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Working Paper No. 026

How Law Changes Networks:
A Social Network Analysis of Board Interlocks

Moran Ofir
Interdisciplinary Center (IDC)

January 2019

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A Social Network Analysis of Board Interlocks

Moran Ofir*

This paper empirically examines the market's reaction to increased corporate governance provisions which were applied to pyramid-structured corporations. Specifically, it examines the influence of legal provisions dealing with the composition of boards of directors on the intensity of board connectivity. For this purpose, two databases have been specially constructed. One reflects the situation prior to the entry of the law into force, and the other, reflects the situation afterwards. These databases have been analyzed using social network analysis methodologies. The findings show that following the entry into force of these legal provisions, the average number of directors per board dropped, as did the average number of board seats held by each director. In addition, the level of connectivity of the board interlocks within the large public corporations dropped. The intensity of the decline was lower than what could be expected under complete adherence to the minimal standard required in primary and secondary legislation.

* Assistant Professor, Radzyner Law School, Interdisciplinary Center (IDC), Herzliya. mofir@idc.ac.il

I would like to thank Gil Appel, Assaf Hamdani, Ehud Kamar, Alon Klement, Benny Lauterbach, Amir Licht, Kate Litvak, Alan Miller, Oren Perez, Uriel Procaccia, Hans-Berns Schafer, Avishalom Tor and the participants of Oxford Business Law Workshop, 2017 European Association for Law and Economics (EALE) Annual Conference, NYU-TAU Corporate Law Conference, Law and Time: An International Conference at IDC Herzliya, Haifa University Law and Economics Workshop, Hebrew University Law and Corporate Finance Conference and Social Network Analysis: Law, Institutions and Transnational Governance, Research Workshop of the Israel Science Foundation and Maya Abramovich and Dor Paska for excellent research assistance. For financial support I would like to thank the Raymond Ackerman Chair in Israeli Corporate Governance. The main findings of this research appeared in the Oxford Business Law Blog https://www.law.ox.ac.uk/business-law-blog/blog/2017/05/how-law-changes-networks-social-network-analysis-board-interlocks

Introduction

The Israeli market is characterized by a concentrated ownership structure. Most publicly traded firms in the Tel Aviv Stock Exchange (TASE) have a controlling block, and many public firms are controlled by a small number of business groups. Approximately one quarter of the publicly-traded firms belongs to 25 business groups, and their total weight in the market value of all public firms is estimated at 69%.[1] These business groups are characterized by large diversification across industries, high leverage,[2] combinations of real and financial assets,[3] and, most importantly for our purposes – a shared network of directors.

The Israeli network of directors is also characterized by high concentration and connectivity.[4] Many directors sit on several boards simultaneously and the boards of many firms are comprised of several interlocked directors, who sit on other boards as well. Much alike the business groups in Israel, the network of directors is characterized by inter-branch connectivity, and by connections between real and financially-oriented firms, while a significant portion of directors who sit on the boards of financial firms in Israel also serve as directors in real firms.[5]

An extensive literature shows that the level of connectivity in board interlocks has significant consequences for the performance and corporate governance practices of various firms.[6] The connections between firms via directors were found to be a pathway for transferring information and propagating either positive or negative practices across

[1] THE COMMITTEE ON INCREASING COMPETITIVENESS IN THE ECONOMY, FINAL RECOMMENDATIONS AND SUPPLEMENT TO THE INTERIM REPORT 9 (2012).

[2] Israel's ten largest business groups represent about half the overall off-bank credit. See *id.*

[3] About half of the Israeli financial firms belong to business groups. TAMIR AGMON & AMI TZADIK, BUSINESS GROUPS IN ISRAEL – DESCRIPTION, ANALYSIS AND RECOMMENDATIONS 2 (Knesset Research and Information Center, 2010).

[4] The network of directors in Israel was found to be a "small world", and that it was possible to get from every director to every other director within only 5-6 steps. Eyal Solgenik, Yitzhak Suary & Liron Constantine, *Directors of Public Companies Network in Israel*, *in* 11 L. & BUS. 251 (2009).

[5] THE COMMITTEE ON INCREASING COMPETITIVENESS IN THE ECONOMY, *supra* note 1, at 25.

[6] Amir N. Licht, *Culture and Law in Corporate Governance*, *in* OXFORD HANDBOOK OF CORPORATE LAW AND GOVERNANCE (Jeff Gordon & Georg Ringe eds., forthcoming); Michal Barzuza & Quinn Curtis, *Board Interlocks and Corporate Governance*, 39 DEL. J. CORP. L. 669 (2014); John Bizjak, Michael Lemmon & Ryan Whitby, *Option Backdating and Board Interlocks*, 22 REV. FIN. STUD. 4821 (2009); Peng-Chia Chiu, Siew Hong Teoh & Feng Tian, *Board Interlocks and Earnings Management Contagion*, 88 ACCT. REV. 915 (2013); Christa H. S. Bouwman, *Corporate Governance Propagation through Overlapping Directors*, 24 REV. FIN. STUD. 2358 (2011); Robert Schonlau & Param Vir Singh, *Board Networks and Merger Performance* (Working Paper, Tepper School of Business, 2009); Marielle C. Non & Philip Hans Franses, *Interlocking Boards and Firm Performance: Evidence from a New Panel Database* (Discussion Paper, Tinbergen Institute, 2009); Thomas C. Omer, Marjorie K. Shelley & Frances M. Tice, *Do Director Networks Matter for Financial Reporting Quality? Evidence from Restatements* (2016), *available at* https://ssrn.com/abstract=2379151; Stephen P. Ferris, Murali Jagannathan & A. C. Pritchard, *Too Busy to Mind the Business? Monitoring by Directors with Multiple Board Appointments*, 58 J. FIN. STUD. 1087 (2003); Eliezer M. Fich & Anil Shivdasani, *Are Busy Boards Effective Monitors?* 61 J. FIN. STUD. 689 (2006); Eliezer M. Fich & Anil Shivdasani, *Financial Fraud, Director Reputation, and Shareholder Wealth* 86 J. FIN. ECON. 306 (2007); David F. Larcker, Eric C. So & Charles C.Y. Wang, *Boardroom Centrality and Firm Performance* 55 J. FIN. ECON. ACCT. 225 (2013)

various firms in the market. In general, it was found that firms tend to have corporate governance practices similar to those of other firms with which they share directors.[7] Specifically, characteristics affected by interlocked directors are board size, board independence, whether the CEO is also chairperson of the board, and CEO and director compensation. In fact, two coexisting tendencies are noted: firms tend to (1) elect their directors from among those who sit on boards of firms similar in the aforementioned characteristics;[8] and (2) show stronger similarities with regard to these characteristics after electing an interlocked director, or after their acting directors join other boards.[9]

With regard to *negative practices*, high levels of connectivity were found to increase the probability for option backdating.[10] Additionally, firms in which most outside directors hold three or more director positions in other firms are more commonly associated with poor corporate governance, produce a lower market-to-book ratio, have lower profitability and show less sensitivity to the correlation between CEO replacement and firm performance.[11]

In addition, the removal of interlocked directors produces abnormal positive return, and on the other hand, the election of an acting director to the board of an additional firm creates abnormal low return.[12] Another study shows that poison pill practices are adopted by American firms via their spread across firms through interlocked directors. Specifically, a firm's connection through an interlocked director to a company that has adopted poison pill practices increases the probability of adoption by over 50%.[13]

With regard to *positive practices,* the post-merger financial performance of acquiring firms with interlocked boards is higher by approximately 7% to 12% than that of acquiring firms with boards characterized by lower levels of connectivity.[14] Furthermore, firms with boards that are more interlocked obtain higher profits.[15]

In light of these findings, and of the unique characteristics of the Israeli capital market, the Promotion of Competition and Reduction of Concentration Law (hereinafter, *Concentration Law*)[16] was enacted. The law is designed to enhance the market's competitive structure, improve its efficiency and stability, and increase public

[7] Bouwman, *supra* note 6, at 2359.
[8] *Id.* at 2360.
[9] *Id.* at 2360–2361.
[10] Bizjak, Lemmon & Whitby, *supra* note 6.
[11] Fich & Shivdasani, *supra* note 6.
[12] See *id.*
[13] Gerald F. Davis & Henrich R. Greve, *Corporate Elite Networks and Governance Changes in the 1980s*, 103 AM. J. SOC. 1 (1997).
[14] Schonlau & Vir Singh, *supra* note 6.
[15] Larcker, So & Wang, *supra* note 6.
[16] Promotion of Competition and Reduction of Concentration Law, 5774-2013, SH No. 2420 p. 92 (Isr.)

welfare.[17] To achieve these goals, it lays down an array of provisions relating to three primary fields: regulation of control through pyramid-structured holdings,[18] regulation of real and financial holdings,[19] and conditions for the allocation of public assets.[20]

In the Concentration Law, the section dealing with regulation of pyramid-structured holdings contains an outline for the transition of the market to a holdings structure of no more than two tiers. Since the structural changes required by the outline are fundamental, the law provides a period of four to six years for the dismantling of existing pyramids.[21] For the duration of this period, it lays down strict corporate governance provisions for firms found in the third or further tiers of the pyramids.[22] Essentially, these require that a majority of board members be independent directors,[23] and that at least half of the sitting directors, minus one, be outside directors.[24]

Since the legislation entered into force, regulations providing for an easement of the requirements regarding the number of outside directors were enacted.[25] The regulations enable firms in the third tier and above to reduce the number of outside directors in two instances: when directors are appointed according to a nomination by a shareholder who is not the controlling shareholder or his relative, and when directors are appointed according to a nomination of a representative workers union.[26] In both, the required number of outside directors will be reduced by the number of directors appointed in said manners, while maintaining a minimum of one third of total board members.

This paper empirically examines the market's reaction to these corporate governance provisions, and specifically, their effect on the intensity of board connectivity in Israel. Two databases were especially constructed for this purpose, with detailed information on the boards of the fifty largest publicly traded firms in Israel. One database reflects the situation six months prior to the entry of the Concentration Law into force, and the other reflects the situation six months afterwards.[27] These datasets

[17] THE COMMITTEE ON INCREASING COMPETITIVENESS IN THE ECONOMY, *supra* note 1, at 4.
[18] Chapter III of the *Concentration Law.*
[19] Chapter IV of the *Concentration Law*.
[20] Chapter II of the *Concentration Law*.
[21] *Concentration Law*, § 25.
[22] Referred to in the *Concentration Law* as "other tier firms".
[23] *Concentration Law*, § 25(d)(1). An independent director, as defined in § 1 of the Company Law, 5759-1999, SH 1711 p. 189 (Isr.), is a director eligible for appointment as an outside director, and who has not sat on the firm's board for more than nine consecutive years.
[24] *Concentration Law*, § 25(d)(2). The provisions dealing with independent directors are found in § 5 of the first chapter of Part VI of the Company Law. The essential requirements for eligibility to be appointed as outside director are the absence of attachments to the firm, its controlling shareholder or key position holders in the firm's management.
[25] Promotion of Competition and Reduction of Concentration Regulations (Easements Regarding Number of Outside Directors), 5774-2014, KT 7382 p. 1188 (Isr.) [Hereinafter *Easements Regarding Number of Outside Directors*].
[26] *Easements Regarding Number of Outside Directors*, § 1.
[27] The provisions dealing with board composition in other-tier firms entered into force on June 11, 2014.

were processed and analyzed using social network analysis software in order to examine the changes that occurred in various connectivity indices as a result of the legislation.

Social Network Analysis

Social network analysis is a methodology for the discovery and analysis of social networks and relationship patterns between individuals comprising the network.[28] This analysis reflects the connection patterns between the individuals within the network using a mathematical analysis of the relations between them, and helps produce both quantitative findings on relationship intensity, and visual findings that enable the unprofessional observer to be impressed with the intensity of connections and the patterns of relations. The indices produced by the analysis provide insights into the role of individuals and different groups within the wider social network, and inter alia help reveal informal roles of entities in the social network. For the presentation and analysis of our results, several basic social network analysis terms are defined below.

Vertex is the set of entities that form a connection amongst themselves, within the network. Entities in this paper include both directors and firms, together comprising the entire sample.

Edge is the manner in which entities within the network are connected. In this paper, the manner in which entities are connected is sitting together on the same board.

Graph Density indicates the number of existing edges in the network, out of all possible edges. The graph will reflect a higher level of density as the amount of edges in the network increases relative to the maximal possible amount of edges in that same network.

Degree of Connectivity indicates the number of direct connections an entity within the network has with others. The degree of connectivity reflects the direct communication channels a director has within the network, through which information and practices may spread.

Closeness Centrality indexes an entity's proximity to all other entities within the network. Practically, the index reflects the speed in which information is transferred and practices are diffused throughout the network. The value of this index is high when connections between entities are close, i.e., when the number of steps required to move from one board to another is low. Practices spread faster as the number of steps is lower.

Betweenness Centrality indexes information flow within the network by examining, per entity, the amount of times it is positioned in the shortest route between every pair of entities within the network. In practice, the index measures the role of every entity in

[28] For further information, see JOHN SCOTT, SOCIAL NETWORK ANALYSIS (3rd ed. 2013).

transferring information and spreading practices across firms. A high value in this index indicates that the entity that it represents is a significant factor in the communications between other entities included in the sample.

There exist several possibilities to model the relationship between directors using social network analysis. One is to examine the network of directors in a model that has two vertex populations: vertices that represent directors, and vertices that represent the firms on whose boards the directors sit. In this model, edges connect the two populations, but do not connect vertices from the same population. That is to say, an edge connects a director and a firm if the director sits on that firm's board.

Another possibility is to model the network in a manner that refers to only one population of vertices – directors. An edge connecting two vertices will exist when both directors sit on at least one shared board. Therefore, each vertex is a director connected with all other directors sitting on the same board. A director sitting on several boards is represented in the network by a single vertex, but is connected with every director that sits on the same boards as she.

This paper reports analyses based on the two different models, in order to produce a rich and varied view of the board interlocks in Israel. Furthermore, analyzing the network utilizing two different models enables to assess the robustness of the findings and phenomena observed by each. If the outcomes of both models reflect the same tendency, this will enhance the validity of its existence worldwide, regardless of which specific model is used.

The Data

For the purpose of this research, data on the fifty largest publicly traded firms in Israel were gathered. The datasets based on the firms included in TASE's TA-100 index. The data were gathered from TASE's MAYA website. Data missing from the website were recovered from the Dun & Bradstreet Directors website, as well as the Bizportal website. The data were gathered for two points in time: January 2014 and January 2015, approximately six months before and after the entry into force of the additional corporate governance provisions regarding pyramid-structured corporations. Firms removed from the TA-100 index during the examined period were removed from the samples examined, in order for the comparison of samples to be based on an identical number of firms.[29]

[29] During the 1-year period examined, six firms were removed from TA-100: Avner Oil & Gas Ltd., Alrov Properties Ltd., Given Imaging Ltd., Delek Drilling – Limited Partnership, Koor (merged into Discount Investment Group Ltd.) & Clal Insurance Ltd.

The data gathered include the list of all directors sitting on the boards of the aforementioned firms. For each director, we examined whether they were the board chairperson or vice chairperson; an outside director; an independent director; a director with accounting and financial expertise;[30] and also a member of the firm's audit committee. Additionally, for each firm, we examined its position within a pyramid-structured business group, and specifically, its tier location.

Table 1: Descriptive statistics:

Year	**No. of directors in network**	**No. of directors on board**			**No. of boards each director sits on**		
		Mean	Median	SD	Mean	Median	SD
2014	365	9.75	10	4	1.1753	1	0.4704
2015	378	9.56	9	2.97	1.1111	1	0.3538

As evident from Table 1, the enactment of the Concentration Law was followed by an increase in the number of directors in the network. In addition, both the number of directors per board, and the number of boards an individual director sits on dropped. The combination of an increase in the total number of directors for the same sample and the drop in the number of boards an individual director sits on indicates that there is greater variety of directors in the network, and a smaller number of interlocked directors.

Analysis of Director Networks in Israel

The data gathered on Israeli director networks before and after the enactment of the Concentration Law were analyzed using two software packages to assess the law's impact on the network's connectivity indices.[31] In addition to calculating the various indices, the software provide a graphic display of the network's structure and array of connections in the examined periods. In order to compare the change reflected from the

[30] The definition of a director with accounting and financial expertise is found in § 1 of Company Regulations (Conditions and Tests for Directors with Accounting and Financial Expertise and for Professionally Competent Directors), 5766-2005, KT 6445 p. 198 (Isr.). Essentially, the director is required to have education, experience and skills that afford him expertise and understanding in business and accounting issues.

[31] The packages are NodeXL and Pajek. Most of the analyses were conducted using NodeXL, which was also used to produce the graphic displays. Pajek was used to shift from a database that includes firms and the directors sitting on their boards to a database that includes only the directors, but delineates connections between directors sitting on the boards of the same firms.

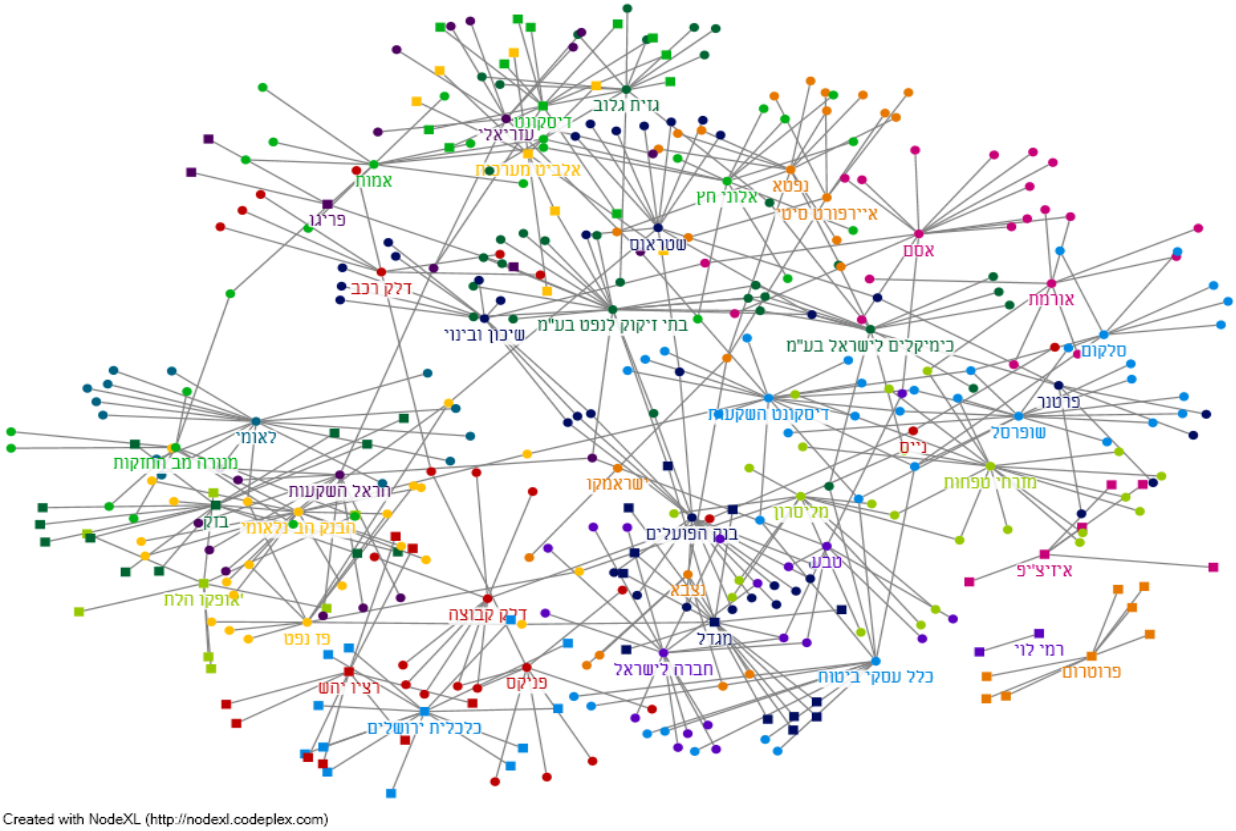
real data with the change expected to occur under complete adherence to the legislation, a simulation displaying the expected changes was conducted. In the simulation, one-third of the board members of all firms on the third tier or above were randomly swapped. According to the easement of requirements provided by the regulations, one third is the minimal amount of outside directors that must be appointed in such firms, while the majority of firms are in fact required to appoint even more. Therefore, the simulation reflects the minimal measure of change that was expected to occur following the application of the additional corporate governance provisions.

Board Interlocks *before* the Concentration Law

The following graph shows the connections between directors and firms in the Israeli market prior to the entry of the Concentration Law into force. Each firm is mentioned by name next to its representing vertex. The additional vertices are the directors. Directors sitting on numerous boards are represented by a single vertex and are connected by several edges to the vertices representing the firms.

As seen below, the network is complex and contains many edges between many firms via shared directors. The number of vertices is 409, the number of edges is 429, and the graph density is 0.0051. The mean degree of connectivity is 2.098 (min=1, max=19). The closeness centrality index is 0.02, and betweenness centrality is 480.489.

Graph 1: The network of directors in January 2014



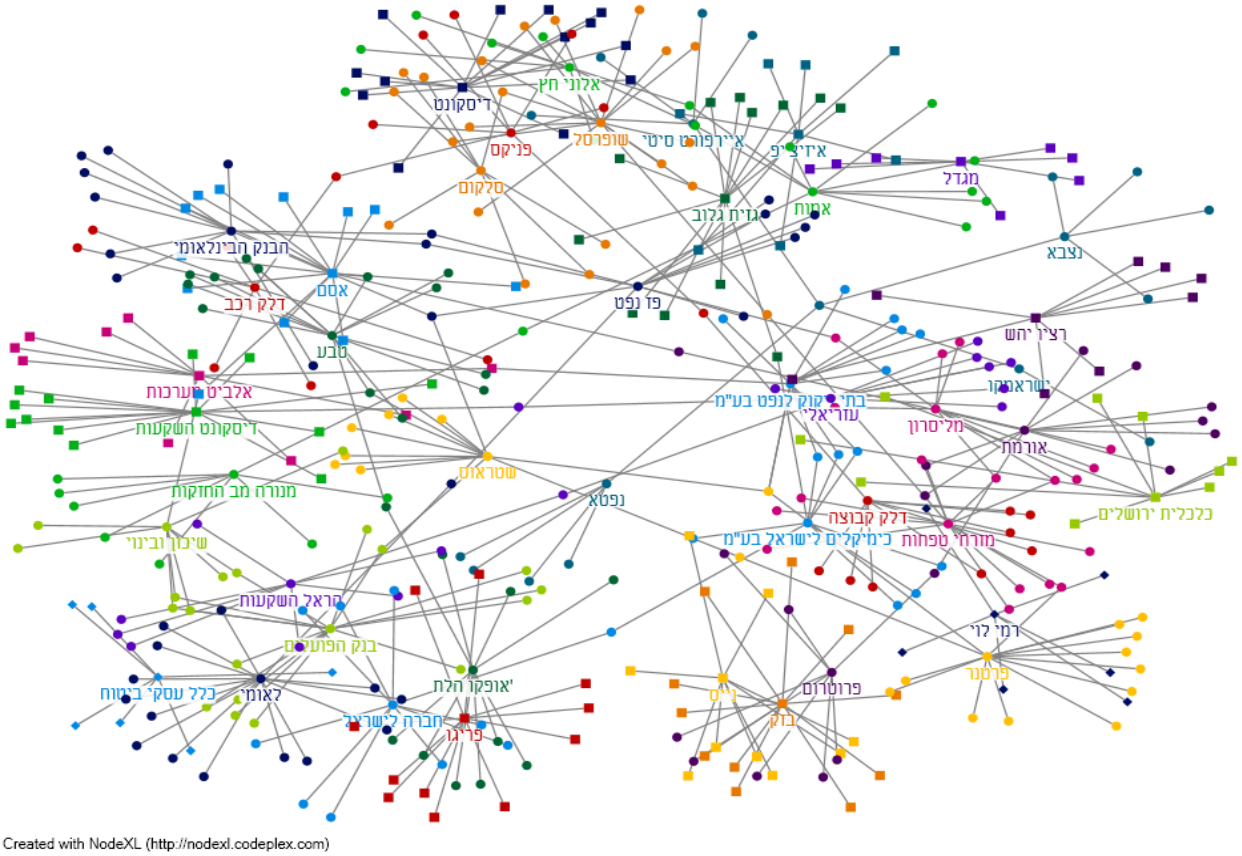
Created with NodeXL (http://nodexl.codeplex.com)

Board Interlocks *after* the Concentration Law

The following graph shows the connections between directors and firms in the Israeli market after the entry into force of the Concentration Law. Here as well, firms are mentioned by name next to their representing vertices. The edges that connect a firm on the one end and an unnamed vertex on the other end represent the connections between a firm and the directors sitting on its board. Directors sitting on numerous boards appear in the graph as a single vertex, connected to each of the different firms on the boards of which they sit.

The number of vertices in the network is 422 and there a clear increase in the number of directors in the network. This indicates a drop in the total number of shared directors. In addition, the number of edges dropped to 419. Graph density also declined slightly, to 0.0047. The mean degree of connectivity is 1.991 (min=1, max=15). Additionally, the closeness centrality index dropped to 0.019, and the betweenness centrality index to 397.815. Therefore, it appears that following the legislation, there was a decline in the various network connectivity indices. In order to examine the decline in these indices, relative to that which was expected, these results must be compared to those of the simulation that was conducted.

Graph 2: The network of directors in January 2015



Created with NodeXL (http://nodexl.codeplex.com)

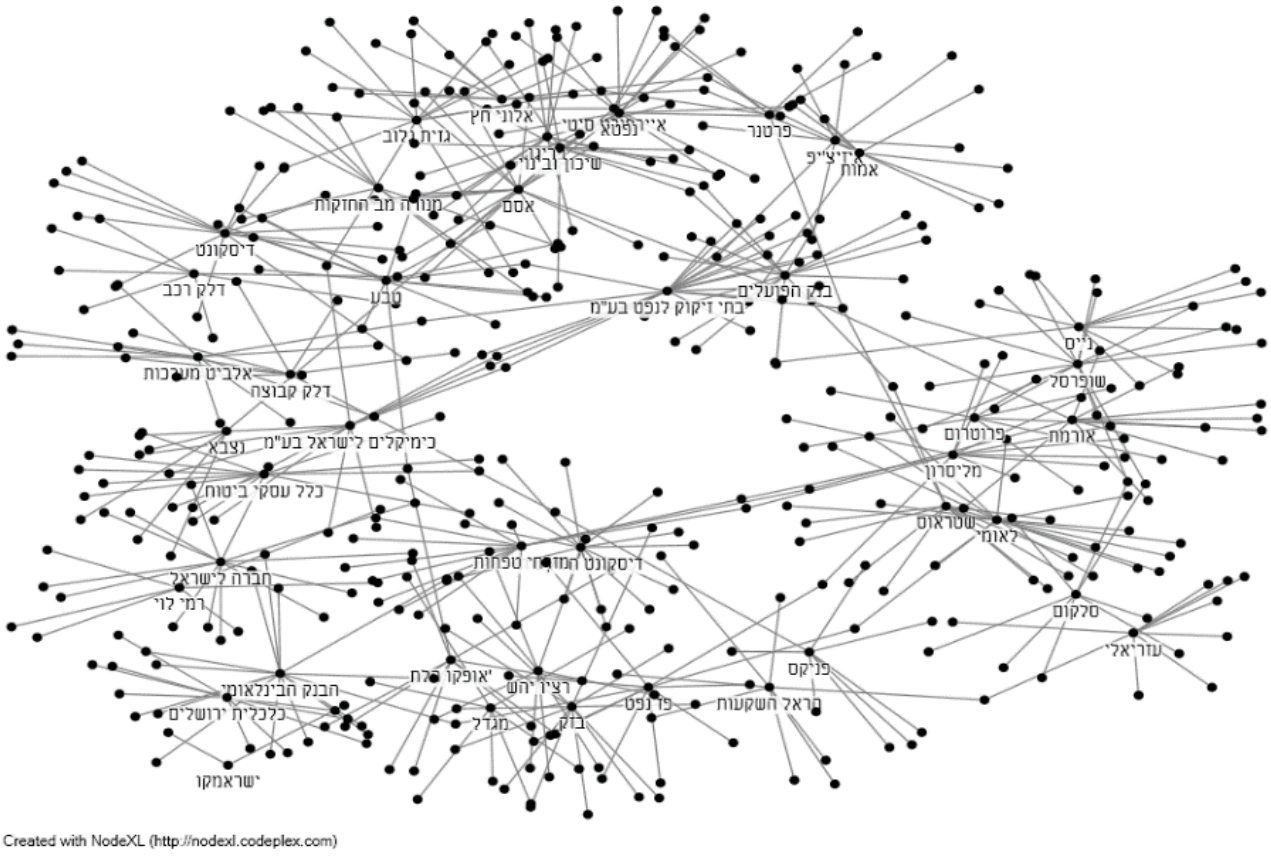
The Expected Board Interlock: Simulation Results

As mentioned, the simulation attempts to examine the expected appearance of the network under complete adherence to the additional corporate governance provisions within the Concentration Law. In the simulation, one third of board members were randomly swapped in the boards of all third- or further-tier firms in business groups with pyramidal structure. The selection of one third of the board, instead of half, is stricter with relation to the model, representing the minimal swap required in those firms. For most firms, the requirement remains half of the board, but as mentioned, for the purpose of simulating complete adherence to the minimal standard required by the law, the stricter requirement was selected.

The results of the simulation indicate that the decline in connectivity indices that occurred in reality was lower than expected. The amount of vertices in this network is 463, meaning an even higher number of different directors within the network, compared to that which existed in reality, could be expected. The expected number of edges is 449, which is also higher than the number observed in reality. Graph density is lower, and is set at 0.0041. The expected mean degree of connectivity is 1.94, and is also lower than that observed in actuality, meaning that we would expect every entity to have a smaller

number of edges than the number observed in reality. The closeness centrality and betweenness centrality indices in the expected network are 0.028 and 381.963, respectively, lower than their equivalents in the actual network observed after the law entered into force.

Graph 3: The expected network of directors under complete minimal compliance



Created with NodeXL (http://nodexl.codeplex.com)

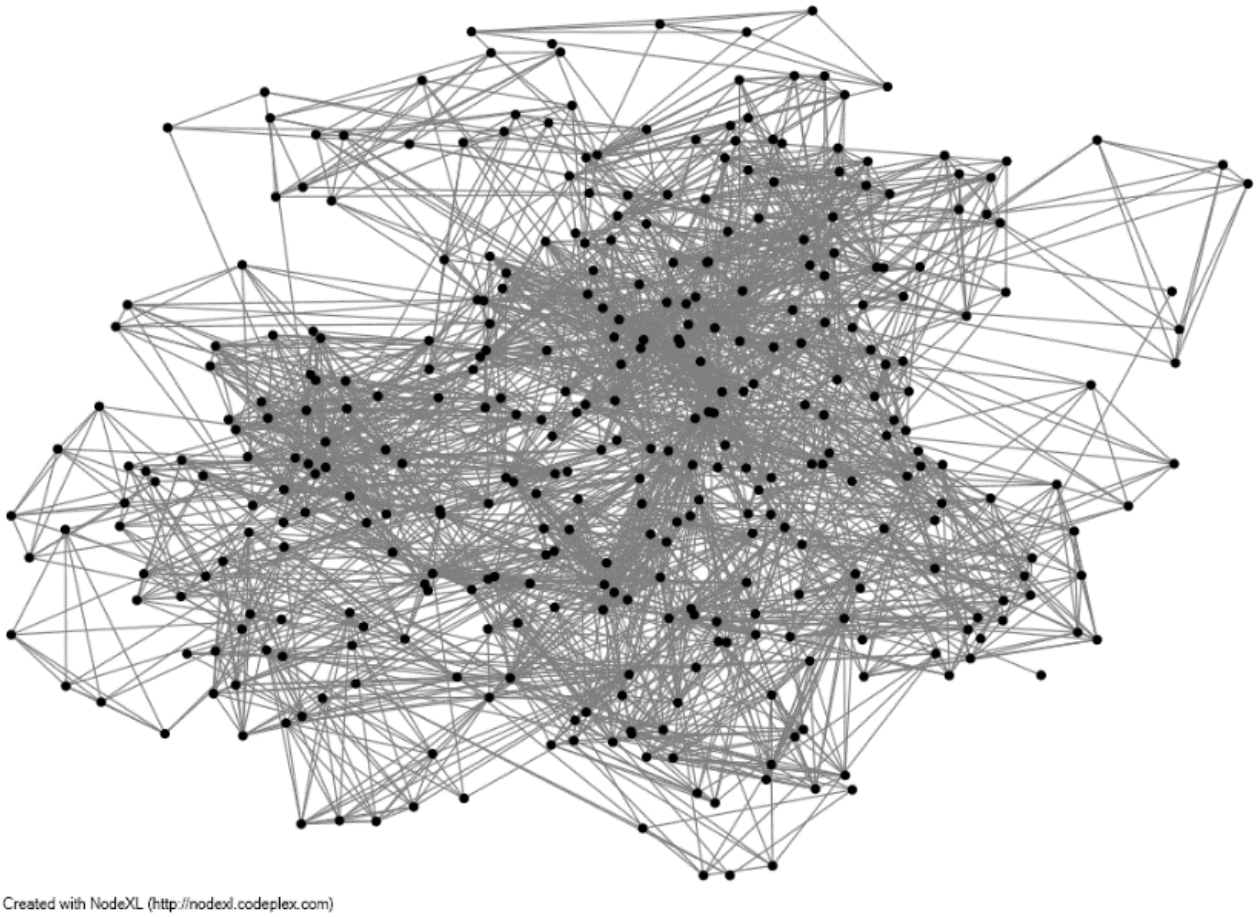
It can be easily observed that in the expected network there exists a "gap" at the center of the network, which does not exist in the actual network. That "gap" represents the removal of connections between directors and firms, which was required by law but not actually performed. From this, we can deduce that the network of directors that exists today is more connected and dense than the one expected under complete adherence to the minimal legal standard.

Analysis of Connections between Directors

Another analysis examines the direct connections between directors themselves, while firms are not treated as vertices in the network. In this analysis, every two directors who

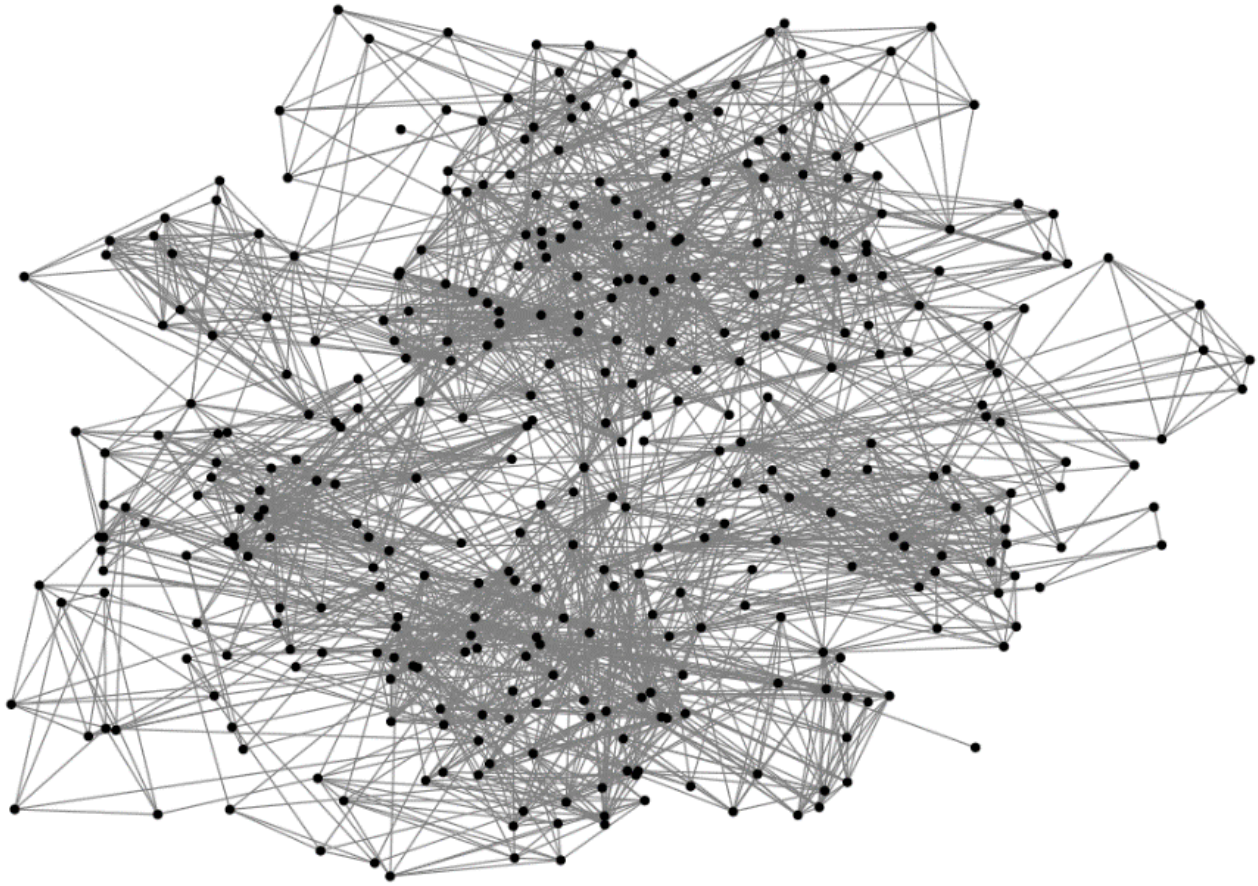
sit on the same board are connected to each other directly, rather than via firms as in the previous analysis. While the previous analysis also depicts inter-firm edges via shared directors, this analysis depicts inter-director edges only, and serves as another means for examining the robustness of the results.

Graph 4: Inter-director connectivity in January 2014



This network depicts inter-director edges prior to the entry of the Concentration Law into force. It contains 362 vertices and 2178 edges. Graph density is 0.0333, and the mean degree of connectivity is 12.033 (min=1, max-38). It is evident that when examining the direct connections between directors, without accounting for firms as an intermediary element, a more complex and connected network is revealed. In order to examine the effects of the Concentration Law on this complex network, these findings must be compared to the network's characteristics after the legislation entered into force.

Graph 5: Inter-director connectivity in January 2015



This network depicts inter-director edges after the entry of the Concentration Law into force. This network contains 373 vertices, a fact which reflects the increase in the number of different directors, stemming from adherence to the requirements set in the law. The network contains 1945 edges, which indicate a decline in the number of inter-director connections. Graph density also declined, to 0.028. The mean degree of connectivity follows the general trend by falling to 10.429 (min=1, max=37). The minuscule difference in the maximal degree of connectivity characterizing an entity in the network indicates that even after the application of the Concentration Law, there are still some directors with a plethora of connections with other directors.

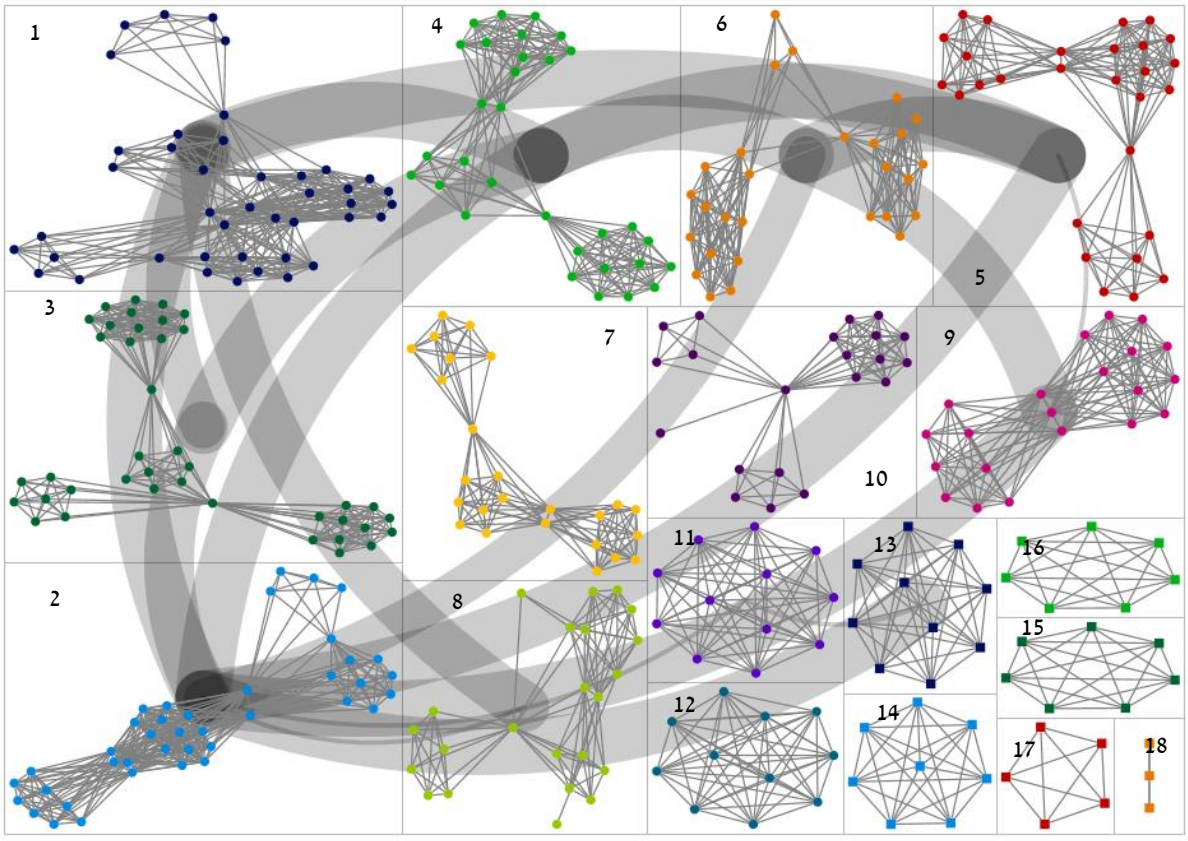
Dividing the Network to Groups of Firms

In this analysis, we divided the network into groups of firms based on the level of connections, reflected by the number of shared directors. The division process was conducted under the Clauset-Newman-Moore algorithm,[32] which helps characterize the structure of large networks. We divided the firms into several groups according to their level of connectivity with one another. The value of this analysis lies in its ability to

[32] Aaron Clauset, M. E. J. Newman & Christopher Moore, *Finding Community Structure in Very Large Networks*, 70 PHYS. REV. E. 1 (2014).

examine the impact of the Concentration Law on the number of groups of firms found in the market and their composition, as well as in its ability to examine the transferring of various practices through interlocked directors, seeing as there is a higher probability for such transfers within the groups provided by the algorithm.

Graph 6: The network of directors divided into groups, January 2014

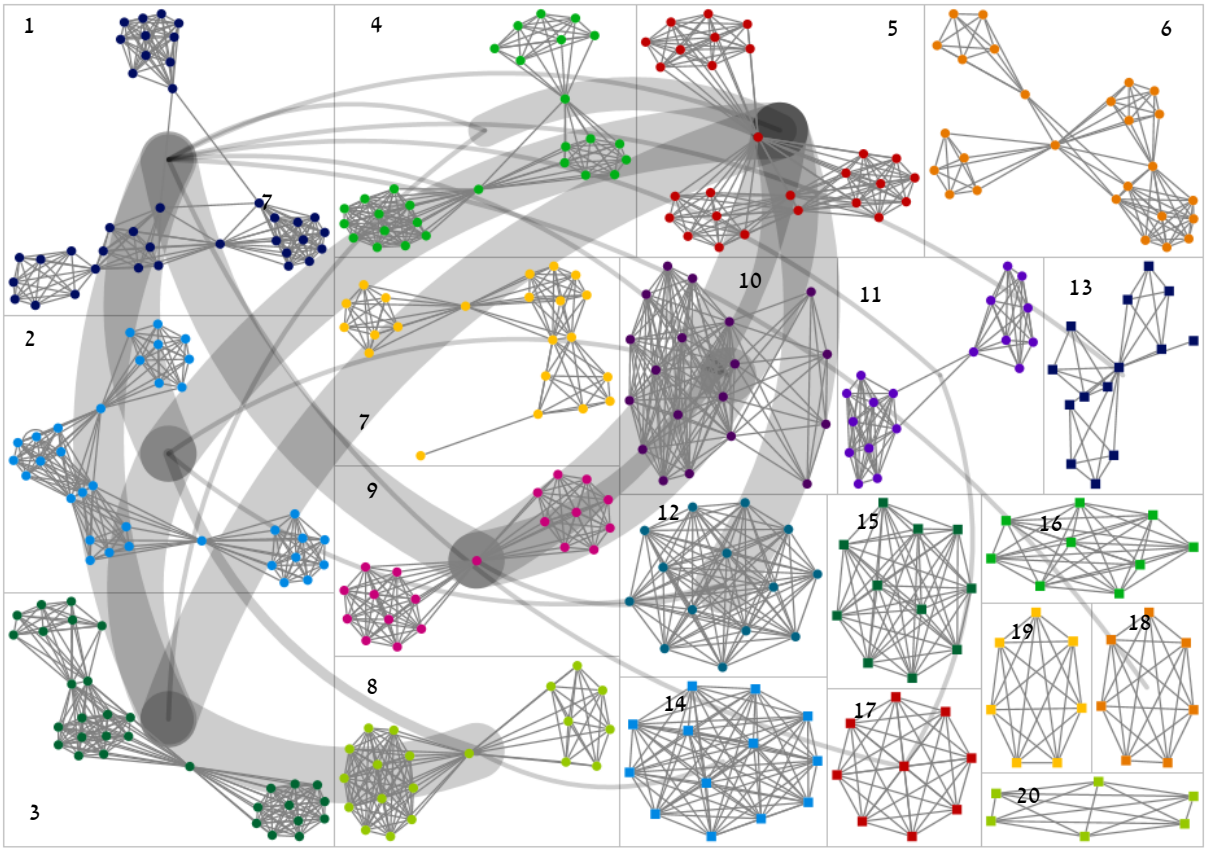


Group numbers are indicated on the graph. Appendix A specifies, for each group, the firms whose directors are most commonly in that group. A group does not always contain all of a firm's directors, and hence there may be firms that are connected to a group but not listed as part of it. These firms are characterized by a small number of directors within that group, and are not listed because their connection to the group is weak. The connections in the background represent the connection between the various groups in the network.

In January 2014, the network of firms comprised 18 groups. Groups 1-10 were comprised of numerous firms and the remaining eight (11-18) had a single firm each. Group 2 was the most connected: to seven other groups in the network.

Following the changes that occurred in boards of directors following the enactment of the Concentration Law, the network's structure in 2015 was divided by the algorithm into 20 groups, more than in the previous year. Twelve groups (groups 1-11, 13) were comprised of numerous firms and eight had only one firm per group. The most significant change observed was the decline in connections between groups in 2015. The most connected group was Group 5, connected to six other groups. Appendix B specifies the firms included in each group, by group numbers.

Graph 7: The network of directors divided into groups, January 2015



Discussion

This paper examined market reaction to regulations that applied additional corporate governance provisions to third- or further-tier firms within pyramid-structured business

groups using social network analysis tools. The results of the analysis include both quantitative results regarding various connectivity indices of the director network in Israel, and visual results in the form of graphs which delineate the network and its connections.

The results of the empirical analysis show that following the entry of these provisions into force, the average number of directors per board declined, as did the average number of firms the same director sits on whose boards. In addition, there was a drop in the level of connectivity of the board interlocks within the large publicly traded corporations in Israel. This decline was lower than what could be expected under complete adherence to the minimal standard required in primary and secondary legislation. The connections between directors themselves were complex and dense, but there was also a decline in their own level of connectivity following the aforementioned regulatory changes. Finally, when dividing the market into groups, there were an evident increase in the number of different groups within the same sample of firms, and a decrease in the number of connections between groups.

In addition to these findings, social network analysis tools enable us to observe qualitative characteristics of the board interlocks in Israel. These include the division of the network into groups, a division that reveals firms that are connected more intensely via shared directors, and the connections between different groups. Thus, it becomes possible to single out groups of firms and certain specific firms that are more intensely connected in the network, and are therefore a decisive element in the transfer of various practices to other firms in the network. The literature shows that directors who sit on the boards of multiple firms bring with them diverse corporate governance practices from other firms, and drive the firm on which they sit in their own direction in such a manner that the effect of said connections is a convergence of corporate governance practices.[33] The analysis conducted here, which reveals firms that function as decisive elements in the network, can predict a tendency for convergence to the corporate governance practices of said firms.

The present research serves as a test case illustrative of the interaction between legislative change and the market. Legislative requirements that are applied to the market within a short time and that require immediate execution of their provisions enable the examination of said interaction in a relatively short time, thus avoiding other possible influences which might explain the market's reaction. Firms in which a structural change has occurred, such as a merger or a change in the form of incorporation (for example, transition from a publicly traded to a limited partnership firm) were

[33] Bouwman, *supra* note 6.

excluded from the sample since these changes might provide an alternative explanation to changes in the firms' board composition.

In general, it is evident that firms in the market reacted with accordance to the legal requirements, causing a drop in the level of board interlock connectivity, although not entirely. The means by which connectivity levels were reduced were varied, including downsizing boards; merging second- and third-tier firms such that the newly merged firm became a second-tier firm, to which the legislation did not apply; and swapping inside directors with outside or independent ones. All reduced connectivity and promoted the law's aim, and are thus equally appropriate.

The question whether reducing board interlock connectivity is appropriate and wise remains controversial in economic and financial literature[34] and requires a separate, in-depth discussion, taking the unique characteristics of the Israeli market into account. Given the current market structure, characterized by the existence of multiple firms with a controlling block, and of business groups that represent the main market share of publicly traded firms, there may be reasons to assume that reducing board interlocks connectivity would be beneficial. The appointment of directors is one of the means to control a firm. When a director has attachments to a specific person or firm, a concern arises that they would act in a manner favorable to the person or firm to whom they are attached. Hence, a network of connections between directors might function as a substitute for the need to possess corporate control. When a gap exists between control in reality and the investment in control measures, an agency problem exists, which entails agency costs that reduce market efficiency.

Finally, this paper examined the impact of legislative change on short-term market behavior. Examination of the long-term impact of declination in director connectivity levels on corporate governance in Israeli publicly traded firms is important and necessary. The findings of this research may serve as a basis for examining long-term impacts on the diffusion of different practices, whether positive or negative, from one firm to another, on the connections between financial and real corporations in Israeli capital market, and on the market's own level of concentration.

[34] Barzuza & Curtis, *supra* note 6.

Appendix A: Details of the Firms Included in Each Group, January 2014

Group Number	Firms in Group
1	Cellcom, Clal Insurance Holdings Ltd., Shufersal, Discount Investment Group, Elbit Systems.
2	Bazan (Oil Refineries Ltd.), Migdal Insurance, ICL (Israel Chemicals Ltd.), Partner, Strauss Group.
3	Leumi, Harel Investments, Azrieli Group, Discount Bank Ltd.
4	FIBI Bank, Paz Oil, Rami Levi.
5	Melisron, Mizrahi Tefahot, Ormat Technologies.
6	Israel Corp, Teva, Osem.
7	Menora Miv. Holdings, Amot, Alony Hetz.
8	Delek Automotive, Delek Group, Nice, Phoenix.
9	Shikun & Binui, Poalim Bank.
10	Nitzba, Naphtha, Airport City, Isramco.
11	Bezeq.
12	Jerusalem Econ.
13	Gazit Globe.
14	Ratio Oil Exploration.
15	Opko Health.
16	Frutarom.
17	EZchip.
18	Perrigo.

Appendix B: Details of the Firms Included in Each Group, January 2015

Group Number	Firms in Group
1	Gazit Globe, Osem, Ormat Technologies, Frutarom.
2	Elbit Systems, Bazan (Oil Refineries Ltd.), Israel Corp, ICL (Israel Chemicals Ltd.).
3	Melisron, Mizrahi Tefahot, Partner.
4	Harel Investments, Azrieli Group, Discount Investment Group.
5	Strauss Group, Paz Oil, FIBI Bank.
6	Clal Insurance Holdings Ltd., Delek Automotive, Delek Group, Phoenix.
7	Menora Miv. Holdings, Amot, Alony Hetz.
8	Shufersal, Cellcom.
9	Teva, Opko Health.
10	Poalim Bank, Shikun & Binui.
11	Bezeq, Ratio Oil Exploration.
12	Leumi.
13	Naphtha, Airport City, Nitzba, Isramco.
14	Discount Bank Ltd.
15	Perrigo.
16	Jerusalem Econ.
17	Nice.
18	Migdal Insurance.
19	EZchip.
20	Rami Levi.