next, I estimate the weights assigned to each performance measure type by calculating the percentage of CEO compensation dependent on each measure type[8]. 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 Appendix A for illustrative purposes.

A second vector relates to the composition of the mix of compensation components (pay mix). Executive compensation packages generally include elements of fixed 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

[7] 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. shareholders returns, 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.

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

represent the magnitudes along each axis. Appendix A includes a numerical example of this calculation.

3.1 Compensation *residual* similarity

I construct pairs of firms by matching each firm with every other firm in my sample (*N*(N-1)/2* pairs).[9] For each type of 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. Because I control for the pairwise similarity in the organizational characteristics of the firms, the *PM_Dist* and *Comp_Dist* measure the pairwise *residual* similarity in compensation contracts, as defined in section 1. The methodology I use to measure firm similarity is described in section 3.2.

I then model the influence of network connections on the two measures of contract residual similarity as follows:

Eq. (1):

$$\begin{aligned} Comp\_Simil_{ij,t} = {} & \alpha_{ij,t} + \beta_1 Dir\_Interlock_{ij,(t-1)} + \beta_2 Shared\_Cons_{ij,(t-1)} \\ & + \beta_3 Shared\_Blockholder_{ij,(t-1)} + \beta_4 CC\_Interlock_{ij,(t-1)} + \\ & + \beta_5 Shared\_Cons\_ECent_{ij,(t-1)} + \beta_6 Shared\_Blockholder\_ECent_{ij,(t-1)} \\ & + \beta_7 Same\_Industry_{ij,(t-1)} + \beta_8 Gov\_Simil_{ij,(t-1)} + \beta_9 Same\_ZIP_{ij,(t-1)} + \beta_{10} Econ\_Simil_{ij,(t-1)} \\ & + \beta_{11} Comp\_Peers_{ij,(t-1)} + \beta_{12} ISS\_Infl\_Simil_{ij,(t-1)} + \varepsilon_{ij,t} \end{aligned}$$

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[9] 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)*.

where the dependent variable $Comp\_Simil_{ij}$ represents either $Comp\_Dist_{ij}$ or PM_Dist_{ij}. The variables of interest to test hypotheses *H1*, *H2*, and *H3* are, respectively, $Dir\_Interlock_{ij}$, which assumes the value of 1 if the firms in the pair share a member of the board of directors and 0 otherwise, $Shared\_Cons_{ij}$, a binary variable equal to 1 if the firms in the pair hire the same compensation consulting firm and zero otherwise[10], and $Shared\_Blockholder_{ij}$, an indicator variable assuming the value of 1 if the firms in the pair share an investor that owns 5% of the outstanding shares in each of the two firms. Since the dependent variable in the model is the Euclidean distance between compensation vectors, smaller distances represent greater residual similarity. Significant negative (positive) values for the estimates of β_1, β_2, or β_3 would reject the corresponding null hypotheses and indicate that the related network connections between firms increase (reduce) the residual similarity in the corresponding compensation contracts.

The variable of interest for the test of *H1a* is $CC\_Interlock_{ij}$, defined as an indicator variable assuming a value of 1 if the firms in the pair 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, compared to any other type of interlock.

Table 2, Panel A, reports the percentage distribution (*Share*) of primary compensation consulting firms retained by the firms in my sample at the time of the negotiation of CEO

[10] The compensation consulting firms considered for this measure are only those that the firm indicates as “primary” consulting firms, which serve the firm in support of the definition of the CEO compensation package. Many firms retain multiple compensation consulting firms for additional purposes, such as provision of statistical data, HR consulting, design of non-executive management compensation. These relationships would be associated with a value of zero for the variable $Shared\_Cons_{ij}$.

compensation for 2012, while Panel B provides some additional descriptive statistics.[11] To examine the influence of consulting firm centrality on compensation design similarity of client firms (*H2a*), I first estimate the eigenvector centrality for each compensation consulting firm in my sample (Table 2, Panel A). *Eigenvector centrality* is a combined measure of the actor's connectedness and prominence in the network. The consulting firm's eigenvector centrality depends on the number of firms in my sample that designate such consultant as primary, who also hire several other (non-primary) compensation consultants, which have, themselves, many customers (Figure 3). [12] Eigenvector centrality is, therefore, not only a measure of relative market share, but it also accounts for general patterns of connections in the whole network.

----- Insert Figure 3 about here -----

----- Insert Table 2 about here -----

The influence of consultants' centrality on the similarity between compensation contracts is conditional on firms in the pair hiring the same primary consulting firm. Therefore I define $Shared\_Cons\_ECent_{ij}$ 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

[11] I omit from Table 2, 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.

[12] See footnote 10 for the distinction between primary and non-primary compensation consulting firms.

residual similarity of compensation contracts between firms that share the same compensation consultant.

Similarly, *Shared_Blockholder_ECent*$_{ij}$ is defined as a variable that assumes the value of the blockholder eigenvector centrality if the firms in the pair share the blockholder, and zero otherwise. Table 3, Panel A, reports the number of firms, within my sample, in which the listed investors own at least 5% of the outstanding shares (which qualifies the investors as blockholders), as well as the eigenvector centrality of each blockholders relative to the sample of firms used in this study.[13]

----- Insert Table 3 about here -----

If coefficient β_6 were to be estimated as positive (negative) and statistically significant, then the centrality of a common blockholder would reduce (increase) the residual similarity of compensation contracts between connected firms.

3.2 Firm similarity

Compensation theory would predict similar compensation structures where firms share certain organizational, strategic, and environmental 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 the firm's investments opportunities (measured as the average book-to-market ratio over the three fiscal years ending with *(t-1)*). 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

[13] I omit from Table 3, Panel A, any blockholder that owns a 5% block of shares in less than 1% of the firms included in my sample.

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 measuring the economic and governance firm attributes into quintiles, and create indicator variables corresponding to each quintile. At the firm-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 or in neither of the firms in the pair, whereas the value of the indicator variable will be equal to 0 if the CEO is the Chairman of the board in one firm in the pair, but not in the other one. Following 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).[14] 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

[14] 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.

compensation vectors) for the estimated values of the regression coefficients associated with each measure of similarity (β_8 for *Gov_Simil*$_{ij}$ *and* β_{10} for *Econ_Simil*$_{ij}$).

Consistent with prior research, economic and governance 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)*.

3.3 Control Variables

Compensation design might be influenced by mimetic and normative pressures emerging within an industry or within a particular geographical region (DiMaggio and Powell 1983). Whether firms in each pair operate in a common industry, is indicated by the binary variable *Same_Industry*$_{ij}$ (equal to 1 in the case of same industry, and 0 otherwise), while the indicator *Same_ZIP*$_{ij}$ measures whether the firms in each pair are headquartered in a common geographical area (value of 1 in the case of same area, and 0 otherwise).[15]

Additionally, I control for the effect of compensation peer groups, as 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)[16]. 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.

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[15] 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).
[16] 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.

Finally, I include a control variable to account for the firm's exposure to the influence of proxy advisory firms, such as ISS or Glass Lewis. Since institutional investors are more likely to relay their voting decisions on the proxy advisers' recommendations, a firm's exposure to the influence of proxy advisers is likely positively correlated with the percentage of outstanding shares owned by institutional investors. After tabulating the continuous distribution of institutional ownership and creating indicator variables corresponding to each quintile, I construct the variable $ISS\_Infl\_Simil_{ij}$, which assumes the value of 1 if the firms in the pair belong to the same quintile, and 0 otherwise. Table 4 describes all the variables utilized in this study.

----- Insert Table 4 about here -----

3.4 Estimation: non-independence between observations

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 in each pair, controlling for pairwise levels of similarities. 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). The data structure for this study is a squared matrix (*NxN*, where *N* is the number of firms in the sample). Each cell in the matrix represents the value of the relationship (tie) between a pair of actors. Observations reported in the same row (column) of the data matrix are likely to be positively correlated, because they represent dyadic relations involving a constant firm. Applying standard 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). In order adjust the OLS standard errors, it is necessary to cluster on both the rows and the columns at the same time (Simpson 2001; Krackhardt 1988, 1987). Petersen (2009) describes a double clustering OLS procedure, which is the estimation approach I use in my analyses.

3.5 Homophily, Contagion and Contextual Drivers

Observed similarity in organizational behaviors of connected firms is not always the effect of network influences (Shalizi and Thomas 2011). Participation in network relationships is, in many cases, an endogenous decision. Firms may choose specific counterparts *because* of their similarity, a phenomenon defined in the sociology literature as *homophily* (McPherson et al. 2001; Golub and Jackson 2012). 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). Alternatively, organizations exhibit similar behaviors due to contextual factors (or *drivers*). Firms might be exposed to common exogenous shocks or environmental characteristics that would drive similar behaviors independently from the existence of interfirm connections. 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. The approach I use in this study is to examine the correlations between structural characteristics and network connections. High correlation coefficients would indicate a higher probability that observed similarity in organizational behaviors are due to homophily or to exposure to common shocks.

3.6 Implications of residual compensation similarity

The analysis of the relation between compensation similarity and excess CEO compensation (*H4a*), as well as the relations between compensation similarity and firm operating and market performance (*H4b*, *H4c*) are operationalized at the firm level. In order measure the residual compensation similarity at the firm level, I calculate the average similarity across all the pairs in which an individual firm participates (that is, I calculate the row average of the matrix of compensation Euclidean distances) for each type of compensation vector, and label the related variables $Ave\_Comp\_Dist_{ij}$ and $Ave\_PM\_Dist_{ij}$, respectively.[17]

In order to test *H4a*, in line with prior literature (Core et al. 1999), I first calculate a measure of excess CEO compensation, as the difference (residual) between observed individual total compensation levels and total compensation predicted by the firm-level economic, governance, geographic and industry characteristics. I then scale such residual by amount of total compensation. I estimate a model of the following form:

Eq (2):

$$Excess\_Comp\_Scaled_i = \alpha_i + \beta_1 Ave\_Comp\_Dist_i + \beta_2 Ave\_Comp\_Dist_i + \varepsilon_i$$

Significant coefficient estimates for β_1 and/or β_2 will reject *H4a*. A negative sign for those coefficients will indicate that compensation similarity (lower Euclidean distance) is associated with greater excess compensation.

To test *H4b*, I follow Core et al. (1999) and estimate the following model:

Eq. (3):

$$ROA_i = \alpha_i + \beta_1 Ave\_Comp\_Dist_i + \beta_2 Ave\_Comp\_Dist_i + \beta_3 ROA\_sd_i + \beta_4 Sales\_\log_i + \varepsilon_i$$

where ROA_sd_i is the average standard deviation of ROA at the firm level over the three fiscal years ending with 2011, and $Sales\_log_i$ is the log of firm revenues for fiscal year 2012. The sign and significance of β_1 and/or β_2 will indicate whether and how compensation residual similarity influences operational performance.

[17] Because the distance matrix is symmetric and the order of firms in the pair is irrelevant, the calculation of the average distance would yield the same results if it were performed along the columns.

Finally, to test *H4c*, I estimate the following model:

Eq. (4):

$$Stock\_Ret_i = \alpha_i + \beta_1 Ave\_Comp\_Dist_i + \beta_2 Ave\_Comp\_Dist_i + \beta_3 Stock\_Ret\_sd_i + \beta_4 Inv\_Opp_i$$
$$+\beta_5 Log\_Enterprise\_Value_i + \varepsilon_i$$

where $Stock\_Ret\_sd_i$ is the average standard deviation of stock returns at the firm level over the three years ending with 2011, Inv_Opp_i is the valuation of the investment opportunities for the firm, measured by the market-to-book ratio in fiscal year 2012, and $Log\_Enterprise\_Value_i$ is the log of the value of the firm in fiscal year 2012. The sign and significance of β_1 and/or β_2 will indicate whether and how the market reacts to compensation residual similarity.

4. RESULTS OF HYPOTHESES TESTS

Table 5 summarizes the main descriptive statistics of all variables included in the study. Panel A describes the main statistics for the dependent variables used in this study. In Table 5, Panel B, the total number of pairs (*N*) 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 (see Table 1 for additional details). 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). Table 5, 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 primary compensation consultant at any time, which mechanically reduces the number of indirect connections considered for this study. Blockholders, on the other hand, manage large and, most often, largely diversified portfolios, which leads them to be typically involved with multiple firms at the same time. On average, as reported in Panel C, Table 4, within my sample a firm interlocks with 5.028 other firms (standard deviation: 4.133), shares a compensation consultant with 80.435 other clients (standard deviation 74.327), and shares a blockholder with 660.055 other firms (standard deviation: 346.781).

----- Insert Table 5 about here -----

4.1 Networks effects on residual compensation similarity

Table 6 reports the results of the statistical tests of my hypotheses with respect to the network effects on compensation residual similarity. As a preliminary analysis, I estimate a baseline model of Eq. (1) limiting the predictors to the variables measuring organizational similarity between firms and peer group benchmarking practices (Model 0). I then estimate the main effects of board interlock networks, compensation consulting networks, and blockholder networks (Model 1). Next, I include the specification of the interlock involving members of the compensation committee, and measures of centrality for the shared compensation consulting firms and for the shared blockholders (Model 2). All estimations are performed using OLS with double-clustering along each member in the pair, in line with the methodology proposed by Petersen (2009). Table 6 reports both the unstandardized and standardized estimations for all coefficients.

----- Insert Table 6 about here -----

The purpose of Model 0 is to validate the assumption that organizational similarities between firms are not sufficient to explain the variability in the degree of similarity between compensation contracts, in line with the predictions of Jensen and Murphy (1990) and Shleifer and Vishny (1997). 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 prior research with respect to economic and governance characteristics of the firm (Core et al. 1999; Armstrong et al. 2012; Finkelstein and Hambrick 1989; Murphy 1985), with the exception of the commonality of geographical area or industry, which are associated with an increase in the Euclidean distance between compensation vectors (Table 6, panel A). This result might be further evidence of the tendencies toward organizational behavior differentiation within industries assessed by Hambrick et al. (2004). Additionally, firms included in compensation peer groups tend to weigh compensation components in a similar manner, as it would be expected based on the benchmarking purpose of compensation peer groups. 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 for the test of hypotheses *H1*, *H2*, and *H3*. Separate estimations are performed with respect to residual similarity in pay mix ($Comp\_Dist_{ij}$) or performance measures mix (PM_Dist_{ij}). When the dependent variable is $Comp\_Dist_{ij}$ all three networks exhibit significant effects on residual similarity (β_1=-0.041, p<0.001; β_2=-0.008, p<0.001, β_3=-0.201, p<0.001 in the standardized regression) allowing the rejection of the null hypothesis for *H1*, *H2*, and *H3* (Table 6, Panel A). When the dependent variable is PM_Dist_{ij}, the estimation results reject the null for *H1* (β_1=-0.006, p<0.001 in the standardized regression), but not for *H2* and *H3* (Table 6, Panel B). In this first level of analysis, it appears that compensation consulting firms or large shareholders do not represent a source of imitative compensation design.

Model 2 reports the results of the test of *H1a*, *H2a*, and *H3a*. When the dependent variable $Comp\_Dist_{ij}$, the inference about the influence of board interlocks (*H1*) and shared consultants (*H2*) is in line with Model 1. However, the results also show that interlocks involving members of the compensation committee amplify the interlock network effect (β_4=-0.004, p<0.05 in the standardized regression), thus rejecting the null for *H1a*. With the inclusion of the measure of shared blockholder centrality, the effect of blockholders on residual pay mix similarity (*H3*) changes sign. Sharing a blockholder drives *lower* residual similarity in pay mix design (β_3=0.170, p<0.1 in the standardized regression), in line with the notion that institutional investors (which represent the vast majority of the blockholders in my sample) are more engaged in designing individualized compensation packages (David et al. 1998). However, the higher the centrality of the shared blockholders (*H3a*), the higher the residual similarity (lower Euclidean distance) between compensation contracts (β_6=-0.378, p<0.001 in the standardized regression), in line with the expectation that large shareholders that are engaged in many different investments tend to support the implementation of compensation schemes that have been successful elsewhere or that are in line with the recommendations of proxy advisers (Larcker et al. 2015).

When the dependent variable PM_Dist_{ij}, it appears that, while hiring a common compensation consultant relates to higher similarity in the design of the performance measure mix (β_2=-0.022, $p<0.05$ in the standardized regression), the centrality of the compensation consultant attenuates the relation (β_5=0.025, $p<0.05$ in the standardized regression), thus rejecting the null for *H2a*. Taken together, the results of the estimation in Model 2 provide evidence that, on average, clients of compensation consulting services prefer more personalized solutions, at least with respect to the choice and weighting of performance measures.[18]

4.2 Homophily, contagion, and exposure to common shocks

Table 7 reports the correlations between the main variables involved in this study. Pairwise correlations were calculated using a quadratic assignment procedure (QAP), a non-parametric approach to inference in presence of dyadic relations commonly used in network analyses (Krackhardt 1987; Simpson 2001). Appendix B includes a short description of this methodology. The correlations (all statistically significant at 99% confidence, with the exception of the correlation between firms sharing governance characteristics and being located in the same geographic area) 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 3.7%. Similarly, the probabilities that similar firms hire the same consulting firm are smaller than 2.3%. The probability that similar firms share blockholders is lower than 15%. Hence, I conclude that, in my settings, homophily, is not a significant alternative explanation to network effects on compensation similarity.

----- Insert Table 7 about here -----

4.3 Implications of residual compensation similarity

[18] Conversations with representatives of some of the larger U.S. compensation consulting firms confirmed that their effort in differentiating the compensation design at the firm level is mostly reflected in the choice of performance measures.

The results of my tests of *H4a*, *H4b*, and *H4c* are reported in Table 8. Due to the different units of measure for the variables included in the model, I only estimate *Eq. (2)*, *Eq. (3)*, and *Eq. (4)* using standardized variables. The regression coefficients estimated in Panel A indicate that residual compensation similarity in the distribution of compensation components is associated with excess compensation (β_1= -0.780, p<0.01), whereas similarity in performance measure mix does not appear to be a vehicle for compensation ratcheting. Panel B reports the results of my test of *H4b*, for which I fail to reject the null. The coefficients summarized in Panel C allow me to reject the null for *H4c* with respect only to residual similarity in the relative weight of compensation components (β_1= -0.123, p<0.05). Taken together, these results indicate that, although residual pay-mix similarity is associated with excess CEO compensation, it does not appear to impact directly the firm's operational performance. However, the stock market appears to respond favorably to pay-mix similarity, likely due to the ease of comparability across compensation contracts. Alternatively, this result might represent an endogenous effect of the large presence of large institutional investors, which, based on the results of my tests of *H3* and *H3a*, appear to drive similarity in pay-mix design.

6. CONCLUDING REMARKS

In this study I show that interfirm network relationships involving members of the board of directors contribute to explain *residual* compensation similarity, which I define as the similarity between compensation contracts that is not reflected in similarity of organizational characteristics of the firms. Board interlocks, compensation consulting firms, and shared blockholders provide access to information about compensation practices of other firms. In addition to offering opportunities for information exchange and learning, interfirm networks represent a source of legitimacy for the board's stipulations, thus incentivizing imitative behaviors. The relative prominence of the connectors moderates the intensity of the network effects on residual compensation similarity.

A concern with respect to compensation homogeneity is that deviating from optimal individualized contracts may introduce significant distortions in the incentives for the executive, ultimately damaging the shareholders. Additionally I show that residual similarity is associated with excess CEO compensation. Nonetheless, the market appears to respond favorably to residual compensation similarity, possibly due to the ease of comparability of CEO compensation across firms.

To compare compensation packages and measure their similarity I use a vectorial representation of two main structural aspects of compensation design (pay mix and performance measure mix). The advantage of this method is that it allows me to compare compensation contracts as systems of compensation components or performance measures, departing from prior literature, which has, insofar, focused on the comparison of individual elements of the compensation contracts. I approximate the measure of compensation similarity between firms with the Euclidean distance of the corresponding compensation vectors.

This study is subject to several limitations. First, although my estimation results are statistically significant, my empirical model yields low explanatory power.[19] Nonetheless, my results provide incremental explanations for the deviation of compensation contracts from the theoretical design. Future research might identify additional constraining forces for the design compensation contracts. Second, the analyses included in this study focus on a contemporaneous

[19] 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.

relation between network relationships and compensation similarity.[20] My results, therefore, provide evidence of association, and not necessarily causation, between the two constructs. Although the use of a cross section is justified by the fact that the relationships considered in this study are particularly sticky, this limitation might be addressed in future research by performing longitudinal analyses, and including considerations about persistence of compensation design over time, as well as lagged effects of network relationships. Finally, the current study does not consider the directionality in the relationships (i.e. who selects whom as a compensation peer, or who imitates whom in the design of compensation packages), or the effects of the variability in the strength of the relationships (i.e. hiring the same consultant for multiple years, sharing more than one director with another firm, sharing more than one blockholder with another firm).

Despite its limitations, this study provides important contributions. First, it extends the literature about drivers of executive compensation, above and beyond known observable organizational characteristics of the firm. Second it provides incremental explanations for the observed homogeneity 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, external consultants, and large investors on board decisions. Fourth, it provides a methodological contribution by adopting a vectorial representation of compensation contracts, through which compensation packages can be compared in their entirety, allowing for complementarities and substitutions in the elements of their design.

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

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VI. APPENDICES

Appendix A: Example of Calculation of Distance Between Contract Vectors

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. 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:

PM	**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. Here below are some examples for compensation paid in 2012:

Ticker	x_1	x_2	x_3	x_4	x_5	x_6
	Abs_Acc %	Rel_Acc %	Abs_Stock %	Rel_Stock %	Abs_NFPM %	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

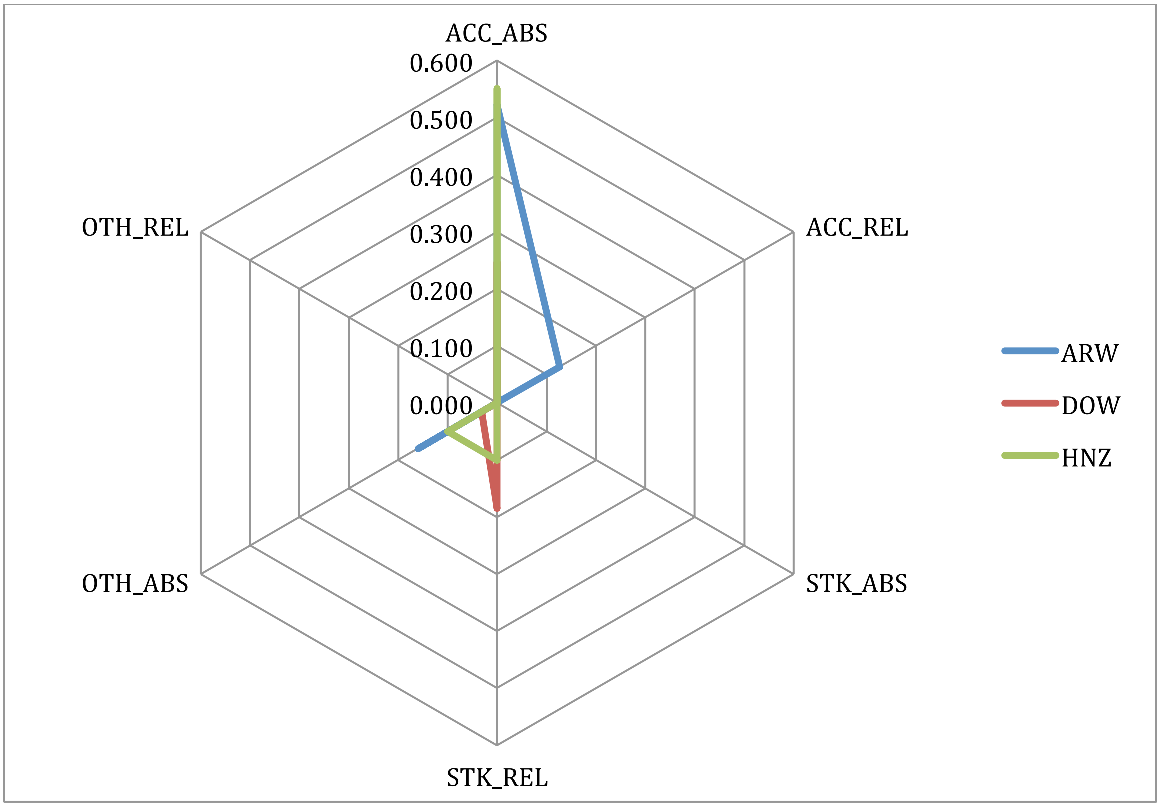
The percentages associated with each performance measure type represent the magnitude of each of the dimensions of the compensation component vector. In other words, each row of the above table lists the performance measures as a row vector for each of the three firms.
I then calculate the Euclidean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

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

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

Pair (*i,j*)	***PM_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, the following figure might provide some intuition behind the calculation of the Euclidean distance as a proxy for similarity in compensation contracts.



2. Euclidean distance between vectors of compensation components (pay-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. Here below are some examples for compensation paid in 2012:

Ticker	x_1	x_2	x_3	x_4	x_5	x_6
	Fixed Pay %	**Bonus %**	**Stock %**	**Options %**	**Pension %**	**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

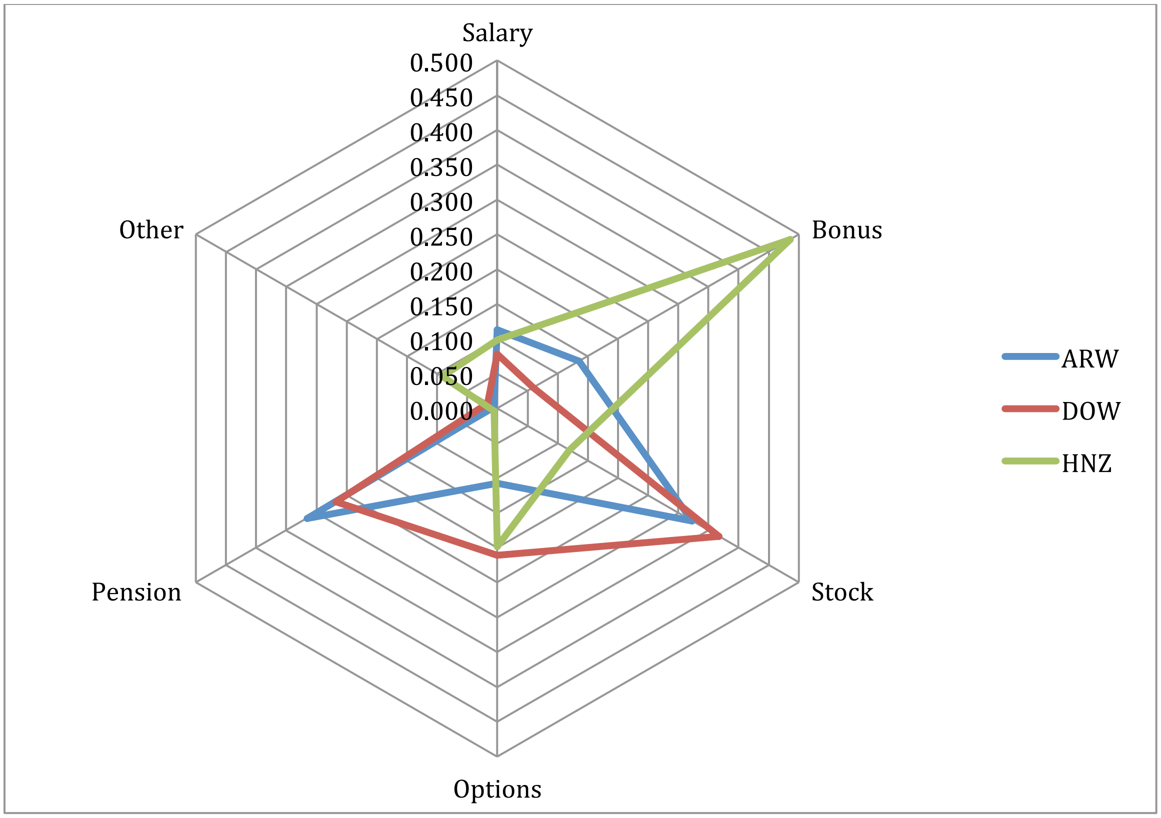
The percentages associated with each compensation component represent the magnitude of each of the dimensions of the compensation component vector. In other words, each row of the above table lists the compensation components as a row vector for each of the three firms.
I then calculate the Euclidean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

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. The following figure might provide some intuition behind the calculation of the Euclidean distance as a proxy for similarity in compensation contracts.


Salary
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Bonus
Stock
Options
Pension
Other
ARW
DOW
HNZ

Appendix B: Quadratic Assignment Procedure (QAP)

The Quadratic Assignment Procedure (QAP) is a non-parametric approach to inference in presence of dyadic relations. 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 (5,000 in this study), 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 (see illustration below). 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 correlation between the matrices of network values is calculated with respect to each iteration, creating a distribution of correlation coefficients. If the correlation originally calculated 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).

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 (5,000 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}

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.

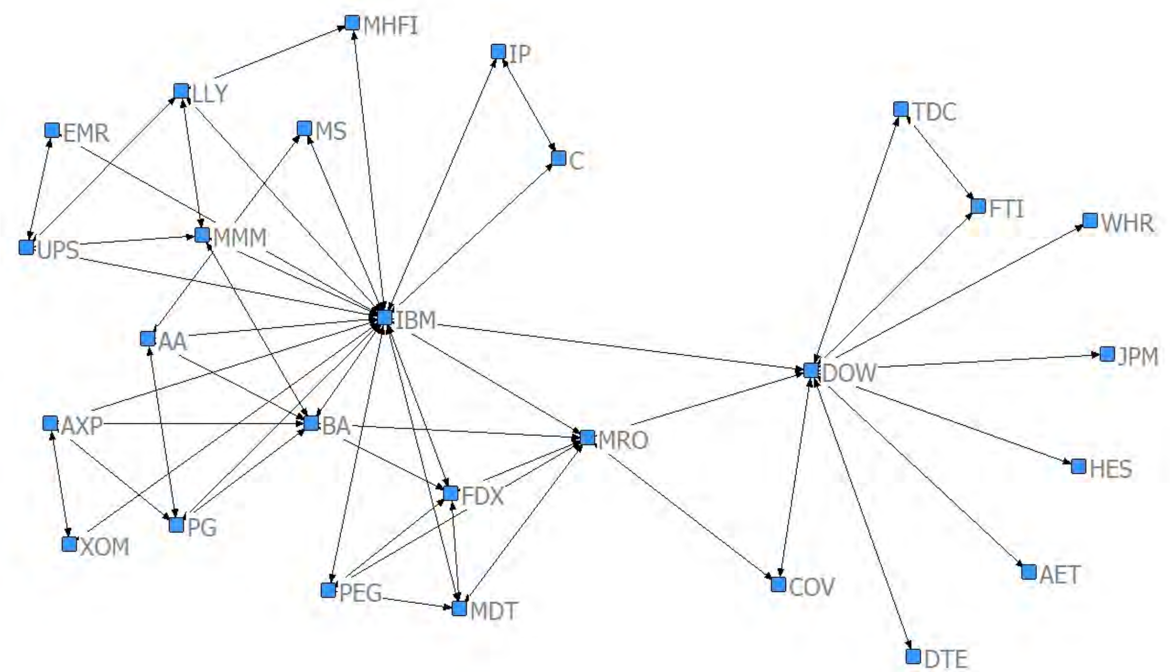


Figure 2: Example of network connections in the compensation consultants' network
The red circles represent firms and the blue squares represent the compensation consulting firms. This figure contains only a partial subsample of the relationships included in the sample for this study. Also, for graphic 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)

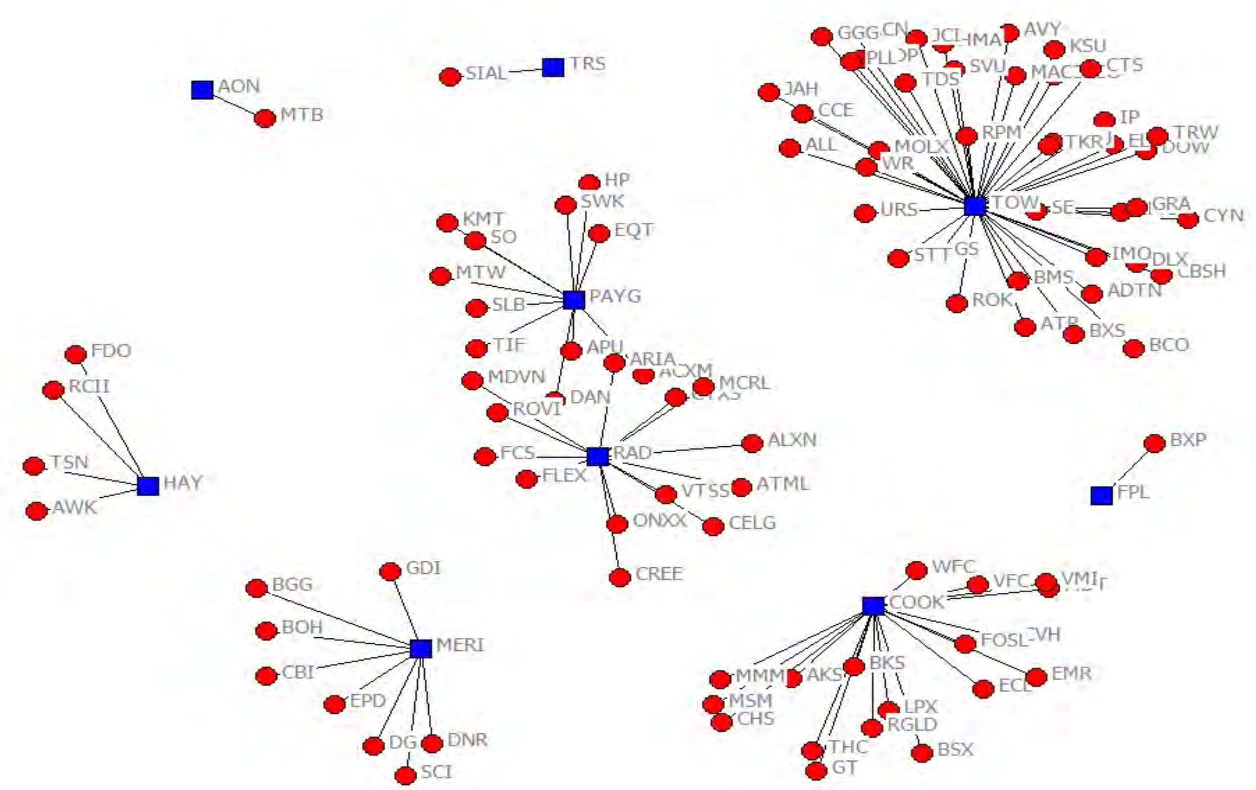


Figure 3: Graphical representation of nodes with different eigenvector centrality
The figure includes only a subsample of the compensation consultants' network. The red circles represent client firms (indicated by their CIK) and the blue squares represent the compensation consultants. The consulting 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).

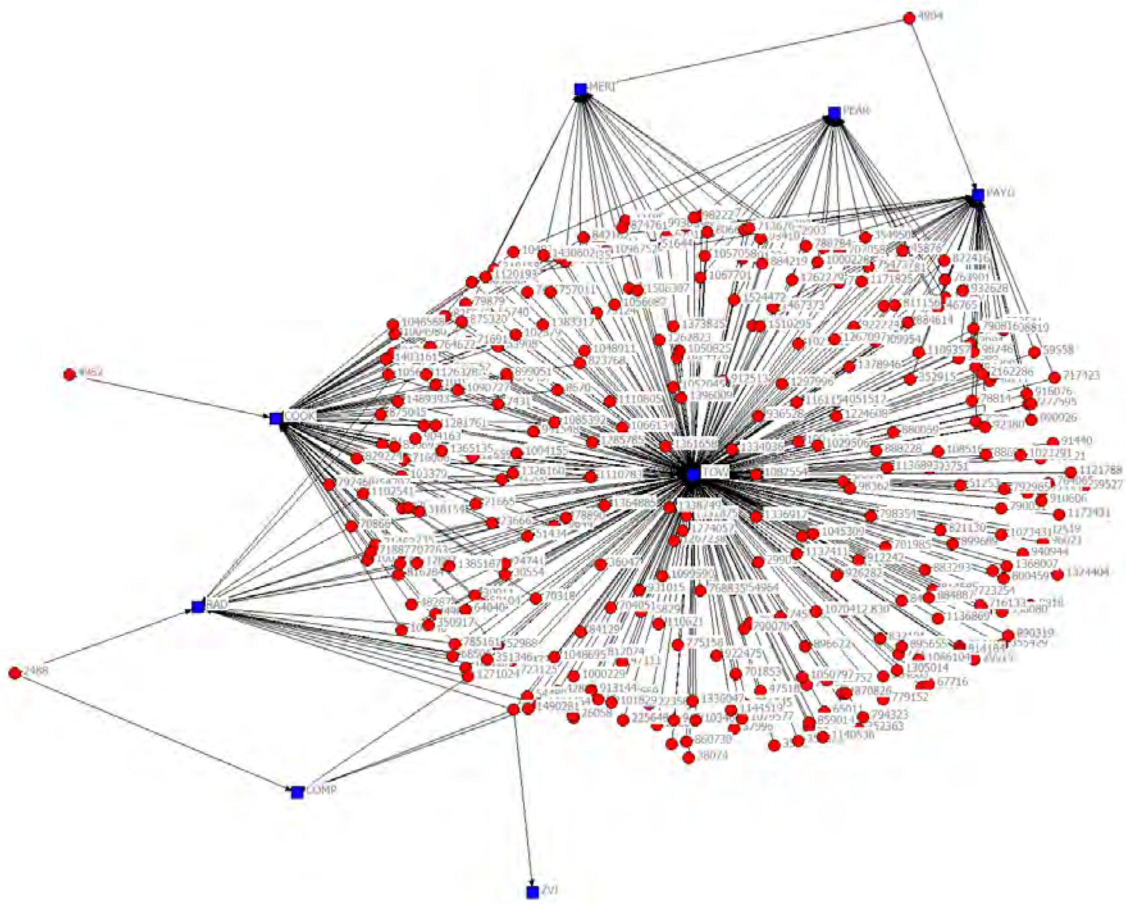


Figure 4: Example of network connections in the blockholders network

The red circles represent firms and the blue squares represent the blockholders. This figure contains only a partial subsample of the relationships included in the sample for this study. The numbers associated with the red circles (clients) represent firms' CIK numbers. The acronyms associated with the blue squares represent Capital IQ identifiers for the blockholders (e.g. IQ23217 = T. Rowe Price Group, Inc.; IQ109783 = Capital Research and Management Company)

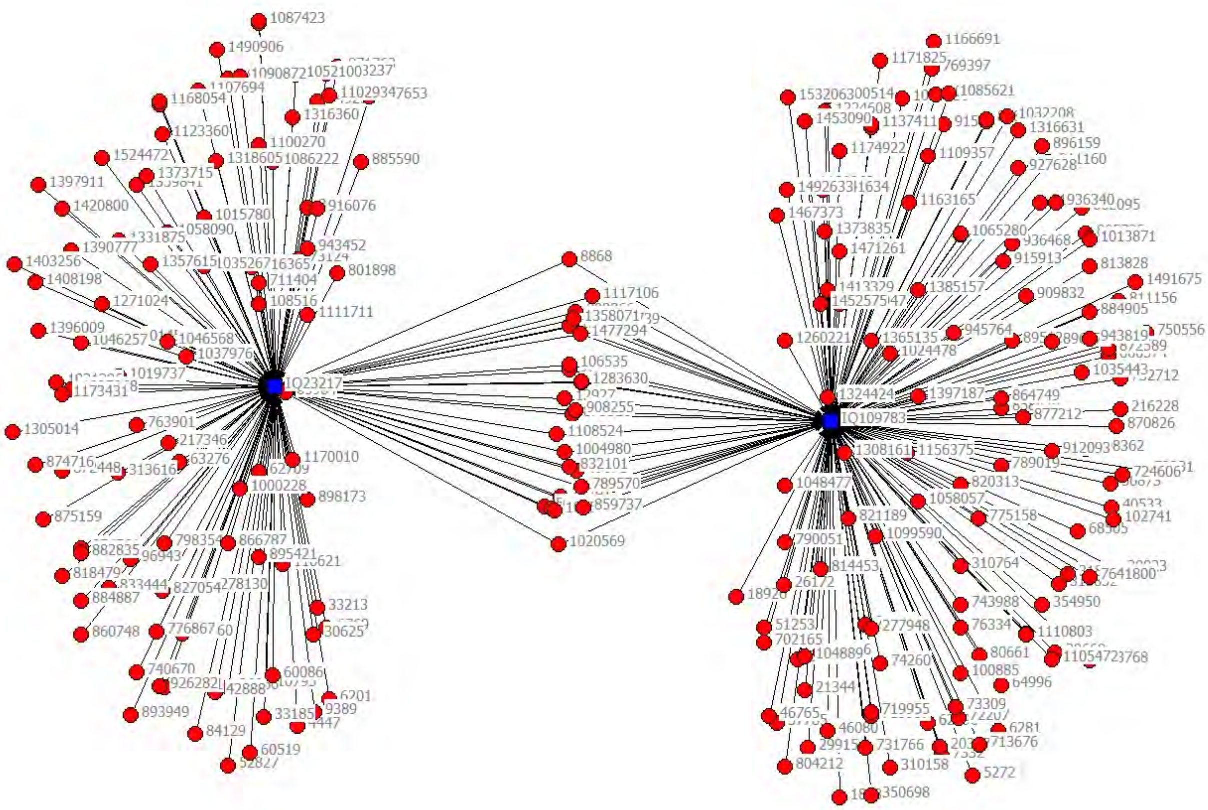


TABLE 1
SAMPLE SELECTION PROCEDURE

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 2
COMPENSATION CONSULTANTS

Panel A: Compensation consulting firms' eigenvector centrality

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: Compensation consulting firms' average statistics

	N	Mean	Std. Dev.
Number of compensation consulting firm's primary clients within the sample	57	17.053	23.945
Share of sample firms served by compensation consulting firm	57	1.754	2.464
Compensation consulting firm's Eigenvector Centrality	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 within my sample that hire the related compensation consulting firm as their *primary* compensation consultant. The calculation of the eigenvector centrality is, instead, based on all compensation consulting relations held by firms in my sample, including relations with clients as secondary compensation consultants, so to account for the information range available to the client. (3) Compensation consulting firms 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 consulting firm for a number of clients within my sample that is more than double the number of clients hiring Towers Watson as their primary consulting firm. However, the eigenvector centrality score for Towers Watson is higher than the one associated with Cook. *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 3
BLOCKHOLDERS

Panel A: Blockholders' eigenvector centrality

Blockholder ID	Investor	# Firms	Share	E-cent
IQ417222	The Vanguard Group, Inc.	816	74.25%	0.698
IQ403413	BlackRock, Inc.	758	68.97%	0.669
IQ109783	Capital Research and Management Company	159	14.47%	0.133
IQ163894	Fidelity Investments	156	14.19%	0.132
IQ23217	T. Rowe Price Group, Inc.	127	11.56%	0.105
IQ823170	State Street Global Advisors, Inc.	106	9.65%	0.098
IQ683779	Wellington Management Group LLP	64	5.82%	0.055
IQ3182643	Dimensional Fund Advisors LP	59	5.37%	0.045
IQ1925133	J.P. Morgan Asset Management, Inc.	34	3.09%	0.029
IQ384779	Invesco Ltd.	25	2.27%	0.020
IQ4817645	PRIMECAP Management Company	22	2.00%	0.019
IQ868792	Massachusetts Financial Services Company	21	1.91%	0.017
IQ28703	Franklin Resources, Inc.	19	1.73%	0.014
IQ4716937	Dodge & Cox	19	1.73%	0.015
IQ208314	Janus Capital Management LLC	18	1.64%	0.014
IQ3290494	Glenview Capital Management, LLC	17	1.55%	0.013
IQ27368370	ClearBridge Investments, LLC	16	1.46%	0.011
IQ396900	GAMCO Investors, Inc.	16	1.46%	0.010

Panel B: Blockholders' average statistics

	N	Mean	Std. Dev
Number of firms in the blockholder's portfolio within the sample	641	5.509	45.318
Share of sample firms held by blockholder	641	0.005	0.041
Blockholder's Eigenvector Centrality	641	0.004	0.039

Notes: (1) These statistics are calculated based on data extracted from Capital IQ. (2) *Panel A:* Blockholders that own 5% or more of the outstanding shares in less than 1% of the firms in the sample considered for this study have been omitted from the table. *Panel B:* The summary statistics are based on the sample of investors (641) that owned at least 5% of outstanding shares of firms in my sample at the beginning of 2012.

TABLE 4
VARIABLES DEFINITION

Executive Compensation Similarity *(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. The smaller the distance, the higher the similarity.
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 stock price-based PM.
Firm-level Dependent Variables	
Excess_Comp_Scaled	Firm-level difference (residual) between observed level of total compensation and compensation predicted by the economic, governance and environmental characteristics of the firm. This residual is scaled by total compensation. The smaller the distance, the higher the similarity.
ROA	Firm-level return on assets for the year of interest in this study
RET	Firm-level stock returns for the year of interest in this study
Pair-level Network Variables	
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 consulting firm, and zero otherwise
Shared_Blockholder$_{ij}$	Indicator variable equal to one if the firms share a blockholder, 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
Shared_Cons_ECent$_{ij}$	Variable equal to the value of the compensation consulting firm's eigenvector centrality if the firms in the pair hire the same consultant, and zero otherwise
Shared_Blockholder_ECent$_{ij}$	Variable equal to the value of the blockholder's eigenvector centrality if the firms in the pair hire the same consultant, and zero otherwise
Pair-level Control Variables	
Comp_Peers$_{ij}$	Indicator variable equal to 1 if the firms belong to the same compensation peer group, and 0 otherwise
ISS_Infl_Simil$_{ij}$	Indicator variable equal to 1 if the firms in the pair belong to the same quintile in the distribution of the percentage of outstanding shareholders owned by institutional investors, and 0 otherwise

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_Industry$_{ij}$	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
Firm-level Explanatory Variables	
Ave_Comp_Dist$_i$	Row average of matrix of pairwise Euclidean distances between compensation component mix vectors
Ave_PM_Dist$_i$	Row average of matrix of pairwise Euclidean distances between performance measurement mix vectors
ROA_sd$_i$	Standard deviation of firm-level return on assets over the three years ending with the year prior to the fiscal year of interest for this study
RET_sd$_i$	Standard deviation of firm-level stock returns over the three years ending with the year prior to the fiscal year of interest for this study
Sales_log$_i$	Logarithm of firm-level sales revenues for the fiscal year of interest in this study
Inv_Opp$_i$	Firm-level market-to-book ratio for the fiscal year of interest in this study
Log_Enterprise_Value$_i$	Logarithm of firm-level enterprise market value for the fiscal year of interest in this study

TABLE 5
DESCRIPTIVE STATISTICS

Panel A: Dependent variables

	N	Mean	Std. Dev.	50th perc.	25th perc.	75th perc.
Pair-level Dependent Variables						
$Comp\_Dist_{ij}$	596,378	0.774	0.827	0.547	0.335	0.892
PM_Dist_{ij}	597,871	0.351	0.195	0.328	0.207	0.468
Firm-level Dependent Variables						
$Excess\_Comp\_Scaled_i$	602	-0.150	0.787	-0.003	-0.313	0.167
ROA_i	1096	4.641	10.734	4.418	1.322	8.728
RET_i	775	0.183	0.317	0.147	0.019	0.297

Panel B: Explanatory variables

	N	Mean	Std. Dev.	50th perc.	25th perc.	75th perc.
Pair-level Network Determinants						
$Dir\_Interlock_{ij}$	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
$Shared\_Blockholder_{ij}$	603,351	0.604	0.489	1.000	0.000	1.000
$CC\_Interlock_{ij}$	603,351	0.004	0.062	0.000	0.000	0.000
$Shared\_Cons\_ECent_{ij}$	603,351	0.025	0.108	0.000	0.000	0.000
$Shared\_Blockholder\_ECent_{ij}$	603,351	0.412	0.341	0.698	0.000	0.698
Pair-level Control Variables						
$Econ\_Simil_{ij}$	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
$Same\_Industry_{ij}$	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
$ISS\_Infl\_Simil_{ij}$	603,351	0.169	0.376	0.000	0.000	0.000
Firm-level Predictors						
$Ave\_Comp\_Dist_i$	1093	0.775	0.538	0.635	0.570	0.765
$Ave\_PM\_Dist_i$	1095	0.350	0.094	0.334	0.286	0.373
ROA_sd_i	1093	3.344	6.524	1.575	0.667	3.424
RET_sd_i	756	0.229	0.232	0.164	0.080	0.297
$Sales\_log_i$	1095	8.252	1.490	8.234	7.331	9.174
Inv_Opp_i	1048	6.042	33.251	2.275	1.417	3.679
$Log\_Enterprise\_Value_i$	1037	3.857	0.604	3.834	3.540	4.211

Panel C: Additional information

	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 a shared blockholder	361,021	60.38%
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%
Number of pairs with similar exposure to ISS	101,598	16.99%
Average number of interlocks per firm (std. dev.)	5.028 (4.133)	
Average number of connections via common compensation consulting firms per firm (std. dev.)	79.551 (74.202)	
Average number of connections via shared blockholder per firm (std. dev.)	660.055 (346.781)	

Notes: *Panels A and B*: (1) The total number of pairs in Panel B (N) is calculated as (*M*(M-1)/2*), where M is the number of firms in the sample as reported in Table 6.The number of pairs (N) in Panel A differs from the one reported in Panel B due to missing information that prevented the dependent variable from being quantified. (2) For the firm-level variables, N refers to the number of firms included in my sample as described in Table 1. *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 as units of analysis.

TABLE 6
REGRESSION ANALYSES: DETERMINANTS OF THE DISTANCE BETWEEN COMPENSATION VECTORS

Panel A: Determinants of the Euclidean distance between vectors of compensation components (double-clustered standard errors in brackets)

DV = Comp_Dist$_{ij}$	**Unstandardized Variables**			**Standardized Variables**		
	Model 0	**Model 1**	**Model 2**	**Model 0**	**Model 1**	**Model 2**
Dir_Interlock$_{ij}$		-0.102***	-0.061**		-0.008***	-0.005**
		[0.024]	[0.030]		[0.002]	[0.002]
Shared_Cons$_{ij}$		-0.131***	-0.120***		-0.041***	-0.038***
		[0.025]	[0.037]		[0.008]	[0.012]
Shared_Blockholder$_{ij}$		-0.340***	0.288*		-0.201***	0.170*
		[0.052]	[0.166]		[0.031]	[0.098]
CC_Interlock$_{ij}$			-0.055**			-0.004**
			[0.024]			[0.002]
Shared_Cons_ECent$_{ij}$			-0.027			-0.004
			[0.102]			[0.013]
Shared_Blockholder_ECent$_{ij}$			-0.916***			-0.378***
			[0.267]			[0.110]
Same_Industry$_{ij}$	0.073***	0.065***	0.063***	0.018***	0.016***	0.015***
	[0.024]	[0.023]	[0.023]	[0.006]	[0.006]	[0.006]
Gov_Simil$_{ij}$	-0.032***	-0.016	-0.016	-0.059***	-0.030	-0.029
	[0.011]	[0.010]	[0.010]	[0.021]	[0.019]	[0.019]
Same_ZIP$_{ij}$	0.083***	0.071**	0.068**	0.016***	0.014**	0.013**
	[0.029]	[0.028]	[0.027]	[0.006]	[0.005]	[0.005]
Econ_Simil$_{ij}$	-0.043***	-0.036***	-0.036***	-0.049***	-0.041***	-0.041***
	[0.006]	[0.006]	[0.006]	[0.007]	[0.007]	[0.007]
Comp_Peers$_{ij}$	-0.139***	-0.103***	-0.101***	-0.024***	-0.018***	-0.018***
	[0.037]	[0.036]	[0.036]	[0.006]	[0.006]	[0.006]
ISS_Infl_Simil$_{ij}$	-0.023**	-0.016*	-0.015*	-0.011**	-0.007*	-0.007*
	[0.010]	[0.009]	[0.009]	[0.005]	[0.004]	[0.004]
Intercept	0.901***	1.068***	1.067***	0.001	0.002	0.004
	[0.045]	[0.065]	[0.065]	[0.032]	[0.031]	[0.032]
N	592,018	592,018	592,018	592,018	592,018	592,018
R^2	0.007	0.049	0.053	0.007	0.049	0.053

Panel B: Determinants of the Euclidean distance between vectors of performance measures (double-clustered standard errors in brackets)

DV = PM_Dist$_{ij}$	**Unstandardized Variables**			**Standardized Variables**		
	Model 0	**Model 1**	**Model 2**	**Model 0**	**Model 1**	**Model 2**
Dir_Interlock$_{ij}$		-0.018***	-0.014**		-0.006***	-0.005**
		[0.004]	[0.006]		[0.002]	[0.002]
Shared_Cons$_{ij}$		-0.001	-0.017**		-0.001	-0.022**
		[0.005]	[0.007]		[0.006]	[0.010]
Shared_Blockholder$_{ij}$		-0.004	-0.001		-0.010	-0.002
		[0.006]	[0.014]		[0.015]	[0.034]
CC_Interlock$_{ij}$			-0.006			-0.002
			[0.006]			[0.002]
Shared_Cons_ECent$_{ij}$			0.045**			0.025**
			[0.023]			[0.013]
Shared_Blockholder_ECent$_{ij}$			-0.004			-0.007
			[0.021]			[0.036]
Same_Industry$_{ij}$	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Gov_Simil$_{ij}$	-0.003**	-0.003**	-0.003**	-0.022**	-0.021**	-0.021**
	[0.001]	[0.001]	[0.001]	[0.009]	[0.009]	[0.009]
Same_ZIP$_{ij}$	0.006	0.006	0.007	0.005	0.005	0.005
	[0.005]	[0.005]	[0.005]	[0.004]	[0.004]	[0.004]
Econ_Simil$_{ij}$	-0.005***	-0.005***	-0.005***	-0.026***	-0.025***	-0.025***
	[0.001]	[0.001]	[0.001]	[0.004]	[0.004]	[0.004]
Comp_Peers$_{ij}$	-0.021***	-0.021***	-0.021***	-0.016***	-0.015***	-0.015***
	[0.004]	[0.004]	[0.004]	[0.003]	[0.003]	[0.003]
ISS_Infl_Simil$_{ij}$	-0.003**	-0.003**	-0.003**	-0.007**	-0.006**	-0.006**
	[0.002]	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]
Intercept	0.364***	0.366***	0.366***	0.000	0.000	0.000
	[0.006]	[0.007]	[0.007]	[0.023]	[0.023]	[0.023]
N	597,871	597,871	597,871	597,871	597,871	597,871
R^2	0.002	0.002	0.002	0.002	0.002	0.002

Notes: (1) Table 7 reports estimation results for *Eq.(1)*:

$$
\begin{aligned}
Comp\_Simil_{ij,t} = {} & \alpha_{ij,t} + \beta_1 Dir\_Interlock_{ij,(t-1)} + \beta_2 Shared\_Cons_{ij,(t-1)} \\
& + \beta_3 Shared\_Blockholder_{ij,(t-1)} + \beta_4 CC\_Interlock_{ij,(t-1)} + \\
& + \beta_5 Shared\_Cons\_ECent_{ij,(t-1)} + \beta_6 Shared\_Blockholder\_ECent_{ij,(t-1)} \\
& + \beta_7 Same\_Industry_{ij,(t-1)} + \beta_8 Gov\_Simil_{ij,(t-1)} + \beta_9 Same\_ZIP_{ij,(t-1)} + \beta_{10} Econ\_Simil_{ij,(t-1)} \\
& + \beta_{11} Comp\_Peers_{ij,(t-1)} + \beta_{12} ISS\_Infl\_Simil_{ij,(t-1)} + \varepsilon_{ij,t}
\end{aligned}
$$

The dependent variable is the pairwise Euclidean distance of all pairs included in the study. The Euclidean distance approximates the degree of residual similarity between contracts (smaller distance = higher similarity). The predictors are defined in Table 2. (2) Columns 2-4 report estimations using raw variables. Columns 5-7 report results of estimations performed using standardized variables. (3) 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. Model 1 estimates the main effects of the interlock and compensation consultants' network, respectively, on compensation design residual similarity. Model 2 represents the full estimation of Eq. (1). (4) All estimations are performed using OLS with double-clustering of errors. (5) 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 7
ANALYSIS OF HOMOPHILY
QAP CORRELATION TABLE

	$CC\_Interlock_{ij}$	$Comp\_Peers_{ij}$	$Econ\_Simil_{ij}$	$Same\_ZIP_{ij}$	Gov_Simil_{ij}	$Same\_Industry_{ij}$	$Dir\_Interlock_{ij}$	$Shared\_Cons_{ij}$	$Shared\_Blockholder_{ij}$
$CC\_Interlock_{ij}$	1.000								
$Comp\_Peers_{ij}$	0.035 ***	1.000							
$Econ\_Simil_{ij}$	0.015 ***	0.093 ***	1.000						
$Same\_ZIP_{ij}$	0.040 ***	0.042 ***	0.011 ***	1.000					
Gov_Simil_{ij}	0.017 ***	0.043 ***	0.057 ***	0.002	1.000				
$Same\_Industry_{ij}$	0.012 ***	0.255 ***	0.054 ***	0.046 ***	0.015 ***	1.000			
$Dir\_Interlock_{ij}$	0.786 ***	0.037 ***	0.016 ***	0.045 ***	0.019 ***	0.014 ***	1.000		
$Shared\_Cons_{ij}$	0.023 ***	0.023 ***	0.022 ***	0.011 ***	0.024 ***	0.013 ***	0.022 ***	1.000	
$Shared\_Blockholder_{ij}$	0.014 ***	0.033 ***	0.048 ***	-0.016 ***	0.151 ***	-0.001 ***	0.013 ***	0.039 ***	1.000

Notes: (1) All correlations are calculated using quadratic assignment procedures (see Appendix B). (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 8
ANALYSIS OF FIRM-LEVEL EFFECTS OF COMPENSATION SIMILARITY

Panel A: Regression of excess compensation on compensation similarity (heteroskedasticity robust standard errors in brackets)

DV = Excess_Comp_Scaled$_i$	***Excess_Comp_Scaled***
Ave_Comp_Dist$_i$	-0.780***
	[0.134]
Ave_PM_Dist$_i$	0.012
	[0.043]
Intercept	-0.168***
	[0.049]
N	601
Adj-R^2	0.050

Panel B: Regression of firm operating performance on compensation similarity (heteroskedasticity robust standard errors in brackets)

DV = ROA$_i$	***ROA***
Ave_Comp_Dist$_i$	-0.046
	[0.031]
Ave_PM_Dist$_i$	0.000
	[0.040]
ROA_sd$_i$	-0.378***
	[0.132]
Sales_log$_i$	-0.051
	[0.054]
Intercept	0.465
	[0.396]
N	1081
Adj-R^2	0.201

Panel C: Regression of firm operating performance on compensation similarity (heteroskedasticity robust standard errors in brackets)

DV = RET$_i$	***RET***
Ave_Comp_Dist$_i$	-0.123**
	[0.056]
Ave_PM_Dist$_i$	-0.045
	[0.032]
RET_sd$_i$	0.273***
	[0.077]
Inv_Opp$_i$	0.010
	[0.033]
Log_Enterprise_Value$_i$	0.108***
	[0.041]
Intercept	-0.576
	[0.531]
N	708
Adj-R^2	0.261

Notes: Table 8 reports the results of my analyses of consequences of residual similarity in compensation design. (1) Panel A reports the estimation of *Eq (2):*

$$Excess\_Comp\_Scaled_i = \alpha_i + \beta_1 Ave\_Comp\_Dist_i + \beta_2 Ave\_Comp\_Dist_i + \varepsilon_i$$

Panel B reports the estimation of *Eq. (3):*

$$ROA_i = \alpha_i + \beta_1 Ave\_Comp\_Dist_i + \beta_2 Ave\_Comp\_Dist_i + \beta_3 ROA\_sd_i + \beta_4 Sales\_\log_i + \varepsilon_i$$

and Panel C reports the estimations of *Eq. (4):*

$$Stock\_\mathrm{Re}t_i = \alpha_i + \beta_1 Ave\_Comp\_Dist_i + \beta_2 Ave\_Comp\_Dist_i + \beta_3 Stock\_\mathrm{Re}t\_sd_i + \beta_4 Inv\_Opp_i + \beta_5 Log\_Enterprise\_Value_i + \varepsilon_i$$

(2) All estimations are performed using standardized variables. (3) All estimations are performed using OLS with heteroskedasticity robust standard errors. (4) The statistical significance of the estimated coefficients is based on the p-values associated with the estimations. * = ($p<0.10$); ** = ($p<0.05$); *** = ($p<0.01$).