Gender and Board Activeness: The Role of a Critical Mass

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Abstract

This study analyzes detailed minutes of board meetings of business companies in which the Israeli government holds a substantial equity interest. Boards with at least three directors of each gender are found to be at least 79% more active at board meetings than boards without such representation of both genders. This phenomenon is particularly driven by women directors, who are more active when a critical mass of at least three women directors is in attendance. Gender-balanced boards are also more likely to replace underperforming CEOs, and are particularly active during times CEOs are replaced.

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1. Introduction

In recent years, companies have been pressured, and at times required, to compose gender-balanced boards. In the United States, for example, the Securities Exchange Commission requires companies to disclose whether they have a gender diversity policy and how it applies to board recruitment practices.[1] Recently, the European Commission has advanced a similar requirement.[2] Moreover, several countries, including Norway, the Netherlands, France, Spain, and Malaysia, have already legislated laws enforcing gender quotas for boards.

Matsa and Miller (2012) and Ahern and Dittmar (2012) document that, in the Norwegian case, introducing a 40% gender quota for boards of directors led, in the short term, to the appointment of younger and less experienced female directors and to decreased firm value (Matsa and Miller, 2012) and profitability (Ahern and Dittmar, 2012).

The present paper seeks to contribute to the discussion of whether having gender-balanced boards is related to board activeness using a novel, detailed dataset of minutes of board and board-committee meetings of eleven Government Business Companies (hereafter: GBCs), in which the Israeli government holds a substantial equity interest. The GBCs are for-profit companies, and are explicitly required by law to maximize their profits. Their minutes are confidential, but were made available to the author ex-post. The minutes document the details of the meetings, including the statements made by every participant in each meeting. For each company, I examine minutes for one year between 2007 and 2009–altogether 155 board meetings and 247 board-committee meetings. In these minutes, 2,459 issues were discussed.[3] Hence, although the number of companies examined in this study is limited, the data are rich.

[1] See Regulation S-K, Item 407(c).
[2] Further information is detailed in this link: http://europa.eu/rapid/press-release_STATEMENT-14-124_en.htm
[3] See Schwartz-Ziv and Weisbach (2013) on the board dynamics documented in this database.

I use this database to evaluate the extent to which the gender composition of a board catalyzes the actions it takes. The minutes data is ideal for understanding the effect of gender on board dynamics for at least three reasons. First, unlike studies based on publicly available information, the minutes allow me to observe the actions of directors at their meetings, most of which are unobservable to outsiders. The minutes I examine are ideal for observing the actions directors take, since they are quasi transcripts (making them substantially more detailed than the minutes of the meetings of American boards of directors, which rarely document the board's discussions in detail). Second, using data on the attendance and the actions taken at each meeting, while controlling for firm-level characteristics, allows observing *within-firm* variation across meetings. Third, these Israeli GBCs have boards that are relatively gender-balanced, with roughly 37% women, and have included a large proportion of women for almost two decades. This diversity is unique, as women directors average only 5%-17% of most boards of directors (Catalyst, 2014).[4] Such boards are ill-suited to study the effects of diversity beyond very low levels of female participation.

As a point of departure, I assume that the impact of gender most closely resembles a step function, meaning that, once a certain minimal threshold of gender-balance is crossed, gender-balance will increase the productivity of a team or, specifically, a board. I make this hypothesis on the basis of the argument made by Shrader et al. (1997), Rosener (1995), and Kramer et al. (2006): in board meetings, a critical mass of three women directors (which constitutes approximately a third of most boards) will catalyze board activeness/performance. This argument is based on the critical-mass theory introduced by Kanter (1977), who argues that only once women comprise at least 35% of a team, thereby creating a gender-balanced team, will gender diversity enhance team performance.

Accordingly, I empirically examine whether the existence of a critical mass of at least three women directors, and also one of at least three men directors, indeed catalyzes board and director's

[4] For example, in the United States, in 2013, 16.9% of the directors of Fortune 500 companies were women (Catalyst, 2014).

activity and how it relates to "observable" outcomes, such as CEO turnover. Although the critical mass argument emphasizes the importance of a critical mass of women, I choose to address how a critical mass of *both* genders relates to board activeness, in order to understand, to the extent possible given the variation in the data, whether the critical-mass effect applies to both genders.

Board activeness is captured using two variables: based on the minutes-data, for each of the 2459 issues discussed I document whether the board (1) requested to receive further information or an update and (2) whether it took an initiative, such as proposing which action should be taken. These two actions document the intensity of the work of boards, both in monitoring (as measured by the first variable), and in being involved in managing the company (as measured by the second variable). I examine how the gender composition of the directors in attendance relates to the likelihood that a board will take each of these actions. The empirical results indicate that boards are most active when they are relatively gender-balanced–when at least three men and three women directors are in attendance, a situation I term a "dual critical mass". Boards with a dual critical mass are found, in comparison to boards without a dual critical mass, to be at least 79% more likely to request further information or an update, or to take an initiative.

To understand whether the increased board activeness documented occurs especially because the men directors, or perhaps the women directors, are more active when boards are gender-balanced, I attribute all actions taken by a single director to the specific director taking the action, and thereby, also to the gender of the director taking the action. Consistent with the critical mass theory that argues that a member of the minority gender will be more active if a critical mass of her own gender is present, I find that particularly women directors are likely to be significantly more active at board meetings if a critical mass of at least three women directors is in attendance.

I next examine whether each gender of directors is likely to focus on different types of issues. To allow such an analysis, each issue discussed by the boards is categorized as either

supervisory or as managerial. The findings document that women directors are more likely to take an action (i.e., to request an update or to take an initiative) with respect to supervisory issues, while men directors are more likely to take an action with respect to managerial issues. This pattern is documented both for board-committees, and also for board-meetings in which both genders receive equal opportunity to be active on the same issues. However, having gender-balanced boards mitigates the tendency of women directors to focus on supervisory issues, and that of men directors to focus on managerial issues. That is, having a critical mass of women directors increases the likelihood that women directors will take an action pertaining to a managerial issue, while having a critical mass of men directors and also one of women directors increases the likelihood that men directors will take an action pertaining to a supervisory issue.

Finally, I examine, both on the generally observable level, and on the generally non-observable level, how critical masses relate to the board's work during the periods CEOs are being replaced. The analysis of the generally observable level is based on a panel data-set of the universe of the 34 GBCs for the 2000-2009 period. This analysis documents that GBCs with weak financial performance whose boards include a dual critical mass are significantly more likely to replace their CEOs. Consistently with these patterns, also on the generally non-observable level (i.e., at the board's meetings), boards are found to be particularly active, during periods in which GBCs are in the process of replacing their CEOs, if a dual critical mass is in attendance.

In sum, the findings of this study portray a consistent pattern: boards with a dual critical mass are more active than boards that do not have a dual critical mass, particularly because the minority gender (women) is more active when the board includes a critical mass of their own gender. Gender-balanced boards are also particularly involved during crucial times, such as CEO turnover. These findings suggest that gender-balanced boards may be valuable particularly when a board's involvement may be needed.

2. Literature Review

2.1. Gender Composition and the Outcome of the Work of Teams and Boards

Why should gender be related to how boards/teams operate and the decisions they make? Prior studies have shown that gender might relate to the dynamics of boards through three potential channels. The first channel is the critical mass channel, which emphasizes that the minority gender (in practice: women directors) may feel more comfortable expressing their opinions if a sufficient number of the minority gender is present.[5]

More specifically, Kanter (1977), who introduced the critical-mass theory, argues that when women are "tokens," comprising only a marginal fraction of a team or an organization, they are treated as female representatives rather than as individuals. Kanter argues that this situation increases the pressure "tokens" experience and, in turn, hinders the ability of such token-women to perform optimally. Kanter argues that once women comprise at least 35% of a team, thereby creating a relatively gender-balanced team, gender diversity will enhance team performance.

Following Kanter, Rosener (1995) and Shrader et al. (1997) have argued that a critical mass of three women directors is required to enhance the work of boards (this critical mass equals approximately 35% of the average board). Indeed, based on interviews with directors, Kramer et al. (2006) find that once a board includes at least three women directors, the women directors no longer represent the "woman's point of view," and directors notice the women directors' opinions rather than their gender.

[5] Tuggle et al. (2011) find evidence in support of this channel. They examine minutes of board meetings of American public companies, and find that the larger the fraction of women directors present, the more the women directors participate in board meetings. Gupta and Raman (2014) also find evidence showing that the larger the fraction of women directors, the more they are able to support other women: they find that the larger the fraction the women directors, the larger the likelihood that a female executive/ female CEO be selected.

The second channel through which gender may relate to the decision making process of boards is peer monitoring between genders. For example, Adams and Ferreira (2009) find that men directors have fewer attendance problems as the fraction of women directors on the board increases, which suggests that the women directors monitor the men directors.[6] The literature that examines the relation between gender diversity and the outcome of a team's/board's work documents patterns that are consistent with the peer-monitoring channel, since these studies frequently document that gender-balanced teams outperform non-gender-balanced teams (Allmendinger and Hackman, 1995; Bear and Woolley, 2011; Hoogendoorn et al. ,2011; Apesteguia et al. 2012).

The third channel through which the gender of directors may relate to the working of boards is the specialization, or relative advantage, channel. Each gender of directors may specialize in certain types of tasks, or perform them better. Huang and Kisgen (2013) show that men and women executives manage their companies differently, and that male executives tend to be overconfident more than women executives do. Adams and Funk (2012), who survey directors, find that men and women directors have significantly different values.[7] These findings demonstrate that, although women directors may be more similar to men directors than the "average" woman, differences between men and women directors exist. Accordingly, as these studies imply, each gender of directors may have different relative advantages and/or inclinations to specialize in certain types of tasks.

Board-committee appointments may potentially reflect the relative skills or propensities of each gender of directors. Studies on gender patterns of board-committee appointments suggest that women directors are more likely to be appointed to committees that conduct tasks oriented toward

[6] Similarly, Hoxby (2000) and Lavy and Schlosser (2011) examine the relation between the gender composition of school classes on achievement tests in the US and Israel, respectively. Both studies find that the higher the fraction of girl students in the class, the better the performance of both girls and boys on achievement tests.

[7] Consistent with findings for the general population, compared to men directors, women directors were found to be less achievement- and power-oriented, and more benevolent. However, in contrast to findings for the general population, compared to men directors, women directors who made it to the top were seeking more stimulation and risk and were less tradition-oriented.

monitoring and sustaining the corporate governance of the company, while men directors are more likely to be appointed to the business-oriented/managerial committees (Kesner, 1998; Bilimoria and Piderit, 1994; Peterson and Philpot, 2007; Adams and Ferreira, 2009).

In sum, constructing teams or boards that include critical masses of each gender, thereby including members of both genders that monitor each other and specialize in different types of tasks, seems to help boost the output of teams and boards.

2.2. Gender Composition of Boards and Financial Performance

The most common approach to generating an understanding of the relation between the board composition and board performance, and ultimately on firm performance, is to examine the association between board composition and firm performance. However, this approach is subject to significant endogeneity concerns (Hermalin and Weisbach, 2003).[8] Prior studies have also documented inconsistent findings concerning the relation between gender composition of boards and financial performance. Rhode and Packel (2010), who provide a comprehensive survey of more than two dozen empirical studies that examine this question, conclude that such a relationship has not been convincingly established.

For example, some studies find a positive association between the percentage of women directors and financial performance (e.g. Carter et al., 2003; Erhardt et al., 2003; Farrell and Hersch, 2005), some studies find no relationship (e.g., Shrader et. al, 1997; Carter et al., 2010), and some studies find a negative one, particularly for companies with strong corporate governance practices (e.g., Adams and Ferreira, 2009). Thus, studies of this type have not provided a conclusive answer as

[8] For example, if a positive association between the fraction of women directors and firm performance is documented, this could be interpreted as an indication that women enhance firm performance. However, it is also possible to argue that firms with strong firm performance have the luxury of being able to appoint more women directors (who may be less competent). This would avoid public pressure to hire women directors, such as that faced by Facebook, which led to the appointment of Sheryl Sandberg (Bloomberg, 2012).

to whether increasing the number/proportion of women directors is beneficial. However, all the studies just mentioned, and most other studies of this kind, examine boards that had, on the average, less than 10% women directors. As Kanter (1977), Shrader et al. (1997), and Rosener (1995) emphasize, these non-gender-balanced boards may not reflect the relation between gender and firm performance for more gender-balanced boards, which include a critical mass of women.

A unique setting in which boards did become gender-balanced occurred in the wake of Norwegian legislation that required that, beginning in 2008, at least 40% of the directors of Norwegian firms be women. Ahern and Dittmar (2012) document that as a result of this this quota, younger and less experienced women directors were appointed, and the profitability of these firms decreased (Matsa and Miller, 2012), as did their firm value (Ahern and Dittmar, 2012).

In sum, it seems that the relation between the gender composition of boards and financial performance is not always consistent.

3. Backgrounds on GBCs and Their Directors

Thirty-four GBCs operate in Israel in various fields, including infrastructure, military technology, construction/housing, and services. Table 1 provides a list of the universe of the GBCs. All GBCs are overseen by the Government Companies Authority, which represents the government in its role as a shareholder. The size of these companies varies greatly: some companies employ only tens of employees, while others employ more than ten thousand. The annual income of the smaller GBCs is just a few million USD, whereas the parallel figure for the larger firms is one to four billion USD. As the bottom section of Table 1 indicates, the GBCs are, on the average, approximately twice as large as the average Israeli listed company.

Israel's 1999 "Corporation Law," which applies to all corporations in Israel including government-owned firms, and its 1975 "Government Companies Law" (GCL), which applies only

to government-owned firms, detail the duties incumbent upon the boards of these GBCs. Both laws stress that the board must determine the company's policy and monitor the CEO. Concerning "business companies," which are the firms examined in this study, the GCL explicitly requires that "the firm operate according to business considerations just as firms with no government shareholder do" (author's translation). Furthermore, the GCL specifies additional tasks for which the board is responsible, which include determining the company's budget, discussing its financial reports, and determining its long-term strategic plan, as well as choosing, appointing, and monitoring the CEO.

The bylaws of each GBC generally require that the board be made up of eight to twelve directors, with seven to ten serving directors being most common. The bylaws of each of the companies also specify which governmental minister appoints the directors of the company; in most cases, this is the Minister of Finance and one additional minister–the minister most relevant to the industry of each GBC. The only compensation GBC directors receive is a fixed payment for each board or board-committee meeting they attend, which ranges between $200 and $300 per meeting, with the exact amount being a function of the company's size.[9] The bylaws of each company also specify the quorum required to hold a board meeting. All GBCs examined have a quorum that is equal to, or larger than, five directors. Appendix A provides additional information on GBCs and their directors.

Since 1993, the Israeli Government Companies Law requires that the boards of GBCs in which the government holds at least 50% of the shares be composed in a way that "gives appropriate representation to women."[10] This law is enforced by a designated committee that oversees the directorship appointment process. In practice, women directors constituted 34% of

[9]The compensation the GBC directors received was quite similar to what outside directors of Israeli public companies were permitted to receive until 2008: a fixed annual income no larger than $3,500 plus an additional $180 per meeting. Starting in 2008, a change in the "Rules Applying to Directors of Public Companies" allowed outside directors of Israeli public companies to receive substantially higher compensation: they were permitted to receive a fixed annual compensation ranging between $5,000-$35,000 plus an additional $280-$1300 per meeting, with the exact amount depending on the size of the firm and the directors' experience. See Ynet article by Lavi, 2007.

[10] Here, as elsewhere in this paper, all translations from Hebrew are by the author.

GBC boards during the years 2000-2009. Of the eleven GBCs for which minutes are examined, nine meet the Law's 50% condition, requiring them to have "appropriate representation" for women. The other two do not meet the law's 50% condition, and therefore, they are not required to have a minimal percentage of women directors.

Table 2 examines the representativeness of the GBC directors in the sample. Specifically, it explores the differences between the background of the GBC men directors versus that of the GBC women directors, in comparison to other benchmark-boards (public Israeli, public Norwegian, public Swiss, and American S&P 500 companies; sources are specified in Table 2). This table demonstrates that the background of the GBC directors, and the difference between the backgrounds of the men versus that of women GBC directors, is similar to that documented for boards in other countries.[11] Namely, the table shows that the male directors serving on the boards of the eleven GBCs examined were older than their female counterparts—a phenomenon which has also been documented for the other four benchmark-boards for which data is available; possessed more executive experience–this too is documented for all other benchmark-boards mentioned above; but were less educated than the women–which is also documented for Israeli and Norwegian directors, although not for the Swiss directors.

In sum, the Israeli GBC directors examined in the present study have backgrounds similar to those of directors in other countries, and the differences between the backgrounds of male and female directors of GBCs are consistent with those documented for boards in other countries. In addition, the legal requirements and responsibilities of GBC boards are virtually identical to those of boards in other countries, including the United States. For all these reasons, the impact of gender on the dynamics of Israeli GBC boards may well reflect its impact in other boards around the world.

[11] This conclusion is also consistent with Adams and Funk (2012), who examine Swedish boards and show that gender gaps between men and women directors in Sweden are similar to those in the United States.

4. Data and Methods

I have been allowed access to unique data: detailed minutes of board- and board-committee meetings of eleven GBCs for a period of one year.[12] The calendar years studied are 2007 (2 companies), 2008 (8 companies), and 2009 (one company). Nine of the eleven companies examined provided minutes of both board meetings and meetings of board-committees; the other two supplied only the former. These minutes aggregate to 4,758 pages, which document 402 meetings of the boards or their committees (155 and 247, respectively), in which–according to my tabulation– 2,459 decisions were made or updates were given (1,422 and 1,037, respectively). Confidentiality agreements preclude identification of the specific firms in the sample. However, all eleven firms are among those listed in Table 1, and they tend to reflect the different fields in which the GBCs operate. They are of different sizes, as measured by annual income, and as the bottom section of Table 1 indicates, the eleven GBCs studied are among the larger GBCs.

To allow a structured analysis of the data, I coded the minutes according to the principles of the content-analysis methodology (Krippendorff, 2004; Lieblich et al., 1998). Content-analysis methodology is a "systematic replicable technique for comprising many words of text into fewer content categories, based on explicit rules of coding" (Stemler, 2001). All coding was done manually (by the author) because the coding guidelines defined require a comprehensive understanding of the contents of the meetings. The coding was reviewed several times to assure consistency. The essentials of the coding guidelines are as follows (for a more detailed description, see Appendix B):

i. **General information.** For each issue discussed, the type of meeting (board/board-committee) at which it was discussed was recorded, and whether the issue was merely presented as an update or, alternatively, culminated in a decision made by the board was noted.

[12] I thank the GCA for graciously providing access to the minutes data both during my employment period and subsequently.

ii. **Aggregate topic-subjects**. Each topic discussed or decision made was coded under one of the following five aggregate topic-subjects: audit, business issues, financial issues, formal issues, and personnel and benefits. These aggregate topic-subjects were further broken down into 23 topic-subjects, as defined in Appendix B.

iii. **Further updates.** A case in which the board requested to receive further information or an update on the subject discussed. Appendix C provides illustrative examples. When only one director requested the update, this director's name was recorded.

iv. **Taking an initiative.** This refers to a case in which the board took an action/an initiative. For example: the board approved a lease it was asked to approve, yet decided to introduce a few revisions of details; it took an active part in defining the steps/actions that should be taken; or it delved into an issue presented to it, discussed the issue, and, finally, formulated and adopted a new alternative policy. Appendix C provides further illustrative examples. When only one director took the initiative, this director's name was recorded.

v. **Dissension:** A case in which a decision was made, and one or more of the directors did not vote as the others (either opposing them or abstaining).

vi. **Disagreement:** A case in which the board did not vote in line with the CEO's proposal.

vii. **Board composition.** For each meeting, the total number of attending directors was coded, as were the numbers of attending women directors and outside directors.[13]

viii. **Supervision**. All topic-subjects (defined in Appendix B) were divided according to whether they were supervisory or managerial in nature. Supervisory issues include the issues for which boards are expected to oversee top management but not to make the managerial decisions themselves. Managerial issues include the type of issues for which boards are expected (by law, for example) to be active. Supervisory topic-subjects are defined as: appointment of members, approving minutes of

[13] Outside directors are defined as directors who are not employed by the government or by the firm.

earlier meetings, audit issues, choosing a chairman for the meeting, contracting/purchases, financial reports, formal issues, legal issues, personnel and benefits, ratification of audit committee, ratification of human resources committee, ratification of operational committee, ratification of financial committee, and regulation and government. Managerial topic-subjects are defined as: appointing/firing an executive, budget, business issues, business projects, cross-firm issues, investment/finance, ongoing general issues, organizational change, and strategic issues.

5. Gender Diversity and Actions Taken by the Board

Section 5 examines, on the board level, how the gender composition of the board in attendance relates to the extent to which boards are active.

5.1. Basic Econometric Model

In each of the meetings, a different board composition is in attendance. There are two reasons that lead to the variation in the (gender) composition of the directors in attendance. First, there exists a natural turnover of directors throughout the year examined. Second, not all directors are able to attend all meetings. The variation of the gender of directors in attendance allows examining how actions a particular board may choose to take, or not to take, are related to the gender composition in attendance, specifically—to the presence of a critical mass of one or both genders.

To capture the extent to which a board is active, for each issue discussed, I examine whether the board took the following actions: (a) requested to receive further information or an update, or (b) took an initiative (e.g., proposed the CEO take a specific action). Appendix C illustrates each of these two actions. These two actions are the most basic actions a board may choose to take or not to take when an issue is brought up at a board meeting or a board-committee

meeting. By taking these actions, boards monitor (documented by the frequency they request an update) and provide advice (documented by the frequency they take an initiative).

Regressions allow examining how variations in the gender composition in attendance, for the same company, generate different levels of board activeness. The regressions in Section 5 are conducted on the board-meeting-issue level. Board is denoted by b, meeting is denoted by m, and issue is denoted by i. Accordingly, the following equation is estimated:

$$A_{bmi} = \alpha_b + \beta_t + B'_{bm}\lambda_1 + I'_{bmi}\lambda_2 + \varepsilon_{bmi} \quad (1)$$

A_{bmi} is a binary variable that equals one if a director took a certain action. In most specifications, this action pertains to the board (a) requesting to receive further information or an update, and/or in alternative specifications, (b) taking an initiative. B'_{bm} is a vector that documents the independent variables that are on the board-meeting level: the fraction of women directors in attendance, the square of the fraction of women directors in attendance, a dummy variable that equals one if a critical mass of at least three women directors is in attendance, a dummy variable that equals one if a critical mass of at least three men directors is in attendance, the fraction of attending outsiders, the total number of attending directors, a dummy that equals one if the company is in the process of replacing its CEO at the time the issue is discussed, the total number of attending directors, and the fraction of attending directors with an MA or an MBA.

I'_{bmi} controls for the type of issue that is discussed via 22 dummy variables that control for the 23 topic-subject categories defined, as listed in Appendix B. I'_{bmi} includes a dummy that equals one if the issue discussed is of supervisory nature rather than managerial nature, as defined in Section 4iii. For those analyses including observations from both board and board-committee meetings, I'_{bmi} also includes a dummy that equals one if the observation occurred in a board meeting (as opposed to a board-committee meeting). All regressions are OLS regressions, unless

noted otherwise. α_b controls for board/company fixed-effects. β_t controls for the year for which the minutes were examined (2007, 2008, or 2009). Unless noted otherwise, errors are clustered on the company level.

5.2. Are Gender-Balanced Boards More Active?

This section examines whether having gender-balanced boards, and particularly boards that include critical masses of one or both genders, catalyzes the extent to which boards monitor on the one hand, and supervise on the other. These two simultaneous roles of boards have been examined extensively in earlier studies of boards (e.g. Adams and Ferreira, 2007; Schwartz-Ziv and Weisbach, 2013; Schmidt, 2014).

Because most board actions are unobservable, it is challenging to find good empirical measures for the intensity with which boards carry out each of these two roles. As mentioned, this study uses a board's request for an update as a proxy for the extent boards monitor the CEO, and boards taking an initiative to proxy for the extent boards advise the CEO. Appendix C demonstrates these two proxies. These proxies may not be perfect, since, for example, it is possible that a board would request data in order to subsequently advise the CEO. Nevertheless, these proxies are estimated using detailed minutes data, rather than relying on the limited observable inputs and outputs of the work of boards. Accordingly, compared to previous studies, the measures used in this study are improvements over the typical proxies usually employed to estimate the intensity with which boards monitor and advise the CEO.

Figures 1a-1d offer an initial indication of how critical masses relate to the frequency boards (1) request an update and (2) take an initiative, based on the 1,313 issues discussed by the GBC boards across 155 board meetings. These figures document that both the likelihood that boards request an update and the likelihood that boards take an initiative jump once at least three

women directors are in attendance (Figure 1a) or once at least three men directors are in attendance (Figure 1b). Similarly, Figures 1c and 1d demonstrate that boards are both more likely to request an update and more likely to take an initiative when at least three women directors are in attendance (Figure 1c) or when at least three men directors are in attendance (Figure 1d). The economic magnitude and statistical significance documented in Figures 1c-1d is particularly large for critical masses of men directors. Table 3 provides additional information on the frequency actions were taken, and the presence of critical masses at board meetings.

Appendix D breaks down, on the topic-subject level, the percentage of cases for which boards either requested an update or took an initiative. This table documents that for most topic-subjects, boards are more active when a dual critical mass (at least three directors of each gender) is in attendance.

Table 4 starts by examining how the gender composition of boards relates to board activeness. Regressions 1-2 of Table 4 examine whether a linear or a U-shaped relation exists between the fraction of women directors in attendance and the likelihood that boards either request an update or take an initiative. The dependent variable in these regressions is equal to one if one or more director of the board took an action (i.e., either requested an update or took an initiative). Regression 1 examines only observations from board meetings, while Regression 2 examines only observations from board-committee meetings. Both regressions fail to establish a significant linear or U-shaped relation between gender composition and board activeness. Such non-significant results are obtained, for both specifications, when including only the fraction of women directors in attendance and excluding the square of the fraction of women and when defining a binary dependent variable that equals one only if an update is requested or, alternatively, only if an initiative is taken. Perhaps this suggests that a linear or U-shaped function is not the most ideal way to characterize the relation between gender and board activeness.

Regressions 3-6 of Table 4 further explore the hypothesis that a critical mass of at least three directors of each gender catalyzes board activeness. Indeed, Regression 3 documents that a critical mass of at least three women directors significantly increases the likelihood that the board request an update, while Regression 4 shows that such a critical mass of women directors significantly increases the likelihood that the board take an initiative. The coefficient in Regressions 3-4 controlling for the presence of a critical mass of at least three men directors is positive, yet its impact is statistically insignificant. However, the insignificance of the latter result may derive from the limited variation concerning a critical mass of men directors: in only 9% of the observations (100%-91%, see Table 3) was there not a critical mass of men directors in attendance at board meetings.

Regression 5 documents that, if at least three directors of both genders are in attendance, the board is significantly (at the 1% level) more likely to take an action, i.e., to request an update or to take an initiative. The economic magnitude documented is quite substantial: since the average percentage of issues for which an update was requested or an initiative was taken at a board meeting is equal to 12.4% (as documented in Table 3), having a critical mass of both genders is expected to increase the likelihood that the board take an action by 79% (0.098/0.124).

Regression 6 is the logit version of Regression 5. Similar to the results in Table 5, Regression 6 documents that a critical mass of at least three directors of each gender increases significantly (at the 1% level) the likelihood that the board either requests an update or takes an initiative. The odds ratio reported in Regression 6 for the variable "at least three directors of each gender" equals 2.83, which indicates that the odds that a board with a dual critical mass takes an action (i.e., requests an update or takes an initiative) are 2.83 greater than the odds that a board without a dual critical mass will do so. In other words, Regressions 5-6 show that boards that

include a dual critical mass are at least 79% more active, the precise magnitude depending on the econometric method and benchmark used.

Appendix E addresses the possible concern that non-random attendance is driving the results (i.e., that one of the genders is likely to attend meetings especially when high or low activeness is expected to be required). This concern is addressed by using instrumental variables (IVs) to instrument for the likelihood that there be a critical mass of women and one of men at the board meeting. Specifically, I use two IVs that document the number of women directors, and the number of men directors, that had at least one board-committee scheduled on the same day that a particular board meeting took place, at which a particular issue was discussed. These instruments exploit the reality that GBC directors have a higher incentive to attend board meetings held on days they also have a board-committee scheduled at the same venue, for the compensation GBC directors receive depends only on the number of (board and committee) meetings they attend and on such days they can attend two meetings, while commuting only once. When using these IVs, the finding that boards are most active when they are gender-balanced holds.

Appendix F examines at which alternative threshold for critical masses board activeness jumps: Is it when boards include at least one, two, three, four, or rather five directors of both genders? The results document a positive and significant relation between critical masses and the likelihood that the board (1) request an update, and also (2) take an initiative, only when critical masses are defined as at least three directors of each gender (and not when critical masses are defined as at least one, two, four, or alternatively five directors of each gender). This supports the argument that board activeness is maximized when boards include at least three directors of each gender, compared to boards that do not include at least three directors of each gender. This result also supports modeling the relation between the number of directors of each gender and board

activeness as a step function that jumps when the board includes at least three directors of each gender.

In unreported specifications, I examine whether at board-committees (which, as reported in Table 3, are attended on the average by 4.3 directors), the relation between the gender composition of the committee and the activeness of the committee also follows a step function. These specifications examine whether the existence of at least one director of each gender—or alternatively, of at least two directors of each gender—significantly increases the likelihood that the board-committee take an action (i.e., request an update and/or take an initiative). No such significant relation is found. Accordingly, the latter results seem to imply that the critical mass effect is particularly pronounced at boards (as larger teams), rather than at board-committees (as small teams).

Appendix G highlights additional differences between the dynamics of board meeting as compared to those of board-committees. This appendix documents that in board committees, a linear relation exists between the fraction of woman directors in attendance, and the extent of communication. However, in board meetings (which are attended on average by 8.1 directors, see Table 3), a U-shaped relation between the fraction of women directors and the extent of communication is documented. The findings indicate that communication increases only once women directors constitute 52% of the board. This implies that in large teams as boards (but not necessarily in small teams as board-committees), a certain percentage of the minority gender is needed to increase the effort exerted by the board members.

Appendix G also examines how the gender composition of boards relates to disagreement (the board not voting in line with the CEO's proposal) and dissension (the board not voting unanimously). The results do not document a significant relation between gender composition (i.e., fraction of women directors/ presence of critical masses) and disagreement, or gender composition

and dissension. These findings suggest that gender composition neither stirs up nor eliminates disagreement or dissension.

In sum, this section documents that boards are particularly active (i.e., request updates and/or take initiatives) when at least three men and three women directors are in attendance.

6. Actions Taken by Individual Directors

Section 6 examines, on the level of the individual director, how critical masses catalyze men and women directors to take action, and which type of action each gender is likely to take.

6.1. Gender Composition and Activeness of Individual Directors

This section examines how the gender composition of the board relates to the extent to which individual directors are active. Specifically, this section examines, on the director level, whether or not a director took an action (i.e., requested an update or took an initiative) when an issue was bought up for discussion. In contrast to Section 5, which explored board activeness on the board level, this section explores how critical masses relate to the activeness of individual women directors and to that of individual men directors. Each unit of observations pertains to a specific director that attended a specific meeting in which a specific issue was discussed, i.e., the board-meeting-issue-director level.

To allow this level of analysis, for each case in which a single director either requested to receive further information or an update, or the director took an initiative, the action taken was attributed to the specific director taking the action, and thereby also to a specific gender. If more than one director took the action, the action was not attributed to a specific director. I am able to attribute 69% of the actions that were taken to one specific director. The remaining actions were

taken by more than one director, so they were not linked to a specific director and, therefore, are not included in the analysis presented in this section.[14]

Table 5 reports descriptive statistics on the board-meeting-issue-director level on the frequency with which each gender of directors took an action (i.e., requested an update or took an initiative). This table documents that male directors were somewhat more active at board meetings: the average percentage of cases in which women directors took an action in these meetings was 0.8%, while for male directors it was 0.92%. In board-committee meetings, women directors were slightly more active: Women directors took an action in 4.56% of the cases, while men directors did so in 4.05% of the cases.

To estimate how the gender composition in attendance catalyzes the activeness of individual directors, the following econometric model is implemented on the board-meeting-issue-director level (using the notations from Section 5.1):

$$A_{bmid} = \alpha_b + \beta_t + B'_{bm}\lambda_1 + D'_{bmd}\lambda_2 + I'_{bmi}\lambda_3 + \varepsilon_{bmid} \qquad (2)$$

Equation (2) includes an additional vector which equation (1) does not include: $\mathrm{D'_{dbm}}$, which controls for the director-level variables (the subscript d denotes director). This vector includes a dummy that equals one if the observation pertains to a woman director, a dummy which equals one if a woman took an action while at least three women directors were in attendance, a dummy which equals one if a man took an action while at least three men directors were in attendance, a dummy which equals one if the director held an MA or MBA, and the number of years of executive experience the director has behind him or her. Errors are clustered on the director level.

Because Table 6 examines how the gender of directors relates to the frequency with which they take an action, the dependent variable in the specification reported in Table 6 is a binary

[14] Due to the limited size of the sample, it is not possible to conduct a detailed analysis of the cases in which an action was taken by two or more directors by further breaking down the gender of those taking the action into more refined categories (i.e., action taken by only men directors, by only women directors, or by both genders).

variable that equals one if the director took an action, and zero if he or she did not. Consistent with the summary statistics reported in Table 5, Regression 1 of Table 6 documents a negative relation between "woman director" and the likelihood that an action is taken at a board meeting, however, this relation is insignificant. Consistent with the summary statistics reported in Table 5, Regression 2 documents a positive and significant relation between "woman director" and the likelihood that an action is taken in board-committees. The latter finding indicates that women directors are more active at board meetings. Perhaps women directors are more comfortable being active in small teams such as board-committees.

Regressions 1 and 2 of Table 6 also document a significant U-shaped relation between the fraction of women directors and the likelihood that an action is taken. The fraction of women directors significantly decreases the likelihood that an action is taken, but the square of the fraction increases that probability. The economic magnitudes documented for this pattern are particularly large for board-meetings (Regression 1) compared to those documented for board-committee meetings (Regression 2). The U-shaped relation documented is consistent to a certain extent with the critical mass theory which argues that boards must pass a certain threshold, a minimal number of directors of the minority gender, before the minority gender can catalyze the directors' activeness.

Regressions 3-6 of Table 6 explore how critical masses of each gender relate to directors' activeness at board meetings. Regression 3 documents that when boards include at least three women directors, directors are significantly more likely to take an action at board meetings. The coefficient for the variable "three or more women directors in attendance" is 0.0072. As Table 3 indicates, on the director level, directors took an action 0.89% of the time. Compared to this average, having a critical mass of woman directors increases the likelihood that directors take an action by 80.9% (0.0072/0.0089).

Regression 4 documents that although women directors are (according to this specification: significantly) less active than men at board meetings, this phenomenon can be partially offset if a critical mass of women directors is in attendance. Specifically, women directors are significantly more likely to take an action if a critical mass of at least three women directors is in attendance, as documented by the coefficient for "woman director and critical mass of women in attendance". This finding provides support for the application to boards of the critical mass theory discussed in Section 2, which argued that women directors will be more active at boards meetings once they include at least three women directors.

Finally, to estimate the effect of critical masses on the activeness of each gender of directors, I examine separately the observations pertaining to each gender. Regression 5 only includes observations pertaining to women directors, while Regression 6 only includes observations pertaining to men directors. Regression 5 confirms once again that women directors are significantly more active when a critical mass of women directors is in attendance. Since a woman director is on average likely to take an action at board meetings in 0.8% of the cases (as documented in Table 5), Regression 5 documents that having a critical mass of at least three women directors increases the likelihood that a woman director take an action by 180% (0.0144/0.008).

Regressions 5 and 6 of Table 6 document a positive relation between critical masses of one gender, and activeness of the other gender. Specifically, Regression 5 documents that when a critical mass of men directors is in attendance, women directors are 0.3% more likely to take an action, and Regression 6 documents that when a critical mass of women directors is in attendance, men directors are 0.4% more likely to take an action. Such patterns are consistent with the peer monitoring channel surveyed in Section 2.1: one gender monitors the other gender, and that catalyzes the activeness of individual team members. However, these cross-gender coefficients are

insignificant, so it is not possible to conclude with confidence that peer monitoring between the genders indeed occurs.

In sum, this section documents that, on the level of the individual director, a critical mass of women directors significantly increases the likelihood that individual women directors will be active at board meetings.

6.2. Do Different Genders Focus on Different Types of Issues?

This section examines whether men and women directors have different penchants or predispositions to take actions concerning different types of issues. As in the previous section, the analysis is conducted on the level of the individual director.

Board-committee appointments are among the few generally observable variables that may indicate whether each gender of directors tends to specialize in certain types of issues. As mentioned in Section 2.1, studies examining board-committee appointment patterns have found that women directors are more likely to be appointed to committees that conduct tasks oriented toward monitoring and sustaining the corporate governance of the company, while men directors are more likely to be appointed to the business-oriented/managerial committees. However, directors are not necessarily appointed to the committees they prefer, and therefore board-committee appointments may not reflect the relative penchants of each gender of directors.

This section examines whether indeed each gender of directors tends to focus on different types of issues, by examining if each gender is likely to take actions pertaining to different types of issues. To allow such an analysis, as in the previous section, each action taken by only one director is attributed to that director. In addition, the type of topic discussed when the director took the action,

is categorized under one of twenty-three topic-subjects, which are each classified as either supervisory or managerial (see Section 4viii and Appendix B for further details).[15]

Columns 2 and 3 of Table 5 report the frequency each gender of directors took an action pertaining to a supervisory issue (henceforth a "supervisory action") or one pertaining to a managerial issue (henceforth a "managerial action"), respectively. These two columns allow computing in Columns 5 of Table 5, for each gender of directors, the average percentage of supervisory actions of all actions taken (by dividing the figure in Column 2 by the figure in Column 1). Column 5 documents that compared to men directors, women directors are more likely to take a supervisory action both at board meetings and at board-committee meetings: In board meetings, 80.6% of all actions taken by women are supervisory, whereas the corresponding figure for men directors is only 61.7%. A similar difference is documented for board-committee meetings: 89.2% of all actions taken by women directors are supervisory, whereas the corresponding figure for men directors is only 77.9%.

Table 7 further explores these differences via regressions. Table 7 assesses the likelihood that a particular gender take an action pertaining to a supervisory issue, as opposed to a managerial one. A necessary condition for a certain type of action to be taken is that an action has been taken by a director. Accordingly, the observations included in Table 7 are conditional on an action being taken, and therefore include only the cases in which a director took an action (i.e., requested an update or took an initiative). As in the previous section, these regressions are conducted on the board-meeting-issue-director level.

[15] Managerial issues include the types of issues for which boards are expected (e.g., by law) to be active. Accordingly, managerial issues include, among others, the topic-subjects that pertain to business issues and to firing and hiring the CEO. In contrast, the supervisory issues include the types of issues that boards are expected to oversee but not carry out themselves. For example, the "audit" topic-subject mostly includes discussions on audit reports that identify problems in the company's operation. These reports are usually prepared by an internal auditing department, and they specify how the problems that have been identified should be addressed. Accordingly, the "audit" topic-subject is classified as supervisory, because the board's primary role with respect to the audit issues is to ensure that problems identified in the audit reports have been resolved.

The dependent variable in the Table 7 regressions is a binary variable which equals one if the action the director took pertained to a supervisory issue, or zero if it pertained to a managerial one. Consistent with the summary statistics reported in Table 5, Regression 1 of Table 7 documents that the probability that a woman director take a supervisory action is 32% higher than the corresponding figure for her male counterpart. Similarly, Regression 2, which is the logit version of Regression 1, estimates that the odds that a woman director take an action concerning a supervisory issue as opposed to a managerial one are 1.71 times greater than the odds that a male director take a supervisory action.

Regression 3 of Table 7 (an OLS regression) documents a similar pattern for board-committee meetings: In these meetings, women directors are 11% more likely than men directors to take an action concerning a supervisory issue. Put differently, at board meetings, in which both genders receive an equal opportunity to be active on the same issues (Regressions 1-2), and at board-committee meetings (Regression 3) in which directors can be active only with respect to the issues discussed at the committees to which they are assigned, women directors are more likely than men directors to take an action pertaining to a supervisory issue. This suggests that women directors have a tendency to focus on supervisory issues.

Regressions 4-6 of Table 7 examine how critical masses relate to the likelihood that men and women directors take a supervisory action, as opposed to a managerial one, at board meetings. Regression 4 of Table 7 includes observations of actions taken by directors of both genders at board-meetings. This regression shows that in board meetings, having critical masses of one's own gender increases the likelihood that women directors take a managerial action (as documented by the positive and significant coefficient for "woman took action, at least three women in attendance"), and that men directors take a supervisory action (as documented by the positive and significant coefficient for "man took action, at least three men in attendance").

To allow a clearer understanding of the magnitude of the critical mass effect on the actions taken by each gender of directors, Regressions 5 and 6 examine only the actions taken by women directors, and only those taken by men directors, respectively. Regression 5 documents that women directors are 0.308 less likely to take a supervisory action if a critical mass of women directors is in attendance (results are significant at the 10% level). Since, as reported in Table 5, 80.6% of the actions taken by women are supervisory, Regression 5 estimates that having a critical mass of women directors is expected to decrease by 38.2% (0.308/0.806) the likelihood that women directors take a supervisory action. This finding also indicates that women directors are more likely to take a managerial action when a critical mass of women directors is in attendance.

Regression 6 documents that having a critical mass of men directors increases by more than 100% the likelihood that men directors take a supervisory action. This extremely large estimate is partially due to the well-documented limitation of OLS models in estimating equations with binary dependent variables. For this reason, in an unreported specification, a logit version of Regression 6 is estimated. The odds ratio estimated by this specification for the "three or more men directors" is equal to 206.2, indicating that the odds that boards with a critical mass of men directors take a supervisory action are 206.2 greater than the odds that boards without a critical mass of men directors take a supervisory action. These large coefficients documented by both the OLS and the logit model indicate that men directors are significantly more likely to take a supervisory action if a critical mass of men directors is in attendance.

Regression 6 reports that a critical mass of women directors is also expected to increase by 0.361 the likelihood that a supervisory action be taken by men directors. Since 61.7% of the actions taken by men directors are supervisory, this coefficient indicates that men directors are 58.5% (0.361/0.617) more likely to take an action pertaining to a supervisory issue if a critical mass of

women directors is in attendance. This indicates that a critical mass of the other gender can also nudge one to take actions pertaining to different types of issues.

In sum, the findings of this section support the argument that women directors have, relative to men directors, a stronger inclination to focus on supervisory issues. However, the findings also show that gender-balanced boards mitigate the penchant of women directors to focus on supervisory issues and vice versa: critical masses of women directors increase the likelihood that women directors take an action pertaining to a managerial issue, while a critical mass of men directors, and also one of women directors, catalyze men directors to take an action pertaining to a supervisory issue.

7. The Gender of Directors at Times of CEO Turnover

Firing and hiring the CEO, and bridging the gaps between CEOs, are among a board's most important functions (Mace, 1971; Weisbach, 1988). For this reason, and because CEO turnover is one of the few observable variables that may reflect the work of boards, CEO turnover has been addressed quite frequently in board studies (e.g., Weisbach, 1988; Adams and Ferreira, 2009). I choose to focus on this transitional time to gain a better understanding on how the gender composition of boards relates to the working of boards during periods boards are particularly needed.

7.1. Gender Composition and CEO Turnover

This section examines the relation between the gender composition of boards and CEO turnover, given the financial performance of GBCs. This analysis is conducted using a panel data set for the universe of the 34 GBCs for the years 2000-2009 obtained from an internal database of the Government Companies Authority and from the annual reports it publishes. During this period,

women directors constituted on average 34% of GBC boards. To the best of my knowledge, the Israeli GBCs are, worldwide, the first companies that have been required since 1993 to have gender-balanced boards. Accordingly, the GBCs allow examination of a relatively long panel data set of gender-balanced boards.

Table 8 examines how the gender composition of boards, combined with financial performance, relates to the likelihood that CEO turnover occurs. The dependent variable in these regressions is a binary variable that equals one if CEO turnover occurred (during the 2000-2009 period examined, 59 CEO turnovers occurred in the 34 GBCs). The primary independent variables examined are the variables controlling for gender composition and those controlling for financial performance (measured by ROE). All observations are on an annual frequency. Year and firm dummies are included in these specifications, and errors are clustered on the company level.

Regression 1 of Table 8 starts by examining whether, given the financial situation of the company, a linear relation exists between the gender composition of the board and CEO turnover. The regression does not document such a significant relation. Regression 2 of Table 8 documents (via the "Fraction of women *ROE" coefficient) that when women constitute a small fraction of the board, and performance is weak, CEO turnover is less likely to occur. However, once the fraction of women directors increases in these weak companies (as indicated by the "square of fraction of women*ROE" coefficient) these companies are more likely to experience CEO turnover.

Regressions 3-5 of Table 8 further examine the latter pattern by investigating how, given the financial performance of the company, a critical mass of women or men directors relates to CEO turnover. Regression 3 does not document a significant relation between critical masses of at least three directors of a certain gender and CEO turnover. This indicates that all else equal, having critical masses does not catalyze CEO turnover. However, these results change once interaction variables between critical masses and financial performance are introduced. Regression 4 documents

that when boards include a critical mass of women directors, and firm performance is weak ("at least three or more women*ROE"), CEO turnover is significantly (at the 10% level) more likely to occur. In other words, if firm performance is weak, CEOs are more likely to be held accountable if the board includes a critical mass of women directors. [16]

Finally, Regression 5 documents that a dual critical mass and weak financial performance significantly (at the 5% level) decreases the likelihood that the company experience CEO turnover. Specifically, the magnitude documented implies that a 1% decrease of the ROE is expected to increase the likelihood of CEO turnover by 2.02%, if the board includes a critical mass of women directors.

This provides further evidence that when boards are gender-balanced and include a dual critical mass, CEOs are likely to be held accountable if they underperform, and, one way or the other, they are likely leave the firm. These findings are consistent with Adams and Ferreira (2009), who examine American public firms and find that firms with a higher fraction of women directors that also exhibit weak financial performance are particularly likely to experience CEO turnover.

In sum, the results of this section reinforce the argument that gender-balanced boards respond actively to poor financial performance by enhancing CEO turnover.

7.2. Gender Composition of Boards When Companies are between CEOs

This section explores how the gender of directors relates to the working of boards during periods in which the CEO is being replaced. The analysis in this section is based on the minutes data described in Section 4. Four of the eleven firms for which minutes were examined replaced their CEO during

[16] Regressions 5-6 do not provide evidence that a critical mass of men directors is significantly associated with an increase in the likelihood of CEO turnover. However, this result may be the consequence of the limited variation in the existence of critical masses of men directors: while 47% of the company-year observations did not include a critical mass of at least three women directors on the board, only 6% of the observations did not include such a critical mass of men directors on the board.

the year studied, and all of these firms had periods during which they were literally "between" CEOs and had no serving CEO. Those periods lasted between several weeks and several months. Such periods occurred for one or more of the following reasons: the board asked the incumbent CEO to resign his position at very short notice, the selection process of the new CEO continued for at least three months,[17] legal issues complicated and extended the selection process, and/or the newly selected CEO was not able to leave his former position from one day to the next.

The board is expected to step in immediately once it fires the CEO, or once it learns that the current CEO will not continue serving in this position. Accordingly, I define a "gap period" between CEOs as starting when the minutes document for the first time that the board is aware that the current CEO will not continue serving in this position, and ending when the new CEO first attends a meeting of the board or of a board-committee. Based on this broad definition, the gap periods experienced by the four companies that replaced their CEO lasted between three to seven months. This gap period is longer than the one mentioned in the previous paragraphs, since the gap period according to the latter definition usually starts before the incumbent CEO actually leaves the company, and ends after the new CEO is selected.

Table 9 explores how critical masses of women and men directors relate to board activeness during these gap periods. This analysis is based on the minutes data described in Section 3, and follows the econometric model presented in Section 5.1. Regressions 1-2 of Table 9 examine whether a linear or a U-shaped relation exists between the gender of directors and board activeness during gap periods, compared to non-gap periods, and do not document any such relation, neither for board meetings (Regression 1) nor for board-committee meetings (Regression 2) at times companies are in gap periods.

[17] The GBC boards are required to publish an advertisement in the newspapers inviting candidates to apply for the CEO position. In addition, several rounds of interviews are usually conducted. In most cases, the board sends at least the final candidates to an external company specializing in executive placements that assesses the applicants. In practice, this process takes at least three months.

Regression 3 examines whether having a critical mass of women and/or men directors increases the likelihood that the board take an action particularly during gap periods. Regression 3 documents that, indeed, having a critical mass of women directors when a company is in a gap period ("three or more women directors and between CEOs") increases (significantly at the 10% level) by 11.2% the likelihood that the board take an action. Similarly, Regression 3 documents that having at least three men directors in attendance when a company is in a gap period increases by 16% the likelihood that the board will take an action (results are significant at the 10% level).

Regression 4 documents that having a dual critical mass during gap periods ("at least three directors of each gender and between CEOs") significantly (at the 5% level) increases the likelihood that the board takes an action. Since the average percentage of cases in which boards took an action at board meetings during gap periods equaled 24.8%, compared to this average, having a dual critical mass during gap periods increased the likelihood that boards take an action by 75.8% ([6.7%+12.1%]/24.8%). These findings provide further support that dual critical masses are particularly likely to increase board activeness during crucial times, such as periods when boards are in the process of replacing their CEOs.[18]

In sum, the previous section (Section 7.1) documented that companies with gender-balanced board are particularly likely to experience CEO turnover if their performance is weak. This seems to suggest that gender-balanced boards are able to show underperforming CEOs the way out. This section (Section 7.2) documents that gender-balanced boards are particularly active when companies are in the process of replacing their CEOs. Taken together, these findings suggest that gender-balanced boards are more likely to be involved and step in at crucial times, such as those in which CEOs are replaced.

[18] Regressions 5-6 of Table 6 shed light on which gender of directors were particularly active during gap periods: Regression 5 of Table 6 documents that women directors were significantly more active when companies were in gap periods. Such patterns are not documented for men directors in Regression 6 of Table 6.

Appendix H provides further support for this interpretation: this appendix documents that particularly GBCs which generally have weak financial performance exhibit a positive association between having gender-balanced boards and financial performance. This appendix also documents that critical masses are likely to increase board activeness specifically in GBCs with relative weak performance. Hence, it seems that the critical mass effect is especially pronounced in situations in which boards are particularly needed – during periods the CEO is replaced, and in companies that have weak performance.

8. Summary

The findings of this study document that boards with dual critical masses are more active at their meetings when they are gender-balanced. This phenomenon is particularly driven by women directors being more active when a critical mass of at least three women directors is in attendance. The study also documents that gender-balanced boards are particularly active in crucial times: gender-balanced boards are associated with increased turnover of CEOs when firm performance is weak, and they are also particularly active in times the CEO is being replaced.

On the methodological level, the study demonstrates that gaining access to the working of boards behind the closed doors of the boardroom allows a direct and delicate examination of the relation between the gender composition of boards and the activeness of directors and, ultimately, of boards. On the practical level, the findings suggest that, in a steady state, gender-balanced boards may be valuable particularly when a company is in need of the board's involvement.

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Table 1

Business Companies in Which the Israeli Government Holds Shares (GBCs)

This table reports 2007 figures for all GBCs. The data were taken from annual reports of the Government Companies Authority. ND indicates data is not available. Data for public Israeli companies was obtained from the "Super Analyst" database.

	Name of company	Annual revenue in thous. USD	Number of employees	Field	Percentage held by the government
1	A.T. Communication Channels	940	8	Transportation and Communication	100%
2	Agrexco Agricultural Export Co. Ltd.	868,460	365	Agriculture	50%
3	Arim Urban Development Ltd.	13,040	28	Building, housing and Development	100%
4	Ashdod Port Company Ltd.	263,670	1,275	Transportation and Communication	100%
5	Ashot-Ashkelon Industries Ltd.	56,120	399	Defense	88%
6	Ashra the Israel Export Insurance Corporation	12,440	18	Industry and Commerce	100%
7	Atarim Tourist Development Corp. Tel Aviv Jaffa Ltd.	6,140	23	Industry and Commerce	50%
8	E.M.S. Ltd.	83,130	ND	Electricity and Water	100%
9	Eilat Port Company Ltd.	27,380	112	Transportation and Communication	100%
10	Elta Systems Ltd.	918,750	3,407	Defense	100%
11	Haifa Port Company Ltd.	210,950	1,064	Transportation and Communication	100%
12	Industrial Development Bank of Israel Ltd.	26,580	43	Industry and Commerce	49%
13	Insurance Fund for Natural Risks in Agriculture Ltd.	46,000	69	Agriculture	50%
14	Isorad Ltd.	12,250	20	Industry and Commerce	100%
15	Israel Aircraft Industries	3,292,110	12,939	Defense	100%
16	Israel Bank of Agriculture	9,780	25	Agriculture	92%
17	Israel Government Coins and Medals Corporation Ltd.	4,560	39	Industry and Commerce	100%
18	Israel Military Industries Ltd.	571,440	2,966	Defense	100%
19	Israel Natural Gas Lines Company Ltd.	7,970	69	Energy and Petroleum	100%
20	Israel Ports Development and Assets Company Ltd.	172,030	105	Transportation and Communication	100%
21	Israel Postal Company Ltd.	421,930	4,860	Transportation and Communication	100%
22	Israel Railways Ltd.	222,770	2,107	Transportation and Communication	100%
23	Life Science Research Israel Ltd.	4,820	47	Industry and Commerce	100%
24	Matz - The Israel National ROEds Company Ltd.	606,470	296	Industry and Commerce	100%
25	Mekorot Water Co. Ltd.	708,070	2,211	Electricity and Water	100%
26	Oil Products Pipeline Ltd.	20,050	0	Energy and Petroleum	100%
27	Petroleum and Energy Infrastructures Ltd.	75,750	383	Energy and Petroleum	100%
28	Pi-Gliloth Petroleum Terminals and Pipelines Ltd.	9,990	76	Energy and Petroleum	50%
29	Postal Bank Company Ltd.	NA	0	Transportation and Communication	100%
30	Rafael Advanced Defense Systems	1,286,160	5,213	Defense	100%
31	Rotem Industries Ltd.	14,890	95	Industry and Commerce	100%
32	The Israel Electric Corporation Ltd.	4,689,390	12,212	Electricity and Water	100%
33	The Marine Trust Ltd.	6,240	8	Building, Housing and Development	50%
34	The National Coal Supply Corporation Ltd.	1,069,140	26	Electricity and Water	99%
	Average				
	all 34 GBCs	476,952	1,531		91%
	11 GBCs for which minutes are examined, num.	700,000	2,300		90%
	Israeli public companies (in 2007)	284,753	624		0%
	Number of observations for Israeli public companies	743	478		743

Table 2

Representativeness of Sample

This table compares the background of the directors serving on the boards of the eleven GBCs for which minutes were examined to the background of directors serving on boards of other types of companies.

	GBCs		Public Israeli		Public Norwegian		Public Swiss		American S&P 500	
	Women directors	**Men directors**	Women directors	Men directors	Women directors	Men directors	Women directors	Men directors	Women directors	Men directors
Average age	**49.3**	**52.5**	51	59	48	55	ND	ND	56^^^	60^^^
Have executive experience^	**52%**	**62%**	79%	94%	51%	61%	4%	28%	56%	67%
Have undergraduate degree	**100%**	**94%**	90%	86%	56%	46%	91%	95%	ND	ND
Have an MA/ MBA degree	**56%**	**44%**	85%	78%	24%	22%	79%	84%	ND	ND
Served or are serving on other boards	**45%**	**44%**	ND	ND	ND	ND	ND	ND	ND	ND
Of these: non govt./ non-NGO boards	**18%**	**22%**	ND	ND	ND	ND	ND	ND	ND	ND
Currently on a board of a listed company	**ND**	**ND**	17%	18%	17%^^	19%^^	18%	31%	24%^^^	21%^^^
Number of directors	**50**	**86**	684	3020	249	383	50	1628	ND	ND
Percent of each gender	**37%**	**63%**	18%	82%	39%	61%	3%	97%	16%	84%
Year examined	2008		2009		2009		2003		2011	
Number of companies examined	11		100		113		269		500	
Source from which data was obtained / used to calculate figure	GCA database		Israeli Stock Exchange Authority, 2010		Ahern and Dittmar, 2012		Ruigrok et al., 2007		Spencer Stuart US Board Index, 2011	

^ In most studies, executive experience is defined as having been a CEO or held an executive position in an organization - e.g., head of a functional unit, partner/principal, or vice president. However, definitions vary among studies.

^^ Figures pertain only to directors whose primary occupation is serving as directors.

^^^ Figure from Peterson and Philpot (2007), pertains to 2002 Fortune 500 boards.

Table 3
Summary Statistics on Minutes-data
This table reports summary statistics on the minutes of the eleven GBCs for which minutes were examined.

	Board meetings	committee meetings	Board & committee meetings
Actions taken by the boards			
Average % of issues discussed for which an update was requested	6.4%	17.1%	11.3%
Average % of issues discussed for which an impact was made	6.8%	12.1%	9.3%
Average % of issues discussed for which update requested or impact made	12.4%	25.7%	18.6%
Average % of issues discussed for which boards did not vote unanimously	3.6%	1.1%	2.5%
Average % of issues discussed for which boards voted against CEO	1.9%	3.2%	2.5%
Actions (updates or initiatives) taken by individual directors	0.89%	4.18%	1.95%
Board composition in attendance			
Average number of directors in attendance	8.1	4.3	6.38
Average % of attending directors who are women	36%	37%	37%
Average % of attending directors who are men	64%	71%	67%
Percentage of issues discussed with at least three women in attendance	58%	28%	45%
Percentage of issues discussed with at least three men in attendance	91%	53%	73%
Percentage of issues discussed with at least three direc. of each gender	51%	16%	35%
Sample size			
Number of companies examined	11	9	
Average number of meetings per company	14.1	27.4	
Median number of meetings per company	12	18	
Average number of issues discussed per meeting	8.5	4.6	6.1
Total number of meetings examined	155	247	402
Total number of issues discussed (cases)	1313	1146	2459
Average number of lines in minutes per issue discussed	65	90	78
Average number of lines per meeting	564	424	478
Average number of pages of minutes per meeting	14.2	10.3	11.8
Total number of pages of minutes	2204	2554	4758

Table 4

Gender Composition and Board Activeness

This table reports regressions analyzing, on the board-meeting-issue level, the issues discussed at board- and board-committee meetings of the eleven GBCs examined. The dependent variable in Regressions 1-2 and 5-6 is a binary variable that equals one if the board either requested to receive further information or an update, or if it took an initiative (e.g., suggested which action should be taken). In Regression 3 the dependent variable equals one if the boards requested an update, while in Regression 4 the dependent variable equals one if the board took an initiative. The primary independent variables are the fraction of attending women directors and its square, a dummy which equals one when at least three women directors were in attendance, a dummy which equals one when at least three men directors were in attendance, and a dummy that equals one if at least three directors of each gender were in attendance. In addition, the regressions control for the fraction of attending outside directors, the total number of attending directors, the average number of years of executive experience of the attending directors, the fraction of attending directors with an MA/MBA, a dummy that equals one if the firm was in the process of replacing the CEO, and a dummy that equals one if the issue discussed was one of supervisory nature. For each variable, the first line in Regressions 1-5 reports the coefficient, while the first line in Regression 6 reports the odds ratio. For all variables and regressions, the second line (in round parentheses) reports clustered errors at meeting level. ***, **, *, indicate significance at the 0.01, 0.05, and the 0.10 level, respectively.

	Action taken		Update	Initiative	Action taken	
	(1)	(2)	(3)	(4)	(5)	(6)
Fraction of women directors in attendance	-0.268 (.226)	-0.083 (.250)				
Square of fraction of women directors in attendance	0.302 (.255)	0.106 (.307)				
Three or more women directors in attendance			0.044** (.019)	0.092*** (.029)		
Three or more men directors in attendance			0.031 (.021)	0.035 (.025)		
At least three directors of each gender					0.098*** (.032)	2.832*** (.315)
Fraction of outsiders	-0.059 (.046)	-0.062 (.088)	-0.003 (.039)	0.007 (.033)	-0.033 (.047)	0.419 (.752)
Number of directors in attendance	0.003 (.007)	-0.012 (.017)	-0.007 (.004)	0.001 (.004)	-0.006 (.006)	0.948 (.065)
Fraction with executive experience	0.006 (.007)	-0.002 (.005)	0.003 (.006)	-0.002 (.005)	0.001 (.008)	1.04 (.084)
Fraction with an MA or an MBA	0.088 (.088)	-0.163** (.077)	-0.043 (.062)	0.166*** (.049)	0.078 (.078)	2.157 (.831)
Dummy supervisory issue	-0.031 (.045)	0.387*** (.056)	-0.086** (.040)	0.140*** (.031)	0.027 (.049)	0.000*** (1.185)
Between CEO period	0.053 (.051)	0.052 (.057)	0.009 (.033)	0.049* (.025)	0.06 (.044)	1.577 (.347)
Company, year, and topic-subject dummies included	Yes	Yes	Yes	Yes	Yes	Yes
Meetings examined	Board	Committee	Board	Board	Board	Board
Type of issues	All	All	All	All	All	All
Type of regressions	OLS	OLS	OLS	OLS	OLS	Logit
R-squared	0.075	0.141	0.059	0.077	0.084	
N	1313	1145	1313	1313	1313	1151

Table 5

Descriptive Statistics on Activeness of Individual Directors

This table reports summary statistics on the board-meeting-issue-director level for board meetings (top panel), and for board-committee meetings (lower panel). The columns report the frequency directors of each gender: took an action, i.e., requested an update or took an initiative (Column 1), took a supervisory action as defined in Section 4viii (Column 2), or took a managerial action as defined in Section 4viii (Column 3). Column 1 is equal to the sum of Columns 2 and 3. Column 4 reports the corresponding number of observations on the board-meeting-issue-director level for each gender. Column 5 reports, conditional on an action being taken, the average percentage of cases each gender took a supervisory action (as opposed to a managerial one), of all actions taken. Column 5 is equal to Column 2/ Column 1.

	Total percent of cases action is taken (1)	Percent of cases supervisory action taken (2)	Percent of cases managerial action taken (3)	N (4)	Average percentage of supervisory actions of all actions taken (5)
Board meetings					
Women directors	0.80%	0.65%	0.16%	3,865	80.6%
Men directors	0.92%	0.60%	0.32%	6,723	61.7%
Committee Meetings					
Women directors	4.56%	4.07%	0.49%	2,038	89.2%
Men directors	4.05%	3.16%	0.90%	3,009	77.9%

Table 6

Women and Men Directors Taking Action

This table examines on the board-meeting-issue-director level, for the 11 GBCs examined, whether or not a director took an action (either requesting an update or taking an initiative). The dependent binary variable in the OLS regressions equals one if the director took an action and zero if he or she did not. The primary independent variables are a dummy that equals one in cases the director taking the action was a woman, the fraction of all women directors in attendance and its square, a dummy that equals one if at least three women directors were in attendance, a dummy that equals one if at least three men directors were in attendance, a dummy that equals one if at least three women directors were in attendance and the action was taken by a woman director, and a dummy that equals one if at least three men directors were in attendance and the action was taken by a man. In addition, the regressions control for the fraction of outsiders, number of directors in attendance, number of years of executive experience of the director taking the action, a dummy which equals one if the director taking the action had an MA or an MBA, and a dummy which equals one if the company was in the process of replacing the CEO at the time the issue was discussed. For each variable, the first line reports the coefficient and the second line reports (in round parentheses) clustered errors at the director level. ***, **, *, indicate significance at the 0.01, 0.05, and the 0.10 level, respectively.

	Action taken by director					
	(1)	(2)	(3)	(4)	(5)	(6)
Woman director	-0.0011	0.0468**	-0.0018	-0.0334**		
	(.002)	(.020)	(.002)	(.016)		
Fraction of women	-0.0586**	-0.1236**				
	(.026)	(.055)				
Square of fraction of women directors in attendance	0.0624**	0.1751**				
	(.032)	(.068)				
Three or more women directors in attendance			0.0072**	0.0035	0.0144**	0.0044
			(.004)	(.004)	(.006)	(.005)
Three or more men directors in attendance			0.0048	0.0064	0.0033	0.006
			(.004)	(.005)	(.005)	(.008)
Woman director and critical mass women in attendance				0.0132***		
				(.005)		
Man director and critical mass men in attendance				-0.0215		
				(.016)		
Fraction of outsiders	-0.0034	-0.0301*	-0.0032	-0.0029	0.0042	-0.0039
	(.004)	(.018)	(.004)	(.004)	(.007)	(.005)
Number of directors in attendance	-0.0009*	-0.0105***	-0.0015***	-0.0014***	-0.0002	-0.0022***
	(.001)	(.003)	(.001)	(.001)	(.001)	(.001)
MA/MBA	0.0057***	-0.0162**	0.0055***	0.0056***	0.0064*	0.0062**
	(.002)	(.007)	(.002)	(.002)	(.003)	(.003)
years of executive experience	0.0003***	-0.0002	0.0003***	0.0003**	0.0001	0.0003**
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Between CEOs	0.0048	0.0005	0.005	0.0045	0.0250***	-0.0031
	(.004)	(.014)	(.004)	(.004)	(.007)	(.005)
Dummy supervision	-0.0069	0.0723	0.0007	-0.0004	0.003	-0.0005
	(.034)	(.065)	(.034)	(.034)	(.089)	(.038)
Meetings examined	Board	Committee	Board	Board	Board	Board
Gender examined	Both	Both	Both	Both	Women	Men
Company, year, and topic-subject dummies included	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.006	0.017	0.006	0.007	0.004	0.011
N	10588	5047	10588	10588	3865	6723

Table 7

The Gender of Directors and the Type of Issues for Which They Are Active

This table examines on the board-meeting-issue-director level, for the 11 GBCs examined, whether or not directors took a supervisory action (as defined in Section 4viii). The observations included are conditional on an action being taken, and therefore include only the cases in which a director took an action. The dependent binary variable equals one if the action taken by a director pertained to a supervisory issue as opposed to a managerial issue. The observations included are conditional on an action being taken, and therefore include only the cases in which a director took an action. The primary independent variables are a dummy that equals one in cases the director taking the action was a woman, the fraction of all women directors in attendance and its square, a dummy that equals one if at least three women directors were in attendance, a dummy that equals one if at least three men directors were in attendance, a dummy that equals one if at least three women directors were in attendance and the action was taken by a woman director, and a dummy that equals one if at least three men directors were in attendance and the action was taken by a man. In addition, the regressions control for the fraction of outsiders, number of directors in attendance, number of years of executive experience of the director taking the action, a dummy which equals one if the director taking the action had an MA or an MBA, a dummy which equals one if the company was in the process of replacing the CEO at the time the issue was discussed, and a dummy which equals one if the issue was discussed at a board meeting as opposed to a board-committee meeting. For each variable, the first line reports: the coefficient in Regressions 1, and 3-6, and the odds ratio in Regression 2. For all variables, the second line reports (in round parentheses) errors clustered on the director level. ***, **, *, indicate significance at the 0.01, 0.05, and 0.10 level, respectively.

	Action taken on supervisory issue					
	(1)	(2)	(3)	(4)	(5)	(6)
Woman director took action	0.320***	1.712***	0.110***	1.690***		
	(.101)	(.535)	(.027)	(.223)		
Fraction of women directors in attendance	1.064	5.139	-0.453			
	(.994)	(4.076)	(.602)			
Square of fraction of women	-1.317	-6.53	0.495			
	(1.295)	(5.603)	(.531)			
Three or more women directors in attendance				0.139	-0.308*	0.361**
				(.144)	(.155)	(.144)
Three or more men directors in attendance				-0.117	-0.14	1.034***
				(.152)	(.189)	(.199)
Woman took action, at least three women in attendance				-0.561**		
				(.217)		
Man took action, at least three men in attendance				0.890***		
				(.144)		
Fraction of outsiders	0.074	0.478	0.051	0.278	0.325	0.384
	(.262)	(1.524)	(.135)	(.247)	(.479)	(.240)
Number of directors in attendance	-0.041**	-0.213**	0.040*	-0.042**	0.016	-0.103***
	(.017)	(.093)	(.018)	(.015)	(.033)	(.019)
Does director have an MA/MBA	-0.121	-0.645	-0.044	-0.159	-0.214**	-0.132
	(.101)	(.495)	(.063)	(.091)	(.072)	(.120)
Number of years of executive experience	-0.006	-0.023	-0.012**	-0.011	0.008	-0.022**
	(.006)	(.031)	(.005)	(.006)	(.005)	(.009)
Between CEO period	-0.154	-0.770*	-0.08	-0.191*	0.132	-0.196
	(.086)	(.436)	(.099)	(.088)	(.222)	(.108)
Meetings examined	Boards	Boards	Committees	Boards	Boards	Boards
Genders included	Both	Both	Both	Both	Women	Men
Type of regression	OLS	Logit	OLS	OLS	OLS	OLS
R-squared	0.052		0.091	0.076	0.119	0.174
N	101	101	225	101	33	68

Table 8

Gender Composition and CEO Turnover

This table reports OLS regressions analyzing a panel data set of the universe of the 34 GBCs for the years 2000-2009. The dependent variable is a binary variable that equals one if CEO turnover occurred. The primary independent variables are the fraction of women directors serving on a board and its square, the fraction of women directors serving on a board times ROE, the square of the fraction of women directors serving on a board times ROE, a dummy that equals one if at least three women were serving on the board, that dummy times ROE, a dummy that equals one if at least three men were serving on the board, and that dummy times ROE. In addition, the regressions control for the ROE, the fraction of outside directors, the number of directors, the tenure of the CEO, and a dummy that equals one if the CEO was a woman. For each variable, the first line reports the coefficient, and the second line reports (in round parentheses) clustered errors on firm level. ***, **, *, indicate significance at the 0.01, 0.05, and 0.10 level, respectively.

	CEO turnover				
	(1)	(2)	(3)	(4)	(5)
Fraction of women directors	0.259	-0.77			
	(.272)	(.505)			
Fraction of women*ROE	-0.591	11.065**			
	(1.691)	(4.194)			
Square of fraction of women directors		1.579**			
		(.618)			
Square of fraction of women*ROE		-18.284***			
		(5.737)			
At least three women directors in attendance			0.088	0.128*	
			(.067)	(.070)	
Three or more women*ROE				-1.752*	
				(.913)	
At least three men directors in attendance			0.005	0.018	
			(.133)	(.134)	
Three or more men*ROE				-0.695	
				(.852)	
At least three directors of each gender					0.172**
					(.084)
At least three directors of each gender*ROE					-2.027**
					(.883)
ROE	0.052	-1.494*	-0.225	0.628	0.389
	(.641)	(.805)	(.358)	(.861)	(.301)
Fraction of outsiders	-0.14	-0.092	-0.108	-0.136	-0.191
	(.168)	(.170)	(.171)	(.171)	(.134)
CEO tenure	0.049**	0.052***	0.050**	0.049**	0.050**
	(.018)	(.018)	(.019)	(.019)	(.018)
Number of directors	-0.004	-0.001	-0.009	-0.014	-0.014
	(.013)	(.014)	(.017)	(.018)	(.020)
CEO woman	0.451**	0.434**	0.465**	0.480**	0.455***
	(.187)	(.186)	(.182)	(.181)	(.135)
Firm and year dummies	Yes	No	Yes	Yes	Yes
Type of regression	OLS	OLS	OLS	OLS	OLS
R-squared	0.193	0.21	0.181	0.188	0.009
N	222	222	244	244	244

Table 9

Gender Composition and Board Activeness in the Absence of a CEO

This table reports regressions analyzing, on the board-meeting-issue level, the issues discussed at board- and board-committee meetings of the eleven GBCs examined. The dependent variable is a binary variable that equals one if an action was taken (i.e., the board requested to receive either further information or an update or if the board took an initiative). The primary independent variables are the fraction of attending women directors and its square, interaction variables for the latter two variables with a dummy documenting if the company was between CEOs (i.e., the board was in the process of replacing a CEO), a dummy which equals one if at least three women directors were in attendance, a dummy which equals one if at least three men directors were in attendance, and interaction variables for the latter two variables with a dummy documenting if the company was between CEOs. In addition, the regressions control for (but do not necessarily report) the fraction of attending outside directors, the total number of attending directors, the average number of years of executive experience of the attending directors, the fraction of attending directors with an MA/MBA, a dummy that equals one if the issue discussed was one of supervisory nature, and a dummy that equals one if the issue was discussed at a board meeting as opposed to a board-committee meeting. For each variable, the first line reports the coefficient and the second line reports (in round parentheses) the clustered errors at meeting level. ***, **, *, indicate significance at the 0.01, 0.05, and the 0.10 level, respectively.

	Action taken			
	(1)	(2)	(3)	(4)
Fraction of women directors in attendance	-0.278	0.057		
	(.272)	(.229)		
Fraction of women directors and between CEOs	0.373	-0.56		
	(.415)	(.370)		
Square of fraction of women directors in attendance	0.255	-0.019		
	(.359)	(.270)		
Square of fraction of women directors and between CEOs	-0.245	0.472		
	(.504)	(.430)		
Three or more women directors in attendance			0.077*	
			(.041)	
Three or more women directors and between CEOs			0.112*	
			(.058)	
Three or more men directors in attendance			0.024	
			(.043)	
Three or more men directors and between CEOs			0.160*	
			(.094)	
At least three directors of each gender				0.067**
				(.032)
At least three directors of each gender and between CEOs				0.120**
				(.052)
Fraction of outsiders	-0.066	-0.09	-0.036	-0.05
	(.054)	(.069)	(.053)	(.050)
Number of directors in attendance	0.004	-0.011	-0.005	-0.005
	(.006)	(.012)	(.006)	(.006)
Fraction with executive experience	0.005	-0.002	0.002	0.002
	(.007)	(.004)	(.007)	(.007)
Between CEO period	-0.033	0.149*	-0.146	0.007
	(.083)	(.079)	(.107)	(.041)
Firm and year dummies	Yes	Yes	Yes	Yes
Company, year, and topic-subj. dummies	Yes	Yes	Yes	Yes
Meetings examined	Board	Committees	Board	Board
R-squared	0.075	0.148	0.087	0.089
N	1313	1145	1313	1313

Figure 1

Actions Taken by Boards at Board Meetings

Figures 1a-1d examine the 1,313 issues discussed by the GBC boards at 155 board meetings. Figures 1a and 1b report the average fraction of cases in which the boards examined requested to receive further information or an update, and they also include those in which it took an initiative. These are broken down by the number of women directors in attendance (Figure 1a) and the number of men directors in attendance (Figure 1b). Figures 1c and 1d break down the frequency with which actions were taken by the boards. This is broken down according to whether or not a critical mass of at least three women directors (Figure 1c) or a critical mass of at least three men directors (Figure 1d) was in attendance. The error bars in Figures 1c-1d indicate the 95% confidence interval.

Figure 1a – Number of Women Directors and Frequency Action is Taken

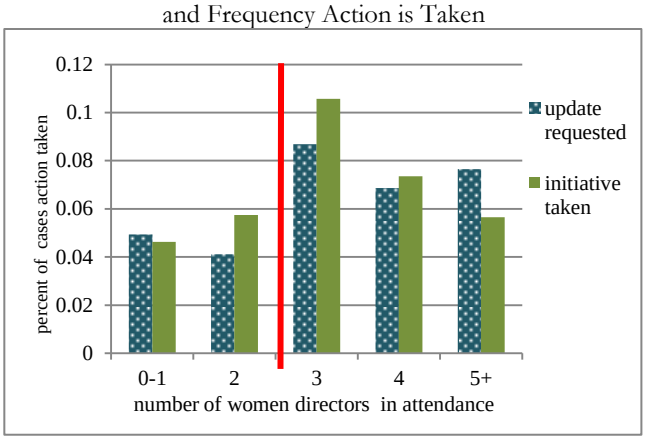


Figure 1b – Number of Men Directors and Frequency Action is Taken

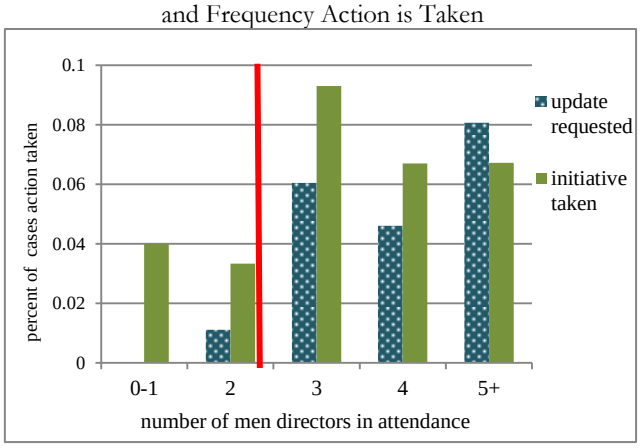


Figure 1c – Critical Masses of Women Directors and Frequency Action is Taken

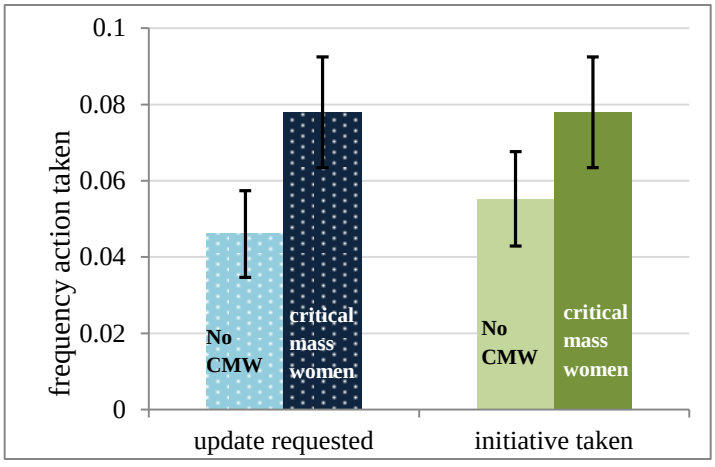
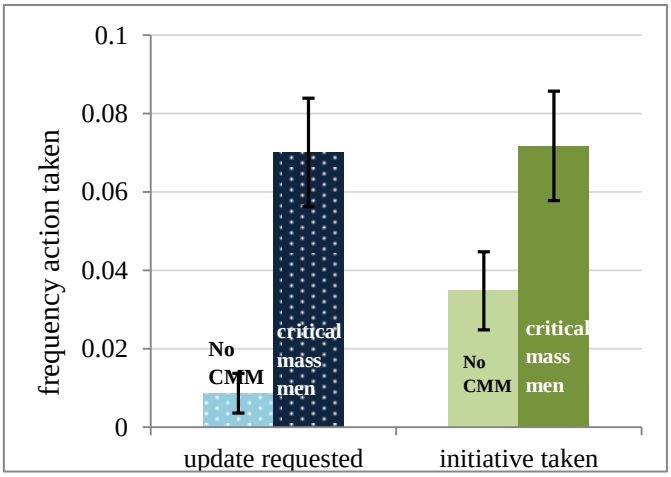


Figure 1d – Critical Masses of Men Directors and Frequency Action is Taken



-FOR ONLINE PUBLICATION-

Appendix A: Additional Information on GBCs

The 1975 "Government Companies Law" GCL states that the CEO is not permitted to serve as the chairman or as a director of the firm of which he is the CEO. However, in the minutes examined, the CEO is present in virtually all meetings of the board and its committees.[19]

The bylaws of each GBC generally require that the board be made up of eight to twelve directors, with seven to ten serving directors being most common. The bylaws of each of the companies also specify which ministers appoint the directors of the company; in most cases it is the Minister of Finance and one additional relevant minister. [20] In certain cases, the bylaws state that some of the directors must be employees of the ministries, and/or representatives of the company's employees, but in none of the companies can more than two of the latter sit on a board. The 1975 "Government Companies Law" imposes restrictions on nominating politicians to GBC boards, and the nomination committee strictly enforces these restrictions. Hence, although the directors nominated must be somehow connected to the ministers, virtually no politicians were nominated to the firms examined.

GBC directors have the same fiduciary duties as directors serving on public and private Israeli companies. Israel's 1999 "Corporation Law" specifies these duties: "An office holder shall owe a fiduciary duty to the company, shall act in good faith and for the benefit of the company" (paragraph 254 (a)). Israeli law is based on the Common Law, and therefore is very similar to comparable American law. Lawsuits against officers and directors of both public and private companies are less common In Israel than in the United States. All directors in our sample have Directors and Officer's Liability Insurance, which provides them similar coverage to that provided to directors of comparable non-governmental firms. The only compensation given to GBC directors is a fixed compensation for each meeting they attend, which ranges between ₪185 and ₪350 per meeting, depending on the company's size.[21]

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[19] All GBCs have finance and audit board-committees. In addition, most GBCs have approximately two to three additional board-committees.

[20] The GCL requires that in companies in which the government holds more than half the votes in the general stockholders' meetings, directors must be at least twenty-five years old, be residents of Israel, and either have degrees in business, economics, law, accounting, engineering, public service, or any other field relevant to the firm, or have at least five years of relevant experience or experience in a senior management position. The requirements regarding the chairman are even stricter.

[21] Although this financial compensation is not high, there are many candidates interested in being directors of GBCs, since such positions provide status, the expansion of one's professional network, and also enable the development of an expertise in demand in the better-paying private sector. In small and medium companies, the chairman is not employed on a full-time basis, and his compensation is based on the number of meetings he actually attends. In large companies, the chairman is employed on a full-time basis, and accordingly receives (only) a monthly salary.

Appendix B: Complete Coding Guidelines

A. Complete coding guidelines

The following coding guidelines were defined in coding the data:

1. *General information*. For each issue discussed, the coding included the name of the company, date of meeting, type of meeting (board or a specific board-committee), whether the issue was merely presented as an update or alternatively culminated in a decision made by the board, the number of lines in the minutes documenting the issue discussed, and the total number of pages of minutes of the complete meeting at which the issue was discussed.
2. *Aggregate topic-subjects*. Each topic discussed or decision made in a board meeting or board-committee meeting was coded under one of the following five aggregate topic-subjects: audit and contracting, business issues, financial issues, formal issues, and personnel and benefits. Each of these aggregate topic-subjects includes the following 23 topic subjects (defined in Section B of this appendix):
    a. *Audit and contracting*: audit issues, contracting or purchases, legal, and ratification of audit committee.
    b. *Business issues*: business issues, business projects, cross-firm issues, ongoing general issues, ratification of operational committee, regulation and government, and strategic issues.
    c. *Financial issues*: budget, financial reports, investment or finance, and ratification of financial committee.
    d. *Formal issues*: appointments of members, approving past minutes of meetings, choosing a chairman for the meeting, and formal issues.
    e. *Personnel and benefits*: appointing or firing an executive, organizational change, personnel and benefits, and ratification of human resources committee.
3. *Supervision.* All topic-subjects were divided according to whether they were of supervisory or managerial nature. Supervisory topic-subjects were defined as appointment of members, approving minutes of earlier meetings, audit issues, choosing a chairman for the meeting, contracting or purchases, financial reports, formal issues, legal issues, personnel and benefits, ratification of audit committee, ratification of human resources committee, ratification of operational committee, ratification of financial committee, and regulation and government. Managerial topic-subjects were defined as appointing or firing an executive, budget, business issues, business projects, cross-firm issues, investment or finance, ongoing general issues, organizational change, and strategic issues.
4. *Presentation of alternatives.* These are cases in which the board was presented with at least two alternatives, including cases in which the CEO or management made its own preference clear.
5. *Further updates.* These are cases in which the board requested to receive further information or an update on the subject discussed. In cases in which concerning a single topic-subject the board requested more than one update or further information, this was coded as one request.

6. *Taking an initiative.* When a board actively did something that was meant to improve the company, according to its own understanding, this was coded as either "minor initiative" or as "major initiative". Minor initiative indicates that the board slightly modified the original proposal. For examples: the board approved a lease it was asked to approve, yet decided to introduce a few revisions of details; the board requested that some moderate action be taken, for instance, that the CEO write a letter to the regulator about an issue discussed at the board meeting; or the board decided to form a committee or appoint a director to handle a certain issue, but when this decision was made it is too early to know whether any action was indeed taken.[22] Major initiative indicates that the board took an active part in defining the steps or actions that should be taken, or delved into an issue it actively requested to discuss. For example: a board requested to examine the company's policy concerning perks (e.g., which employees were eligible to be driven to work, at what times, and under what circumstances), discussed the policy concerning that perk quite thoroughly, and finally, formulated and adopted a new alternative policy; or a board actively sought, both within the boardroom and elsewhere, to change the regulation imposed on the firm.[23]
7. *Decision in line with CEO.* For each decision made by the board, the decision was coded as either in line, partially in line, or not in line with the CEO's or management's proposal. [24]
8. *Dissension.* These are cases in which a decision was made, and one or more of the directors did not vote as the others (either opposing them or abstaining).
9. *Size of board and board composition.* For each meeting, the total number of attending directors was coded, along with the number of attending women directors, directors from ethnic minority members (Arabs), and outside directors.[25]
10. *No serving CEO.* These are cases in which the firm had no CEO at the time the board or board-committee meeting was held.
11. *Consistency.* To assure consistent standards all coding was executed by a single person (one of us),[26] who reviewed the coding several times.

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[22] If the minutes of subsequent meetings documented that the board did take a major initiative, it was categorized accordingly for that subsequent meeting.

[23] One could argue that this specific coding category is one with a soft definition. For this reason, great care was taken to assure that the coding be conducted according to consistent standards. After the coding was completed, apart from the general rechecking of all of the coding, the coding of this specific category was carefully reexamined throughout all minutes examined.

[24]In cases in which the chairman received a monthly salary and, accordingly, dedicated most of his time to the firm, it is generally evident from the minutes that in the boardroom his views were coordinated and aligned with those of the CEO. In these cases, the chairman usually complemented the CEO and vice versa. Accordingly, views of chairmen who receive monthly salaries were regarded and coded as identical to those of the CEO. In contrast, in firms in which the chairman was compensated only on a base of board and board-committee meetings he attended, his views were not always coordinated and aligned with those of the CEO and, therefore, he was regarded as a board member and his views were coded accordingly as views of the board.

[25] Inside directors were defined as government employees and firm employees.

[26] This was also due to the confidentiality of the minutes, which were made available to the authors with the proviso that virtually only they be allowed access to them.

B. *List of topic-subjects*

Each topic discussed or decision made in a board or board-committee meeting was coded under one of the following 23 topic-subjects.

i. *Appointing or firing an executive* – executives include the CEO, his deputies, and the auditor.

ii. *Appointment of members* – to board-committees or boards of subsidiary firms.

iii. *Approving minutes of past meetings* – formal approval of the minutes by the board.

iv. *Audit* – audit reports and audit issues regarding the firm.

v. *Budget* – updates, suggested changes, and projected budget.

vi. *Business issues* – a standard business issue. For instance, in the case of a bank, waiving part of a problematic debt.

vii. *Business project* – data regarding a specific project the firm or a subsidiary had undertaken or ad considered undertaking.

viii. *Choosing a chairman for the meeting* – for companies that do not have a permanent chairman and elect one for each board meeting.

ix. *Contracting or purchases* – contracts regarding purchasing raw materials, supplies, real estate, or services, for example, from advisers and external accountants. This category also includes problems that could arise within contractual relation.

x. *Cross-firm issue*s – an issue with across-the-firm implications (for example, proposed changes in the customer service or moving the offices to a new location), or the plans of a specific unit that have ramifications and implications for the firm at large.

xi. *Financial reports* – discussions regarding the financial reports and the assumptions upon which they rely.

xii. *Formal issues* – issues that must receive the formal approval of the board, such as granting the authority to sign a contract or financial reports or to represent the firm in a general meeting.

xiii. *Investment or finance* – issues regarding money invested, borrowed from banks or the government, or raised from institutional investors or the stock market, and also issues regarding the firm's floating stock.

xiv. *Legal* – legal issues, including insurance.

xv. *Ongoing general issues* – ongoing continuing issues in the life of the firm, including brief anecdotal updates on issues previously discussed by the board. Most board meetings commenced with such brief updates presented by the CEO or chairman. When distinct issues were discussed in detail, each was coded separately.

xvi. *Organizational change* – structural changes in the firm.

xvii. *Personnel and benefits* – employee benefits (e.g., receiving bonuses or leasing cars), behavioral problems among employees, changes in the total number of employees, general policies regarding employees, and a limited range of issues regarding compensation and benefits received by the directors.

xviii. *Ratification of audit committee* – a decision made by the audit board-committee that was only briefly presented to the board, to allow ratification of the decision.

xix. *Ratification of financial committee* – a decision made by the financial board-committee that was only briefly presented to the board, to allow ratification of the decision.

xx. *Ratification of human resources committee* – a decision made by the human resource board-committee that was only briefly presented to the board, to allow ratification of the decision.

xxi. *Ratification of operational committee* – a decision made by the operational board-committee that was only briefly presented to the board, to allow ratification of the decision.

xxii. *Regulation and government* – relation with the government, whether as regulator, shareholder, or otherwise. Examples of issues included are fees determined by the regulator, dividends the government demanded, and privatization.

xxiii. *Strategic issues* – discussions pertaining to the strategic business plan of the firm, or at least of a major activity of the firm, for the following years.

Appendix C: Examples of Actions Taken

This Appendix illustrates the types of actions that were taken by the boards. Namely, the appendix documents all the actions that were taken and coded under one of the twenty-three topic subjects – the "budget" topic-subject. For the budget topic-subject, eighteen requests were made to receive further information or an update, and ten initiatives were taken. All these actions are specified bellow.

Requests to receive further information or an update:

The board requested to receive:

1. A sensitivity analysis examining how the budget would change if the Dollar – Israeli New Shekel exchange rate would increase or decrease.
2. Information on new business projects that have not been presented to the board, and the proposed budget for those business projects.
3. An analysis examining how the budget would be affected if the firm's projected revenue were to decrease by 5%.
4. An analysis of how the valuation methods required by SOX (which the firms were required to implement gradually) affected the value of the firm's assets and those of its daughter companies.
5. An analysis of how purchasing raw materials in the spot market could affect the firm's budget.
6. The actual expenses of several projects, compared to those projected.
7. An analysis of the expenses incurred in order to maintain the vehicles owned and used by the company, and a parallel analysis as to what the company's expenses would be if it were instead to lease the vehicles it uses.
8. A report on the profitability of the different business sectors in which the firm operates.
9. A list of all the outside advisers providing services to the firm, the services they provide, and their cost.
10. An updated budget following the firing of some of the employees.
11. Information on how one of the major raw materials is purchased, and a proposal of alternatives that could possibly cut those expenses.
12. A report on a specific budget category that, in the previous year, the board had demanded be cut, and on the actual expenses in this budget category.
13. A more accurate long-term budget.
14. A new investment budget that would be cut by 10%.
15. A legal opinion concerning the company's ability to use a designated budget category for other purposes.
16. A document that summarizes the exposures of the company following a change in regulation.
17. A quarterly update comparing the budget as initially planned to actual expenses.

18. Several alternatives to the proposed budget.

Initiatives taken:

1. Following the presentation of the revenue and expenses of one of the daughter firms, the board expressed its desire to consider seriously selling this daughter company. An additional discussion of this topic was scheduled.
2. Following receipt of a budget update, the boards requested that the firm change its policy not to include any "allowance for bad debt", and that it indeed make such an allowance.
3. To increase the limited cash flow of the company, the board suggested and decided that the company attempt to increase its suppliers' credit, and that it limit the number of miles employees are permitted to drive in the companies vehicles as well as the limits on cell phone bills that would be covered by the firm.
4. The board proposed and decided to hire an outside consultant who would map the firm's financial exposures, and recommend how to invest the firm's cash.
5. The board proposed and decided that the budget allocated to providing improved customer service be increased.
6. The board made it clear that it expected the company to generate a minimal profit it had defined, and demanded the projected budget be revised accordingly.
7. The board requested that the CEO seek alternative suppliers. These alternative suppliers were expected to affect the short- and long-term budget.
8. The board initiated a meeting with the regulator, which was attended by the board and the management. In this meeting, the boards and management requested that the regulation be changed in a way that would increase the firm's income.
9. The board decided to make priorities as to which projects should receive increased budget, and at the next meeting, accordingly, it made changes in the proposed budget.
10. The board initiated a discussion on the times, intervals, and format in which it wishes to receive information concerning the budget.

Appendix D: Critical Masses and Type of Actions Taken

Table I: Critical Masses Taking Actions Broken Down by Topic-Subject

This table reports the 1313 issues discussed at board meetings by the boards of the eleven GBCs examined, broken down by the topic-subject discussed. Columns 1-6 report the percentage of cases an update was requested or an initiative was taken given that: a critical mass of women was, or was not, in attendance (Columns 1-2, respectively), a critical mass of men was, or was not, in attendance (Columns 3-4, respectively), and given that a critical mass of both genders was, or was not, in attendance (Columns 5-6, respectively). The last line reports t-statistics for each pair of columns specified above, where ***, **, *, indicates significance at the 0.01, 0.05, and 0.10 level, respectively

	Women critical mass	No critical mass of women	Men critical mass	No critical mass of men	Dual critical mass	No dual critical mass	Total number of cases
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Audit	41.2%	4.8%	21.1%	0.0%	41.2%	4.8%	38
Contracting/ purchases	19.2%	25.8%	22.8%	0.0%	20.0%	24.2%	83
Legal	27.8%	10.7%	17.8%	0.0%	29.4%	10.3%	46
Ratification of audit committee	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8
Total audit and contracting	*24.7%*	*14.0%*	*20.1%*	*0.0%*	*25.9%*	13.3%	*175*
Business issues	0.0%	3.7%	3.1%	0.0%	0.0%	3.7%	417
Business projects	18.1%	27.3%	22.7%	5.9%	20.3%	19.4%	105
Cross-firm issues	35.7%	11.1%	25.6%	33.3%	37.0%	10.5%	46
Investment/ finance	8.9%	8.3%	9.8%	0.0%	10.5%	6.5%	69
Ongoing general issues	4.9%	5.0%	5.4%	0.0%	5.8%	4.3%	120
Ratification of operational comm.	0.0%	12.5%	11.1%	0.0%	0.0%	12.5%	9
Regulation and government	13.5%	4.9%	9.4%	12.5%	13.3%	6.3%	93
Strategic issues	11.1%	66.7%	27.3%	0.0%	12.5%	50.0%	12
Total business issue	*15.1%*	*9.6%*	*13.2%*	*7.7%*	*16.4%*	9.0%	*417*
Budget	26.2%	10.3%	22.2%	0.0%	30.6%	8.6%	71
Financial reports	17.1%	23.1%	21.3%	0.0%	20.0%	18.8%	67
Investment/ finance	8.9%	8.3%	9.8%	0.0%	10.5%	6.5%	69
Ratification of financial comm.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10
Total financial issues	*16.7%*	*12.9%*	*16.9%*	*0.0%*	*19.5%*	10.6%	*218*
Appointment of members	5.7%	0.0%	0.0%	33.3%	0.0%	11.8%	47
Approving past minutes	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	83
Choosing chairman for meeting	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	31
Financial reports	17.1%	23.1%	21.3%	0.0%	20.0%	18.8%	67
Formal issues	3.0%	0.0%	1.7%	0.0%	3.2%	0.0%	224
Total formal issues	*2.3%*	*0.0%*	*0.5%*	*8.0%*	*0.9%*	1.8%	*224*
Appointing/ firing an executive	31.0%	36.0%	36.7%	0.0%	37.5%	30.0%	54
Organizational changes	7.7%	0.0%	5.9%	0.0%	7.7%	0.0%	17
Personnel and benefits	12.8%	9.8%	12.7%	0.0%	14.2%	8.3%	279
Ratification of HR committee	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	30
Total personnel and benefits	*14.1%*	*14.7%*	*15.6%*	*0.0%*	*16.0%*	12.2%	*279*
Total in percentage	*14.0%*	*10.1%*	*13.2%*	*4.3%*	*15.5%*	9.2%	
Difference, t-test	*3.9%**		*8.84%***		*6.31%****		
N	770	543	1198	115	671	642	1313

Appendix E: Boards Taking Actions – 2sls Analysis

It is possible that men and women directors have different attendance patterns. Specifically, it is possible that directors of one gender are particularly likely to attend meetings that are expected to require high involvement and activeness from the board, while directors of the other gender are particularly likely to attend meetings that are expected to require low levels of activeness. A director can quite easily establish such expectations based on the agenda and other materials he or she receives (usually at least several days) prior to each meeting. If this is indeed the case, the existence of a critical mass of each gender may be endogenous.[27]

In this Appendix H address the concern that non-random attendance may be driving the results, and that attendance may be driven by other factors included in the error term, such as whether directors expect high versus low involvement to be required. I introduce here a model similar to the one presented in Section 5.1, with one difference: the model in this appendix assumes that the presence of a critical mass of three women directors, and also one of three men directors, is endogenous. Accordingly, the model includes exogenous instrument variables that control for the likelihood that a critical mass of women directors, and a critical mass of men directors, will choose to attend a particular board meeting in which a particular issue is discussed. Exogenous variables exist as a result of the customary ways in which meetings are scheduled.

Frequently, committee meetings are scheduled on the same day as board meetings, just before or immediately after the board meeting. Because different directors sit on different board-committees, there exists a variation in the total number of meetings men and women directors have on a day a board meeting takes place. If a director is a member of a board-committee that meets before or after the board meeting, he or she has a stronger incentive to attend (both of) these meetings. This is because the only compensation GBC directors receive is a fixed amount for each meeting they attend (as described in Section 3). Hence, a director who has a board meeting and a board-committee meeting scheduled on the same day must commute only once (since the meetings are held at the same location) but will receive compensation that corresponds to the number of meetings he or she attends. In addition, regardless of the financial compensation, directors usually want to be involved, and therefore they may prefer attending meetings on days in which they have an increased opportunity to do so – the days they have more than one meeting scheduled.

The 2sls model introduced in this appendix uses this information on the day board-committee meetings are scheduled to instrument for attendance. The model instruments for the presence of a critical mass of women directors using the number of women directors that were invited to at least one board-committee meeting on the same day a particular issue was discussed at a particular board meeting. A parallel variable is constructed to instrument for the presence of a critical mass of men directors. Using data concerning the number of board-committee meetings held as IVs controlling for the likelihood that women and men directors

[27] The attendance rates of GBC men and women directors examined were similar: on the level of the individual directors, the average percentage of meetings a director was invited to but did not attend, equaled 20% for women directors and 19% for men directors. Nevertheless, non-random attendance may exist.

attend board meetings conforms to the requirements from an IV: As will be shown, these IVs impact significantly (at the 1% level) upon attendance, of both men and women directors. In addition, because the meetings are in the vast majority of cases scheduled months in advance, the IVs have no direct impact on the likelihood that boards will take an action (i.e., request to receive an update or to take an initiative).

Specifically, usually each firm has its own tradition concerning the number of meetings the board and board-committees hold during a given period (e.g., one audit board-committee every quarter). Depending on the firm, every quarter, half-year or year the firm's secretary notifies the directors of the schedule of upcoming meetings. Since numerous people must attend these meetings (directors, employees, auditors, external consultants, etc.) in the vast majority of cases the meetings are indeed held on the date and time initially scheduled. However, the agendas of the meetings are determined only after the meetings are scheduled, usually one to three weeks prior to each meeting. Therefore, whether or not a board-committee is scheduled on a particular day should not be correlated with the error term of the 2sls equation, which includes the expectations of directors that the meeting be one which requires a high/low level of board activeness.

In Table III I address potential concerns related to the exclusion restriction requirement: First, I examine the possible concern that boards discuss different types of issues at board meetings scheduled on days on which also a board-committee meeting is scheduled, versus board meetings scheduled on days on which no additional board-committee meeting is scheduled. Panels 1 and 2 of Table III show that the issues that were discussed on days on which also a board-committee meeting is scheduled, as opposed to days in which no such meeting is scheduled, are not significantly different. I also address the concern that firms adjust the type of issues brought up for discussion depending on whether the board is indeed gender-balanced: Panel 3 of the Table III documents that the type of issues discussed do not change significantly given that the board is or is not gender-balanced.

Accordingly, using the notations introduced in Section 5.1, the following 2sls model is defined:

$$A_{bmi} = \alpha_b + \beta_t + CMW_{bmi} + CMM_{bmi} + B'_{bm}\lambda_1 + I'_{bmi}\lambda_2 + v_{bmi} \qquad (3)$$

The difference between the OLS model, specified in Equation (2) of Section 5.1, and the 2sls model, specified in Equation (3), is that the primary variables in the latter equation documenting the gender composition of the board at the time an issue was discussed are assumed to be endogenous in Equation (3). These endogenous variables are denoted in (3) by CMW_{cmi}, which is a dummy variable that equals one if at least three women directors were in attendance, and CMM_{cmi}, which is parallel variable for men directors. To solve this equation, as mentioned, two exogenous variables are introduced: CoW_{cmi} is an instrument that equals the number of women directors that were invited to at least one board-committee meeting on the same day issue i was discussed at the board meeting, and CoM_{cmi} is the parallel variable for men directors. Accordingly, a 2sls model that consists of three equations is defined, which includes the following two first-stage equations:

$$CMW_{bmi} = CoW_{bmi} + CoM_{bmi} + \alpha_b + \beta_t + B'_{bm}\lambda_1 + I'_{bmi}\lambda_2 + \varepsilon a_{bmi} \quad (4)$$

and

$$CMM_{bmi} = CoW_{bmi} + CoM_{bmi} + \alpha_b + \beta_t + B'_{bm}\lambda_1 + I'_{bmi}\lambda_2 + \varepsilon b_{bmi} \quad (5)$$

The results for Equations (3)-(5) are reported in Table II. Regressions 1-2 of Table II report the first-stage equations (Equations (4) and (5), respectively). As these first-stage regressions document, indeed a positive and significant relation is documented between the IVs and the potentially endogenous variables. Regression 1 shows that the number of women directors that were invited to two or more meetings on the day issue i was discussed is positively and significantly (at the 1% level) related to the likelihood that a critical mass of at least three women directors is present at a board meeting. Similarly, Regression 2 documents parallel results for men directors. I report the Angrist-Pischke multivariate F-test described in Angrist and Pischke (2009). This F-test is particularly informative for a model with multiple endogenous regressors and multiple instruments, which is the case in this analysis. For both first stage regressions, the Angrist-Pischke F-test are larger than the F=10 threshold suggested by Stock et al. (2002) as the minimal threshold required to conclude that the instruments used in a 2sls model are strong.

The results of the second stage of the 2sls analysis (Equation (3) above) are reported in Regressions 3-5 of Table II. The dependent variable in these regressions is a binary variable that equals one if the board requested to receive further information or an update (Regression 3), took an initiative such as suggesting which action should be taken (Regression 4), or either requested an update or took an initiative (Regression 5). As Regressions 3-5 document, consistent with the results presented in Section 4.2, the results presented in this Appendix indicate that having a dual critical mass, and particularly one that includes a critical mass of women directors, is associated with a significant increase in the likelihood that the board request an update and/or take an initiative. Hence, the 2sls analysis confirms the results from the previous section.

The economic magnitude of the impact of critical masses of men and women directors is substantially larger in the 2sls analysis compared to that documented in the OLS analysis. However, by definition, the 2sls model is less efficient than the OLS model, and this may cause inaccurate estimates (e.g., Larker and Rusticus, 2010). To examine whether the 2sls model is indeed required in this case to solve a problem of endogeneity, and accordingly, if its economic magnitude is more reliable, I report the Anderson canonical correlation statistic for Regression 5, which includes two instruments and one potentially endogenous variable, and then conduct a Hausman test for each of the specifications reported in Regressions 3-6 in Table II. The Anderson canonical correlation statistic which tests the relevance of the instruments, is large, and its' p values is small, indicating that the instruments are jointly valid. Therefore, we may proceed and conduct a Hausman test.

In Regressions 6-7 in Table II I repeat this analysis, but I define the potentially endogenous variable as the presence of a gender-balanced board. In these regressions I include both instruments described above. A

gender-balanced board is defined in Regression 6 as a board that includes at least three directors of each gender, and in Regression 7 as a board in which each gender consists at least 35% of the board. Once again, the results show that gender-balanced boards were significantly (at the 1% level) more active.

As the figures reported for Regressions 3-7 of Table II indicate, for all these specifications the Hausman test fails to reject, at the 1% level, the null hypothesis that no difference exists between the 2sls and the OLS estimates. Hence, the results of the Hausman test imply that no systematic difference exists between the OLS and the 2sls estimates. Therefore, given that the 2sls results are biased and inconsistent in finite samples, in this case the estimates of the OLS model seem to be those that provide the most accurate information on the magnitude of the impact of critical masses of women and men directors. The contribution of the 2sls analysis is that it demonstrates that the significant and positive impact of a critical mass of women directors is not driven by non-random attendance.

In sum, the results in this section reinforce the conclusion that appointing gender-balanced boards catalyzes board activeness.

Table II

Gender Composition and Board Activeness – 2sls Analysis

This table reports results of a linear 2sls model analyzing on the board-meeting-issue level, the 1313 issues discussed at board meetings by the boards of the eleven GBCs examined. The model instruments for the likelihood that the a critical mass of at least three women directors, one of at least three men directors, or a gender-balanced board, will attend a particular board meeting in which a particular issue is discussed, using an instrument variable that equals the number of women directors that were invited to at least one board-committee meeting on the same day a particular issue was discussed at the board meeting, and a parallel variable for men directors. Regressions 1-2 report the first-stage regressions of the 2sls analyses reported in Regressions 3-5. The dependent variable is a binary variable that equals one if the board requested to receive further information or an update (Regression 3), took an initiative such as suggesting which action should be taken (Regression 4), or either requested an update or took an initiative (Regression 5-6). The regressions control for the following control variables (not reported): the fraction of attending outside directors, the total number of attending directors, the average number of years of executive experience of the attending directors, the fraction of attending directors with an MA/MBA, a dummy that equals one if the firm was in the process of replacing the CEO, and a dummy that equals one if the issue discussed was one of supervisory nature as described in Section 4viii. For each variable, the first line reports the coefficient and the second line reports (in round parentheses) errors. ***, **, *, indicate significance at the 0.01, 0.05, and the 0.10 level, respectively.

	Three or more women in attendance (1)	Three or more men in attendance (2)	Update requested (3)	Initiative taken (4)	Update or initiative (5)	Update or initiative (6)	Update or initiative (7)
Number of women invited to board-committee	.061*** (.006)	-.015*** (.005)					
Number of men invited to board-committee	-.017*** (.005)	.017*** (.004)					
Three or more women directors in attendance			.241** (.122)	.338*** (.128)	.561*** (.201)		
Three or more men directors in attendance			.576 (.370)	.659* (.389)	1.401** (.6108)		
At least three directors of each gender						.558*** (.160)	
At least 35% of both genders							.751*** (.001)
Board control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year and firm dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Topic-subject dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2sls equation estimated	First stage	First stage	2sls	2sls	2sls	2sls	2sls
Number of observations	1,313	1,313	1,313	1,313	1,313	1,313	1,313
R square	.712	.369					
Angrist-Pischke F-test	66.38	10.01					
Significance	.000	.000	.000	.000	.000	.000	.000
Hausman (p-value)			2.55 (.999)	2.45 (.999)	3.81 (.999)	8.02 (.999)	15.51 (.999)
Anderson canonical correlations (p-value)					10.39*** (.001)		

Addendum to Appendix E: Exclusion Restriction

Table III: Board Meetings on Days With and Without Board-Committee Meetings

This table compares board meetings that were held on days no board-committee meeting was held ("only board") to board meetings held on days on which at least one board-committee meeting was held ("board and committee"). Panel 1 breaks down the number of issues discussed categorized as important versus those categorized as being only of secondary importance. Important issues are defined as appointing or firing an executive, budget, business issues, business projects, cross-firm issues, financial reports, investment/ finance, organizational changes, personnel and benefits, regulation and government, and strategic issues. Issues of secondary importance include appointment of members, approving minutes of past meetings, audit, choosing a chairman for the meeting, contracting and purchases, formal issues, legal issues, ongoing general issues, ratification of audit committee, ratification of financial committee, ratification of HR committee, and ratification of operational committee. Column 1 in Panel 1 reports the average percentage of the *number* of issues boards discussed that were categorized as important (i.e., number of important issues/(number of important issues + number of issues of secondary importance)), while Column 2 reports the percentage of *time* boards spent discussing important issues. The time spent on each issue discussed is estimated based on the number of lines in the minutes that document each discussion. Column 3 reports the percentage of the number of supervisory issues boards discussed as opposed to managerial issues (see Section 4viii for definitions), and Column 4 reports the percentage of time boards spent on supervisory issues. Panels 2 and 3 break down, on the aggregate topic-subject level, the topics discussed by boards depending on whether a board-committee took place on the same day (Panel 2), and depending on whether a dual critical mass (at least three directors of each gender) was in attendance. All panels report for each column t-statistics that examine whether the percentages pertaining to "only board" observations, as opposed to "board and committee" observations, are statistically different.

Panel 1

	Number of issues Important	Percent of time Important	Number of issues Supervisory	Percent of time Supervisory
Only board	51.6%	64.5%	64.0%	58.3%
Board and committee	40.6%	57.5%	62.5%	53.0%
t-statistic (two sided)	0.568	0.186	0.692	0.295

Panel 2

	Percentage of issues discussed broken down by aggregate topic-subject level					
	Business issue	Financial issues	Formal issues	Personnel & benefits	Audit & contracting	Total
Only board	11.9%	36.6%	18.4%	5.0%	28.2%	100%
Board and committee	10.3%	27.6%	25.4%	3.6%	33.1%	100%
t-statistic (two sided)	0.614	0.342	0.655	0.134	0.930	

Panel 3

	Percentage of issues discussed broken down by aggregate topic-subject level					
	Business issue	Financial issues	Formal issues	Personnel & benefits	Audit & contracting	Total
Dual critical mass	11.8%	29.8%	18.6%	17.9%	21.9%	100%
No dual critical mass	11.8%	28.9%	16.1%	20.9%	22.1%	100%
t-statistic (two sided)	0.982	0.801	0.459	0.290	0.963	

Appendix F: Alternative Thresholds of Critical Masses and Actions Taken by Boards

This appendix examines how alternative critical masses of both genders relate to board activeness. To examine this, in each of Panels A and B of Table IV, critical masses are defined in each specification using a different threshold: at least one, two, three, four, or five directors of both genders. Panel A examines how these alternative critical masses relate to the likelihood that the board requests an update (the dependent variable is a binary variable that equals one if the board requested an update), while Panel B examines how these critical masses relate to the likelihood that the board takes an initiative (the dependent variable is a binary variable that equals one if the board took an initiative). All regressions control for the fraction of women directors in attendance, which is included to rule out the possibility that a linear relation exists between gender composition and board-activeness.

Of the five regressions included in Panel A of Table IV, only Regression 3, which includes a dummy that equals one if at least three directors of each gender were in attendance, has a positive and significant coefficient for the variable controlling for the presence of a critical mass. Put differently, Regression 3 documents that, once the board includes at least three directors of each gender, the board is significantly more likely to request an update. Furthermore, Regressions 1-2 and 4-5 in Panel A of Table IV have negative and insignificant coefficients for the variable controlling for the presence of critical mass of both genders. Put differently, the critical masses defined in these four regressions, are not found to increase the likelihood that boards request an update.

Similar results are obtained in Panel B of Table IV: of all five specifications, each including alternative variables controlling for the presence of a critical mass, only the variable controlling for the presence of at least three directors of each gender (Regression 3) has a positive and significant coefficient. In other words, board activeness is maximized when boards include at least three directors of each gender, compared to boards that do not include at least three directors of each gender. Hence, the results of both Panel A and of Panel B of Table IV indicate that a critical mass of at least three directors of each gender is the cutoff at which board activeness jumps and peaks.

Table IV: Alternative Thresholds of Critical Masses and Actions Taken by Boards

Using alternative thresholds to define critical masses of each gender, this table reports, for the eleven GBCs examined, OLS regressions analyzing on the board-meeting-issue level, the relation between critical masses and the frequency boards take an action (updates requested in Panel A and initiatives taken in Panel B). The regressions control for the fraction of attending outside directors, the total number of attending directors, the average number of years of executive experience of the attending directors, the fraction of attending directors with an MA/MBA, a dummy that equals one if the firm was in the process of replacing the CEO, and a dummy that equals one if the issue discussed was one of supervisory nature. Company, year, and topic-subject dummies are included. For brevity, most control variables are not reported. For each variable, the first line reports the coefficient and the second line (in round parentheses) reports clustered errors at meeting level. ***, **, *, indicate significance at the 0.01, 0.05, and the 0.10 level, respectively.

Panel A: Alternative Thresholds of Critical Masses and Updates Requested

	Was an update requested by the board?				
	(1)	(2)	(3)	(4)	(5)
At least one director of each gender	-0.026				
	(.036)				
At least two directors of each gender		-0.04			
		(.028)			
At least three directors of each gender			0.051**		
			(.021)		
At least four directors of each gender				-0.003	
				(.031)	
At least five directors of each gender					-0.002
					(.039)
Fraction of women directors in attendance	-0.033	-0.02	-0.079	-0.058	-0.058
	(.073)	(.069)	(.065)	(.064)	(.065)
Number of directors in attendance	-0.003	-0.002	-0.007	-0.003	-0.004
	(.004)	(.004)	(.004)	(.005)	(.004)
R-squared	0.057	0.058	0.061	0.057	0.057
N	1,313	1,313	1,313	1,313	1,313

Panel B: Alternative Thresholds of Critical Masses and Initiatives Taken

	Was an initiative taken by the board?				
	(1)	(2)	(3)	(4)	(5)
At least one director of each gender	-0.071*				
	(.037)				
At least two directors of each gender		0.015			
		(.029)			
At least three directors of each gender			0.076***		
			(.022)		
At least four directors of each gender				-0.049	
				(.031)	
At least five directors of each gender					-0.029
					(.040)
Fraction of women directors in attendance	0.133*	0.05	0.033	0.061	0.074
	(.074)	(.071)	(.066)	(.065)	(.067)
Number of directors in attendance	0.009**	0.006	0.001	0.010**	0.007*
	(.004)	(.004)	(.004)	(.005)	(.004)
R-squared	0.07	0.068	0.077	0.07	0.068
N	1,313	1,313	1,313	1,313	1,313

Appendix G: Gender and Communication

The literature reviewed in Section 2 suggests that different genders may promote different dynamics within teams or boards. The board minutes allow examining how the gender composition in attendance relates to the extent of communication, and also to the level of confrontation. The extent of communication is proxied for by the length of the meeting.[28] Confrontation is measured using two measures: (1) whether dissension occurred (i.e., the board did not vote unanimously), and (2) whether disagreement occurred (i.e., the board voted against the CEO's recommendation).[29]

Panel A in Table V examines whether the gender composition of boards impacts upon the extent to which they communicate. The latter is proxied using the length of a given meeting, which is measured by the number of lines in the minutes documenting the complete meeting. Regressions 1-2 of Panel A of Table V examine only observations from board-committees, while Regressions 3-5 examine only observations from board meetings. Regression 1 documents that, the larger the fraction of women directors in board committees (which are attended on average by 4.3 directors, see Table 3), the larger the number of lines documenting the meeting. The economic magnitude of this phenomenon is quite substantial: According to the estimates in Regression 1, if the percentage of women directors were to increase in a board-committee from 0% to 35%, the length of the meeting is expected to increase by 18.4% (0.35*223.609/424)[30]. A U-shaped relation between the fraction of women directors and the extent of communication is not documented in Regression 2 for board-committees. Accordingly, Regressions 1 and 2 indicate that, in board-committees (which are small teams), the larger the fraction of women directors, the more extensive the communication.

For board meeting observations, critical masses of women and men (Regression 3) and the fraction of women directors (Regression 4) are not found to be significantly related to the extent of communication. However, Regression 5 of Table V documents a U-shaped relation between the fraction of women directors and the length of the meeting. Specifically, the length of the meeting deceases until women directors constitute 52% of the board, and it increases after this point. Hence, it seems that, in board meetings (which are attended on average by 8.1 directors; see Table 3), the extent of communication increases only after women directors constitute a large percentage of the board members in attendance. This pattern is similar, to a certain extent, to the one documented in Section 5.2–once boards include critical masses of each gender, they become more active.

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[28] I do not judge the quality of communication. It is possible that longer discussions do not necessarily indicate that communication is of better quality. However, in another analysis conducted (not reported), longer discussions were not found to be significantly associated with higher rates of dissension (i.e., that the board not vote unanimously) or disagreement (i.e., that the board not vote in line with the CEO). This suggests that longer discussions are not associated with more confrontational communication.

[29] Both dissension and disagreement may occur only in cases in which the discussion concluded with a formal vote.

[30] Table 3 shows that the average number of lines documenting a board-committee meeting is equal to 424.

Taken together, the findings of Panel A of Table V show that, in board-committees (which are smaller teams), the larger the fraction of women, the more extensive the communication. In board meetings (which are larger teams), communication increases only once women make up a relatively large fraction of the board in attendance.

Panel B of Table V examines how the gender composition in attendance impacts dissension (Regressions 1 and 3) and disagreement (Regressions 2 and 4). The regressions control for (but do not necessarily report) all independent variables included in the specifications examined in Section 5.1 and reported in Table 4. Regressions 1 and 2 of Table V examine whether a linear or U-shaped relation exists between the gender composition of the board and dissension (Regression 1) or disagreement (Regression 2) at board and board-committee meetings. No significant relation is documented in either regression. Similar results are obtained in parallel unreported specifications including only board observations, or alternatively, only board-committee observations.

Regressions 3 and 4 examine whether critical masses of at least three women or at least three men directors increase dissension (Regression 3) or disagreement (Regression 4) at board meetings. Here too, no significant results are obtained for the variables controlling for the gender composition of the board. Put differently, the findings do not provide support for the argument that the proportion of each gender in attendance, or the presence of a critical mass of each gender, increases the likelihood that communication will be more tense, i.e., that disagreement or dissension will emerge.

Table V

Gender Composition and Boards Dynamics

This table examines, on the board-meeting-issue level for the eleven GBCs examined, the impact of gender on board dynamics. Panel A reports OLS regressions analyzing the impact of the gender composition on the extent of communication of the board, measured by the total number of lines documenting the meeting in the minutes. Panel B reports OLS regressions analyzing the impact of the gender composition of the board on the likelihood that the board dissent—i.e., not vote unanimously (Regressions 1 and 3)—or that it vote against the CEO's recommendation (Regressions 2 and 4). The primary independent variables are the fraction of attending women directors and its square, a dummy which equals one when at least three women directors were in attendance, and a dummy which equals one when at least three men directors were in attendance. The regressions control for the fraction of attending outside directors, the total number of attending directors, the average number of years of executive experience of the attending directors, the fraction of attending directors with an MA/MBA, a dummy that equals one if the firm was in the process of replacing the CEO, and a dummy that equals one if the issue discussed was one of supervisory nature. Company, year, and topic-subject dummies are included. For brevity, most control variables are not reported. For each variable, the first line reports the coefficient and the second line (in round parentheses) reports clustered errors at meeting level. ***, **, *, indicate significance at the 0.01, 0.05, and the 0.10 level, respectively.

Panel A: Extent of Communication within Boards

	Number of lines documenting the meeting				
	(1)	(2)	(3)	(4)	(5)
Three or more women directors in attendance			-23.721		
			(120.053)		
Three or more men directors in attendance			-33.22		
			(151.452)		
Fraction of women directors in attendance	223.609**	253.309		-454.035	-2335.138**
	(93.401)	(244.211)		(327.971)	(984.576)
Square of fraction of women directors in attendance		-33.746			2264.349**
		(256.286)			(1118.999)
Number of directors in attendance	-33.966**	-34.830**	-17.867	-20.089	-8.95
	(15.420)	(16.787)	(23.004)	(20.666)	(21.168)
Company and year dummies	Yes	Yes	Yes	Yes	Yes
Meetings examined	Committee	Committee	Board	Board	Board
R-squared	243	243	156	156	156
N	0.443	0.441	0.414	0.425	0.438

Panel B: Boards Dissenting and Disagreeing

	vote not unanimous	vote against CEO	vote not unanimous	vote against CEO
	(1)	(2)	(3)	(4)
Fraction of women directors in attendance	-0.052	-0.006		
	(.053)	(.069)		
Square of fraction of women directors in attendance	-0.003	-0.009		
	(.060)	(.080)		
Three or more women directors in attendance			0.011	-0.007
			(.020)	(.014)
Three or more men directors in attendance			0.016	0.012
			(.025)	(.019)
Number of directors in attendance	0.009**	-0.001	0.004	-0.003
	(.004)	(.002)	(.006)	(.003)
Company, year, and topic-subj. dummies	Yes	Yes	Yes	Yes
Meetings examined	Board& Com.	Board & Com.	Board	Board
R-squared	1421	1421	799	799
N	0.065	0.011	0.082	0.019

Appendix H: Gender Composition and Finances

The ultimate responsibility of boards is to boost financial performance. For this reason, the relation between board composition and financial performance has been studied extensively (as reviewed in Section 2.2). In continuation to the analysis presented in Section 7 which examines whether similar patterns are documented both on the observable level (which includes outcomes such as CEO turnover and financial performance) and the generally unobservable level (which includes the actions taken by directors at their meetings), this appendix Gurther examines these two levels with a focus on the company's finances. Specifically, Section A of the Appendix examines the relation between the gender composition of boards and financial performance, while Section B examines the relation between the gender composition of boards and board activeness: with respect to financial issues discussed or given the company's financial performance.[31] The goal of all these analyses is to examine whether the critical mass effect, which has been documented throughout this study, is also evident with respect to financial issues and financial performance, the latter being the ultimate target of the efforts of the board.

A. Gender Composition and Financial Performance

The paper documents that boards with a dual critical mass are more active than boards without such dual critical masses. This leads to the question: are these patterns also evident in the financial performance of firms? This question is addressed using the panel dataset introduced in Section 7.1, which includes financial performance data for the universe of the 34 GBCs during the 2000-2009 period. The Israeli GBCs offer a good setting for examining the relation between gender and financial performance, since the Israeli quota, which has been intact since 1993, applied only to GBCs, which are equal to approximately 5% of the companies listed at the Tel Aviv Stock Exchange. For this reason, the quota was not likely to have a dramatic effect on the demand, and quality, of the Israeli female directors appointed. For comparison, in the Norwegian case, the quota applied to all Norwegian listed companies, thereby probably creating a more pronounced shortage in highly qualified women directors.

[31] The tradeoff of this study is that it provides an in-depth observation of the working of boards at the expense of the number of companies examined. Since all minutes observations pertain only to eleven companies, only the association between the frequency boards take actions and firm performance can be computed, as opposed to conducting a robust analysis via regressions. I compute these correlations–between the average percentage of cases in which the boards examined took an action (either requesting an update or taking an initiative) and the change in a financial ratio between the year following the year for which the minutes were examined and the year for which the minutes were examined (I adjust—i.e., inflate—the percentage of cases in which an action was taken for the two firms for which only minutes of board meetings were obtained, since more actions are usually taken at board-committee meetings, as documented in Table 3). The Pearson correlations between the average percentage of cases in which boards took an action and net-profit-margin equals 0.51 (significance =0.106); cash flow from operating activities/current liabilities equals 0.57 (significance =0.064); ROE equals 0.26 (significance =0.425). Needless to say, correlations do not provide firm evidence that the actions examined directly improve firm performance.

Table VI examines the relation between the gender composition of boards and financial performance. The dependent variable in these regressions is the ROE in the following year (Regressions 1-4) or the net-profit-margin in the following year (Regressions 5-8). Table VI does not document a significant linear or U-shaped relation between the fraction of women directors including its square, and ROE_{t+1} (Regression 1) or Net-profit-$margin_{t+1}$ (Regression 4). These results are consistent with those documented in Section 5. (i.e., no significant linear or U-shaped relation is documented between gender composition and the likelihood that the board take an action)

However, consistent with previous findings, Table VI does document a positive relation between the existence of a critical mass of women directors and financial performance. Regressions 2 and 6, provide evidence that a critical mass of women directors is associated with an increases of the ROE_{t+1} and the net-profit-$margin_{t+1}$ at the 10% and 1% levels, respectively. Regression 3 does not document a significant association between the presence of a dual critical mass and ROE_{t+1}, but Regression 7 does document a positive and significant association between a dual critical mass and net-profit-$margin_{t+1}$.

I next examine if gender-balanced board are associated with enhanced performance in companies with relatively weak financial performance. Weak GBCs are defined as the 17 GBCs that have a ROE below the average ROE documented for all 34 GBCs for the 2000-2009 period. The remaining 17 GBCs are categorized as GBCs with strong performance. Using this simple rule of thumb allows restricting the sample to the relatively weak, or relative strong, companies.

Regressions 4 and 8 of Table VI include only observations pertaining to GBCs whose performance was categorized as weak. Both Regressions 4 and 8 document a statically significant (at the 5% and 1% levels, respectively) relation between the existence of a critical mass and ROE_{t+1} and net-profit-$margin_{t+1}$, respectively. Moreover, in unreported specifications, Regressions 4 and 8 are re-estimated, but they include only observations of GBCs categorized as having strong performance. In these specifications, no significant association is found between critical masses and financial performance. This finding is consistent with the narrative that critical masses are particularly valuable in challenging times or in challenging companies.

Finally, I would like to emphasize that the relation documented in this section between critical masses and financial performance is only correlational. Endogeneity concerns may be particularly acute in the context of financial performance, as is well known (e.g., Hermalin and Weisbach, 2003). The addendum of this appendix Gurther explores the relation between the existence of a dual critical mass and financial performance, using an IV approach. The results in the addendum are consistent with those obtained in the OLS analysis, yet the addendum results are subject to the usual caveats regarding instrument validity.

In sum, this section documents that companies with a dual critical mass of directors are associated with enhanced financial performance, particularly for companies that generally have weak performance. These

findings are consistent with the findings that have been documented in Section 7–having a dual critical mass during crucial times as those before and after CEO turnover, is particularly beneficial.

B. Finances, Gender Composition, and Board Activeness

This sub-section explores how critical masses relate to board activeness at the board meetings with respect to financial issues discussed, and how critical masses relate to activeness with respect to all issues discussed, given the financial performance of the company. This analysis is based on the minutes data, and reported in Table VII. Regressions 1-3 and 6-8 are confined to examining two of the 23 topic-subjects, which document the discussions concerning the core financial issues: the budget and the investment and finance topic-subjects. The rationale of focusing on these issues is that boards should be particularly interested in issues related to their company's finances, since their ultimate responsibility is to enhance financial performance.

The regressions reported in Table VII include the same control variables included in prior minutes data specifications (for example, Table 4). In Regressions 1-5 of Table VII, the dependent variable is equal to one if the board took an action (i.e., requested an update or took an initiative). Consistent with prior findings, Regression 1 does not document a linear or U-shaped relation between gender and the likelihood that an action be taken. Regression 2 documents that boards with critical masses of women directors, and particularly with critical masses of men directors, are significantly more likely to take an action. Similarly, Regression 3 implies that boards with critical masses of at least three directors of each gender are significantly more likely to take an action. Since boards took, on average, an action in 14.2% of the cases in which financial issues were discussed, the increase documented in Regression 3 is equal to 131% (18.7/14.2). The latter economic magnitude is larger than that documented in Regression 5 of Table 4—79% (0.098/0.124), using the same econometric model (yet including in the specification *all* issues discussed at board meetings). This highlights that critical masses catalyze board activeness particularly with respect to financial issues.

Regressions 4 and 5, which examine all issues discussed at board meetings, examine how critical masses affect board activeness in GBCs with relatively weak performance (Regression 4) versus those with relative strong performance (Regression 5). GBCs with weak performance include the five GBCs that had, in 2009, a ROE below the 2009 ROE average for the eleven GBCs whose minutes were examined. The remaining six GBCs, which had relatively large ROEs, are classified as GBCs with strong performance.

The results show that critical masses of men and women directors have a particularly large and significant effect in weak companies. For example, Regression 4 documents that having a critical mass of men directors increases the likelihood that the board takes an action, by 16.1% (the results are significant at the 1% level). In contrast, Regression 5 does not illustrate such a relation between critical masses of men directors, and the likelihood that an action be taken in GBCs with strong performance. In addition, Regression 4 documents a larger magnitude for the coefficient controlling for the effect of a critical mass of women directors on the likelihood that an action be taken, compared to the magnitude documented in Regression 5

for this variable for GBCs with strong performance. These findings highlight that the critical mass effect is particularly pronounced in relatively weak companies. This conclusion is also consistent with those of the previous section documenting that critical masses are associated with enhanced financial performance, particularly for companies that generally have weak performance.

Regressions 6-8 of Table VII focus on a different aspect related to the working of boards–the extent to which boards communicate when financial issues are discussed at board meetings. The extent of communication serves as a proxy for the extent to which boards are involved, and exert a certain level of effort in a particular issue discussed. The extent of communications (the dependent variable) is measured using the number of lines in the minutes documenting the discussion of each financial issue. Once again, Regression 6 does not show a significant linear or U-shaped relation between the fraction of women directors in attendance and its square and the number of lines documenting the discussion. However, Regression 7 provides evidence that having a critical mass of at least three women directors significantly (at the 5% level) increases the extent of communication. And finally, Regression 8 documents that having a dual critical mass (i.e., at least three directors of each gender) increases the extent of communication at the 10% level. Since the finance issues discussed were recorded over 75 lines on average in the minutes, the increase of 32.3 lines documented in Regression 8 if a dual critical mass is in attendance is equal to an increase of 43% (32.3/75). In parallel regressions not reported, no such effect was documented between critical masses and the extent of communication for the remaining 21 topic-subjects not included in Regressions 6-8. This suggests that critical masses particularly catalyze the extent of communication when financial issues are discussed.

In sum, this section documents that, when boards discuss financial issues, they are particularly likely to take an action (i.e., request an update or take an initiative) when critical masses are in attendance. Furthermore, with respect to all the issues discussed at the board meetings, critical masses are particularly likely to catalyze board activeness in companies that particularly need the board's involvement—companies with weak performance. Last, when boards discuss financial issues, having a dual critical mass significantly increased the extent of the communication.

These findings are consistent with those presented in Section A of this appendix–boards with a dual critical mass exhibited improved financial performance, particularly for companies that had relatively weak financial performance over the sample period. Moreover, these findings are also consistent with those of Section 7, documenting that boards were more likely to replace underperforming CEOs, and were more active during periods in which the company was in the process of replacing the CEO, when the board included a dual critical mass. Put differently, boards were likely to step in at crucial times, and in companies that were not performing well, when boards included critical masses.

Table VI

Gender Composition and Financial Performance

This table reports OLS regressions analyzing a panel data set of the universe of the 34 GBCs for the years 2000-2009. The dependent variable is ROE (Regressions 1-4) or net profit margin—i.e., net profit divided by sales (Regressions 5-8). Regressions 4 and 8 include only observations from GBCs that over the sample period examined performed below the average ROE of all 34 GBCs. The primary independent variables are the fraction of attending women directors and its square, a dummy which equals one when at least three women directors were serving on the board, and a dummy which equals one when at least three men directors were serving on the board. In addition, the regressions control for the fraction of outside directors, the number of directors, and the tenure of the CEO. Year and firm dummies are included as specified. For each variable, the first line reports the coefficient and the second line reports standard errors clustered on the company level (in round parentheses). ***, **, *, indicate significance at the 0.01, 0.05, and 0.10 level, respectively.

	ROE t+1				Net-profit-margin t+1			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fraction of women directors	0.137 (.178)				-0.166 (.278)			
Square of fraction of women directors	-0.038 (.203)				0.327 (.310)			
At least three women directors in attendance		0.050* (.026)				0.103*** (.038)		
At least three men directors in attendance		0.045 (.042)				-0.075 (.068)		
At least three directors of each gender			0.048 (.032)	0.069** (.032)			0.103*** (.038)	0.149*** (.042)
Fraction of outsiders	-0.066* (.040)	-0.049 (.039)	0.027 (.041)	-0.034 (.055)	0.023 (.080)	-0.022 (.078)	0.013 (.075)	0.013 (.103)
Number of directors	0.005 (.004)	-0.002 (.005)	-0.009* (.005)	-0.008 (.005)	0.005 (.007)	-0.006 (.009)	-0.01 (.008)	-0.019* (.010)
CEO tenure	0 (.004)	-0.001 (.004)	-0.002 (.005)	-0.004 (.005)	-0.001 (.006)	-0.003 (.006)	-0.002 (.006)	0.001 (.008)
Firm and year dummies	Yes	No	No	Yes	Yes	No	No	Yes
Companies included	All	All	All	Weak performance	All	All	All	Strong performance
R-squared	0.007	0.013	0	0.019	-0.204	-0.125	-0.143	0.12
N	197	197	117	65	161	161	161	87

Table VII

Board Involvement in Financial Issues

This table reports OLS regressions analyzing, on the board-meeting-issue level of the eleven GBCs examined, the relation between the gender composition of boards, and (1) the actions they take and (2) the extent they communicate at board meetings. The dependent variable in Regressions 1-5 is a binary variable that equals one if an action is taken by the board (i.e., an update is requested or an initiative is taken). Regressions 1-3 and 6-8 only include observations concerning financial issues discussed by the boards. Regression 4 includes all board-meeting observations for the five GBCs that had, in 2009, a ROE below the 2009 ROE average for the 11 GBCs for which minutes were examined. Regression 6 includes only observations for the remaining six GBCs that had the relatively larger ROEs. The dependent variable in Regressions 6-8 is the number of lines that document the discussion of financial issues in the minutes. The primary independent variables are the fraction of attending women directors and its square, a dummy which equals one when at least three women directors were in attendance, a dummy which equals one when at least three men directors were in attendance, and a dummy which equals one of at least three directors of each gender were in attendance. In addition, the regressions control for the fraction of attending outside directors, the total number of attending directors, the average number of years of executive experience of the attending directors, the fraction of attending directors with an MA/MBA, and a dummy that equals one if the firm was in the process of replacing the CEO. For each variable, the first line reports the coefficient and the second line (in round parentheses) reports clustered errors at the company level. ***, **, *, indicate significance at the 0.01, 0.05, and the 0.10 level, respectively.

	Action taken					Number of lines		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fraction of women directors in attendance	0.184 (.986)					-69.998 (157.945)		
Square of fraction of women directors in attendance	0.126 (1.009)					208.015 (168.532)		
Three or more women directors in attendance		0.169* (.084)		0.168** (.064)	0.095** (.047)		46.505** (16.273)	
Three or more men directors in attendance		0.227*** (.051)		0.161*** (.054)	-0.024 (.034)		23.765 (22.161)	
At least three directors of each gender			0.187** (.077)					32.319* (15.746)
Fraction of outsiders	-0.002 (.168)	0.071 (.096)	-0.009 (.114)	-0.092 (.140)	0.061 (.062)	48.768 (45.806)	44.375 (46.212)	38.13 (44.390)
Number of directors in attendance	-0.007 (.023)	-0.018 (.021)	-0.018 (.021)	-0.021 (.013)	0.008 (.010)	-3.218 (3.337)	-6.845* (3.641)	-5.909 (3.814)
Average number of years of executive experience	0.013 (.025)	0.012 (.025)	0.012 (.024)	0.011 (.013)	-0.007 (.010)	-6.204 (5.662)	-5.316 (5.956)	-7.039 (6.381)
Fraction with an MA or an MBA	-0.058 (.459)	-0.018 (.282)	-0.035 (.277)	0.085 (.134)	-0.017 (.131)	-8.034 (79.200)	-20.032 (56.334)	-15.159 (56.125)
Between CEO period	-0.181** (.060)	-0.132 (.074)	-0.143* (.079)	0.029 (.074)	0.059 (.061)	-31.151 (24.663)	-20.252 (23.757)	-27.046 (23.892)
Firm and year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Companies included	All	All	All	Weak performance	Strong performance	All	All	All
R-squared	-0.044	-0.017	-0.018	0.187	0.071	0.061	0.062	0.064
N	140	140	140	582	731	140	140	140

Addendum to Appendix H: Financial Performance – 2sls Analysis

As mentioned, the analysis on financial performance presented in Section 7.2, may suffer from endogeneity, since certain types of boards may be appointed to certain types of companies, rather than a particular type of board impacting upon financial performance in a particular direction. To address this concern, I introduce in this section a 2sls model that takes advantage of the unique settings of GBCs – every few years the government ministers that appoint the GBC directors are replaced. Specifically, all directors that are appointed to the 34 GBCs are appointed by one of eleven government ministers (the particular minister varying from one GBC to the other) and by the Minister of Finance (for all companies). During the 2000-2009 period examined, the Israeli government was reelected or replaced every 2-3 years, and correspondingly, the government ministers were also replaced when a new government was elected. This exogenous change allows instrumenting for the likelihood that women directors be appointed to each company each year.

I use the characteristics (age and sex) of the eleven different ministers appointing the GBC directors, as instruments that allow predicting the likelihood that boards be gender-balanced, or in practice, include a critical mass of women directors (since virtually all GBC boards do have a critical mass of men directors appointed). Specifically, I assume that younger ministers are more likely to appoint gender-balanced boards, i.e., women directors, since younger people tend to have less traditional views concerning the roles of each gender (e.g., Tinklin et al., 2005). I also expect to find that female ministers are more likely to appoint gender-balanced boards, i.e., women directors, since female ministers will prefer supporting other women (e.g. Matsa and Miller, 2011; Adams and Kirchmaier, 2012; Gupta and Raman, 2014).

The first step of the 2sls analysis uses the instruments – the age of the minister, a dummy that equals 1 if the minister is a woman, and an interaction variable for the latter two variables, while including the regular control variables (the fraction of outsiders, the total number of directors, the tenure of the CEO, as well as dummies that control for the firm, year, and identity of the particular government) to predict the likelihood that the board will be gender-balanced.

Regression 1 of Table II, which documents the first stage of the 2sls model, documents that, indeed, younger ministers are significantly more likely to appoint gender-balanced boards. This regression also shows that female ministers are more likely to appoint gender-balanced boards, yet the latter result is not significant. The Angrist-Pischke F-test equals 33.56, which is above the threshold (F>10) required according to Stock et al. (2002) to conclude that the instruments used in a 2sls model are strong.[32]

[32] A standard Hausman test yields negative results for both ROE and net profit margin. Hence, I compute the residuals from the first stage, and include them as independent variables in the second stage of the 2sls analysis, as described in Söderbom, 2011. In the second stage, when financial performance is measured by ROE, the coefficient of the residual does not enter significantly, indicating that the existence of a critical mass of women is exogenous, and therefore, the basic OLS model is sufficient, and there is no need for the 2sls model. When financial performance is measured by net profit margin, the coefficient of the residual enters significantly at the 10% level, indicating that the existence of a critical mass of women may be endogenous. However, as mentioned, when measuring performance via net profit margin, the results of the 2sls models are positive, significant, and similar to those obtained via the OLS model. All these results

The second stage of the 2sls model documents that having a critical mass of women directors relates positively and significantly to financial performance when financial performance is measured by net-profit margin (Regression 2 of Table II). In unreported specifications, when financial performance is measured in the 2sls model by ROE, gender-balanced boards have a positive, yet non-significant relation with ROE. Nevertheless, when examining the one year lagged ROE, gender-balanced boards are found to impact positively and significantly the lagged ROE.

Taken together, these results provide evidence that even after endogeneity is taken into account, creating gender-balanced boards boosts financial performance as measured by the companies' net profit margin.

provide further support for the conclusion that a company with a board that includes a critical mass of women directors exhibits enhanced financial performance.

Table II

Gender Composition and Financial Performance

This table reports OLS regressions analyzing a panel data set of the universe of the 34 GBCs, for the years 2000-2009. Regressions 1-2 report a 2sls analysis. In the first stage (Regression 1), the age, sex (1=female), and age*sex of the government minister appointing the directors serve as instruments for predicting the likelihood that a gender-balanced board be appointed. The dependent variable in the second stage (Regression 2) is net profit margin. For each variable, the first line reports the coefficient and the second line reports standard errors (in round parentheses) clustered on the company level. ***, **, *, indicate significance at the 0.01, 0.05, and 0.10 level, respectively.

	Critical mass of women	Net-profit-margin
	(1)	(2)
At least three directors of each gender		.188***
		(.064)
Age of minister	-.007***	
	(.002)	
Female dummy of minister	.294	
	(3.53)	
Female dummy * age of minister	-.022	
	(.072)	
Fraction of outsiders appointed		.055
		(.069)
Number of directors appointed		-.027***
		(.008)
Tenure of CEO		.002
		(.005)
Firm, year government dummies	Yes	Yes
Number of observations	224	224
F probability	.000	.000
R-squared	.621	
2sls equation	First stage	Second stage
Angrist-Pischke F-test		33.56