Closing the Gap: Corporate Boards add more Women when Interlocked with Diverse Peers

by

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Abstract

Much of the recent progress in the gender diversification of corporate boards has been attributed to the efforts of institutional investors and regulators (Hatcher, 2020; Groves, 2019; Gertsberg et al., 2021). Their success may suggest boards need to be coerced into adding women directors. However, with this thesis, I sent evidence showing the trend has been uneven and clustered, and that progress may be better explained by social conformance to descriptive norms among interlocked firms, over and above the effect of institutional investors and governments. The research demonstrates strong, albeit observational, evidence that gender diversification is in part a social, adaptive, and self-organizing process, where directors observe the norm for gender diversity on interlocked boards and use this norm as a reference point when electing new directors.

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Introduction

Corporate boards of directors wield substantial power. They monitor, govern, and control corporations and in the past, boards consisted almost exclusively of men. Progress toward gender diversity has been steady but slow. In May of 2021, 40 years after the first women were elected to major corporate boards, 30% of the directors on S&P 500 companies were women (Larker & Tayan, 2013).

Statement of the Problem

In this thesis, I present evidence showing the progress towards gender equity has been uneven and clustered, suggesting it may also be better explained by conformance to norms among a board's 'interlocked' peers, over and above two more popular explanations based on the business case and normative pressure from investors.

Justification of the Problem

Considering the business case for gender diversity, mounting evidence suggests that it has positive effects on board performance: in constructive risk-taking (Bernile 2018), merger & acquisition performance (Fonseka, 2017; Ravaonorohanta, 2020), firm innovativeness (Torchia, 2011; Post, 2015), etc. However, even if firms were to ignore the evidence supporting the business case, the ethical motivation for gender diversity is clear: equality of representation.

Much of the recent progress has been attributed to the efforts of institutional investors, who target un-diverse boards through "shareholder activism." The "Big 3" Asset Managers (Blackrock, State Street, and Vanguard) vote against the reelection of directors for un-diverse boards, and their efforts since 2017 are estimated to have increased the rate of diversification by two and a half fold (Gormely et al, 2021). Separately, state governments have legislated for the

cause (Hatcher, 2020); a 2018 California Law (SB 826) mandates a progressive quota for women directors, which is widely considered an effective policy for increasing gender diversity (Groves, 2019; Gertsberg et al., 2021).

The success of these tactics may suggest boards need to be coerced into adding women directors. However, this inference conflicts with traditional theories of corporate governance. Institutional Theory predicts firms—to maintain legitimacy—will adapt to societal norms by emulating their "important" peers (DiMaggio, 1983). If we expect boards adapt to societal norms, why do they need to be coerced by institutional investors and regulators? Further, empirical findings suggest boards cluster around the 'descriptive norm' for gender diversity—defined here as the averaged observed behavior among one's peers (Chang et al., 2019). These results suggest boards learn and adapt to changing norms, and do not need direct instruction or coercion.

Disentangling the impact of these external forces (institutional investors and regulators) from internal forces (conformance to descriptive norms) has important implications for understanding the trend towards gender parity: is this socio-normative effect distinct from the 'activism' of institutional investors and policies of regulators? Or is it a result of their actions?

To answer this question, we first must understand the mechanisms that support descriptive norms: how do boards learn the norm and what peers do they observe? Resource Dependence Theory (RDT) gives us a frame to address these questions. It emphasizes the role of corporate 'interlocks' in diffusing information among the 'corporate elite,' and are commonly used to explain a variety of firm-to-firm interrelationships (Mizruchi, 1996; Pfeffer, 2003; Davis, 2001). In corporate governance, boards are 'interlocked' if they share directors. Could these employment relationships be the mechanism which support descriptive norms?

My hypothesis is that a board's interlocks create a local descriptive norm for gender diversity, which signals when the board should diversify, and that the effect of the local descriptive norms is independent of the actions of institutional investors and governments—not a result of it. To test this, I create a variable that captures relative board diversity assuming a descriptive norm and include it in a regression model. Then, I compare the effect of descriptive norms among interlocked peers against a variety of non-interlocked peer groups to isolate the interlock effect. Finally, I partition the data, separating periods of high activity—among institutional investors and regulators—from periods of low activity, and show how board behavior changes over time.

Literature Review

Generally, research on gender diversity and corporate governance fit two categories: gender diversity and its relation to performance, and the dynamics of gender diversification. Because we are concerned with how social norms moderate a board's probability of electing a woman director, we will cover the determinants of gender diversity without explicitly discussing performance implications. Considering the dynamics of gender diversification, we can further categorize by how a firm's characteristics or intrinsic qualities determine the gender of incoming directors—e.g. a firm's size, sector, etc.—from how a firm's external factors influence or act to diversify the board (institutional investors, regulators, social networks, etc.)

Firm Characteristics

In general, there is significant cross-sector variability in the probability of electing a woman director, with consumer-oriented companies being more likely to elect women (Brammer et al, 2007). Presumably, this is because these consumer-oriented firms serve end-consumers, and as most household spending is controlled by wives and mothers, the business case is clear for a

gender-diverse board is clear: they can better sympathize and empathize with the needs of their customers (Brennan, 2020). In addition, we see that larger boards have more women, which often correlates with sector (Charles et al. 2015).

Distinct from the business case for gender diversity, A firm's 'visibility' or susceptibility to public scrutiny, is thought to increase the probability it elects women directors (Hillman et al., 2007). Because 'visibility' or 'renown' cannot be directly measured, past research has generally used a firm's 'size' as a proxy for public awareness and attention—'size' is usually defined as market capitalization. A few studies attempt to quantify 'visibility' using media mentions and alternative signals, but market capitalization—or semi-equivalent financial measures, like revenue—are the normative measure for 'visibility' (Chang et al, 2019).

Beyond firm characteristics, we know the past and present composition of the board determines the election of incoming directors. The 'gender matching heuristic' is an empirical phenomenon in which the gender of out-going directors tends to 'match' the gender of incoming directors—males for males, females for females (Farrell & Hersch, 2005; Tinsley et al., 2017). The 'gender matching heuristic' is corroborated by both observational and experimental results and suggests that gender is an important consideration during the elections of new directors, and that the gender makeup of the board is clearly non-random and actively managed.

Considering that boards tend to 'match' the gender of directors and that are generally conservative to this established norm, we know the broader cultural environment determines if and when these beliefs update. Early research found the probability of electing a woman to be inversely related to the number of women already on the board. This result can be explained by the fact that to add more women would be to deviate from the norm of the time (Farrell & Hersch, 2001). Recently, Change et al. (2019) found that boards tend to cluster around the

descriptive norm for the number of women directors, beyond what is 'expected' by chance. While their methodology is subject to scrutiny, the result does align with the theoretical and empirical foundations: boards actively manage gender diversity and adapt to changing norms. In addition, their experiments corroborate their hypothesis that descriptive norms for moderate group diversity and guide decision making.

External Factors

Now, considering external forces and the resources of the firm: shareholder proposals, even failed ones, work to diversify boards (Perrault, 2015; Marquardt & Wiedman, 2016; Rastad & Dobson; 2020). In general, when shareholders pressure boards to diversify, boards conform to their demands, one way or another.

On the other hand, regulators have created policies which promote gender diversity on corporate boards. In 2018, the California Legislature enacted a progressive quota for the number of women and underrepresented minorities on state boards. While it was struck down in April of 2022, the legislation measurably accelerated the diversification of Californian boards, without negative repercussions on the market value of compliant firms (Gertsberg et al. 2021).

Considering how firms influence each other, interlocks have explained the diffusion of corporate governance techniques such as the poison pill (Davis, 1991), differential firm performance and social capital (Hillman et al., 2009). Seierstad and Opsahl (2011) found that the gender quota in Norway gave rise to a central group of women holding many directorships within the corporate network, and Hillman et al. (2007) found the likelihood of having a woman director is higher when the firm is interlocked with peers that have female directors themselves. However, these results fail to explain how changing norms influence the behavior of boards, or how interlocks facilitate this adaptive behavior.

Method

In this section, I begin by describing my sample and analysis strategy. Then, I will describe key measurements, the empirical models, and how I define the interlock network.

Sample

The data is compiled from BoardEx—a leading provider of board of director (BOD) information and employment histories. It is cross-validated with ISS Directors—another data source used in academic research (WRDS, 2022). I analyze all elections to the BODs of the December 2021 S&P 1500, and do not consider promotions, role changes, or when a director leaves and rejoins the board. The sample includes companies from 3 indices—the S&P 500 (Large Capitalization), the S&P 400 (Middle Capitalization), and the S&P Small Cap 600 (Small Capitalization). These companies are selected by S&P's index managers, who determine eligibility based on market capitalization (McFarlane, 2022). Although it is not a random sample, it is diverse by intention and covers 90% of US equity market capitalization. I analyze the *2021* S&P 1500 because reliable information on historical membership is hard to find, as S&P does not release its official rosters.

Concretely, I track all additions to the BODs from 2010 through 2020, following the company's first annual-report date after going public. I ignore the board's membership on the first annual-report date, because it is not clear when these directors joined the board. Further, I drop elections without the following associated data: the company's share price at the point of election, its number of outstanding shares, and the number of women directors on the board. The first two data-points are necessary to compute market capitalization, which has been found to be a significant predictor of gender diversification (Hillman et al, 2007). I use average market

capitalization as a control variable and gather the stock price and outstanding share data from CSRP (Center for Research in Securities Prices), and cross-validate this data with Thompson Reuters' Institutional Holdings database—these are standard data sources. Finally, I do not consider elections when the board has 0 interlocking directors with other public companies; I make this restriction because I need reliable information on the gender diversity of interlocked boards and including non-listed companies would invalidate any insights. In summary, I dropped 603 observations from consideration, ending with 11,257 unique elections among 1,437 boards.

An obvious limitation of this sample is survivorship bias. The managers of the indices—S&P Global—select companies based on their market capitalization (McFarlane, 2022), and a company's market capitalization is positively associated with the probability of electing female directors (Hillman et al, 2007). However, because we are interested in how *relative* diversity among interlocks moderates the probability of *further* diversifying, I do not consider this to be a significant limitation. Moreover, the 3 indices have lower turnover than comparable indices, suggesting we see roughly the same companies over time. Considering our sample, 77% of the firms were public in 2010 and 99% were by 2016:

***** Please Insert Figure 1 Here*****

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Analysis Strategy

The goal of my thesis is to test how a board's relative diversity affects their decisions to elect female directors. To do this, I define a simple measurement which assumes a descriptive norm and uses it to compute a board's relative diversity: Deviation from the Descriptive Norm (DEV). Considering an arbitrary board i, take its percentage of women directors W_i and the mean

percentage of women directors among an arbitrary set of peer boards $\{J\}$: $\frac{\sum_{j \in J} W_j}{|J|} = \overline{W_J}$. Then, calculate the difference:

$$DEV_{i,J} = W_i - \overline{W_J}$$

DEV is analogous to statistical deviation and is useful because we can vary the set of peers, as well as the descriptive norm, and calculate the board's relative diversity.

Further, to test the robustness of the interlock effect, I substitute different peer groups into DEV (from now on, referred to as "global reference groups"), to measure a board's relative diversity among many comparable firms, whose similarities are agnostic to the interlock network structure. I call this measure global DEV and to discern its interaction with local DEV—the board's relative diversity among its interlocked peers—I create dummy variables for when a board is above/below the local norm and when it is above/below the global reference group norm. In this study, I use the following 5 global reference group:

1. Global: All Boards in the Interlock Network
2. S&P 1500: All belonging to any S&P Index
3. Index: All Boards in the same S&P Index
4. Industry: All Boards in the Interlock Network in the same Industry
5. Sector: All Boards in the Interlock Network in the same Sector

If the local effect does not vary depending on which global reference group is used, it can be inferred that a board's relative diversity among its interlocked peers is a robust predictor of gender diversification, independent of the global context or its relative diversity compared to similar boards in its sector, industry, or index.

Empirical Models

To test the measure's effect, I use a model built for longitudinal data analyses with binary dependent variables—General Estimating Equation (GEE) Regression using the Binomial Distribution and Logit link function. GEE is an extension of Generalized Linear Modeling (GLM) without the assumption of independence between observations; it allows for repeated measurements of the same subject over time – (Cui, 2007). With GEE, we can model the measures' effects at the board-level and have confidence in a population-level estimate. To determine the model's covariance structure, I used the QIC method, which is equivalent to Akaine's information criterion—a model selection tool for GLM—and selected the 'Exchangeable' option.

Although I run multiple regressions and vary which control variables are included, I consider 8 which have been found to vary with the probability of electing a woman director: a discrete control for the year y; index i and sector s dummy variables (Brammer et al., 2007; Chang et al., 2019); discrete controls for the board size bs and the number of women directors previous to the addition nw (Farrell & Hersch, 2001; De Cabo et al., 2020); a continuous control for the firm's average market-capitalization mc during the previous year (Hillman et al., 2007; Chang et al., 2019); and discrete controls for the number of women and men exiting the board in the year preceding the addition, we and me respectively, which captures the "gender matching heuristic" (Farrell & Hersch, 2005; Tinsley, 2017).

Specifically, I use the following 5 empirical models, where X represents the product of the dependent variable(s) of interest and their coupled coefficient(s). For instance, X can represent local DEV and its regressed coefficient. $I_j(V)$ is an indicator function evaluating to 1 if $V = j$ and 0 otherwise, and P_w is the probability of electing a woman director:

1. $\log\left(\frac{P_w}{1-P_w}\right) = b_0 + X$

2. $\log\left(\frac{P_w}{1-P_w}\right) = b_0 + X + b_y y$

3. $\log\left(\frac{P_w}{1-P_w}\right) = b_0 + X + b_y y + \sum_{j=2}^{N_s} b_{sj} * I_j(s) + b_{mc} \ln(mc)$

4. $\log\left(\frac{P_w}{1-P_w}\right) = b_0 + X + b_y y + \sum_{j=2}^{N_s} b_{sj} * I_j(s) + b_{mc} \ln(mc) + b_{we} we + b_{me} me$

5. $\log\left(\frac{P_w}{1-P_w}\right) = b_0 + X + b_y y + \sum_{j=2}^{N_s} b_{sj} * I_j(s) + b_{mc} \ln(mc) + b_{we} we +$

   $b_{me} me + \sum_{j=2}^{N_i} b_{ij} \cdot I_j(i) + b_{bs} bs + b_{nw} nw$

A summary of these methods—the descriptive norm definition, the global reference groups, and the empirical models—can be found in Appendix 2.

Network

I represent the interlock network with a simple, unweighted graph. Thus, all connections are equivalent in strength. For example, I do not differentiate the strengths of connections between firms that share 5 directors from firms that share 1 director. I think this is a simpler assumption than assuming each director adds some fixed weight or connection strength between firms. To differentiate the weightings, I would need an evidence-based justification.

Each year, firms are interlocked if a director at the S&P 1500 board works at another public company (in an arbitrary position). With this definition, I implicitly assume that the directors on the sampled boards (the S&P 1500) are 'high up' at the interlocked companies. Thus, they will observe the descriptive norm for gender diversity through their assumed seniority or closeness to the board.

Results

Let's begin our discussion of the results by first describing the sample, and then we will discuss each hypothesis in-depth.

Descriptive Statistics

In the sample, 'large' companies generally have bigger boards than 'small' companies—I define size as market capitalization or the market value of a company's shares. Although average board size has remained constant over time, there is significant variation between the S&P indices, which is expected because the criterion for inclusion is market-capitalization:

***** Please Insert Figure 3 Here*****

In terms of how and when directors are nominated, many of the elections in our sample are effectively replacements for out-going directors, because the observations do not include founding-board members and are probably not a result of board expansions, as average size has remained constant.

Considering the rate of additions to boards, companies elect directors at a steady cadence—about once per year—with little variability in averaged rates: Median elections / year ≈ 0.86, Mean ≈ 0.93, Standard Deviation ≈ 0.49. Specifically, "averaged" rates are computed for each firm by summing the number of elections during the full period (2010-2020), and by dividing the sum by the number of years in the active period: the year of the first election to 2020, inclusive of both.

Looking at the time-distribution of additions, I find significant bias is my sample. The number of elections in 2020 is roughly double that of 2010—667 to 1272. Further, the number of boards adding directors in 2020 is about double that of 2010—478 to 805. This can be attributed to two things: 1) the sample selection—this is the 2021 S&P 1500 and the number of firms may increase over time; and 2), it could be that the behavior of the boards is changing over time:

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***** Please Insert Figure 6 Here*****

In the interlock network, we include companies in each year if they are public. We can see the number of S&P 1500 boards remain constant from 2010 to 2020 (around 1150 boards in each year). This evidence suggests the time bias is more a factor of changing behavior; not a result of the number of firms increasing over time (see Appendix 1 for detailed network statistics). Considering network measures, we see moderate assortative mixing by gender-diversity—which is the tendency for diverse boards to interlock with each other, and vice versa for un-diverse boards. From 2010 to 2016, the measure remains somewhat constant around 0.20. However, it drops precipitously in 2017 coinciding with the initiation of "Big 3" shareholder activist campaigns:

***** Please Insert Figure 7 Here*****

This suggests a fundamental change in firm behavior as interlocked boards become less similar—gender-wise—over time.

Hypotheses

H1*: If a board is less diverse than the descriptive norm among its interlocked peers, it will be more likely to add a female director.*

Specifically, I hypothesize that a Board's Deviation from the Local Descriptive Norm (local DEV) is negatively associated with the probability of electing a woman director. We would expect under Institutional Theory, as the board seeks to gain legitimacy by conforming to the 'new' norm among its peers, as well as under Resource Dependence Theory, which conceptualizes interlocks as means for the corporation to collect information (Pfeffer, 2003). The

goal of this hypothesis is to determine if interlocks form a local descriptive norm which is relevant and salient in the election of women directors.

After running 5 regressions by varying the set of included control variables, all models evidence that support the hypothesis: that descriptive norms among interlocked peers moderate the probability of electing a women director. They produce statistically significant effects with coefficients on local DEV being -2.51%, -2.49%, -2.69%, -2.77%, and -2.51% respectively. If a board is 10% less diverse than the average among its interlocked peers, we would predict it is ~25% *more* likely to add a women director, roughly *double* the base-rate probability of electing a women director, because ~30% of the observed elections were women. Further, the effect's consistency across models suggests the measure is predictive and robust across a range of possible confounders:

***** Please Insert Figure 8 Here*****

H2: *Even if a board is more diverse than the descriptive norms among its non-interlocked peers—e.g. the boards in a shared sector, industry, index, etc.—the S&P 1500 will be more likely to add a woman director, if it is less diverse than its interlocked peers.*

Because boards may be relatively un-diverse in both the local and global contexts (e.g., a board may be un-diverse as compared to their local network as well as compared to all boards in the S&P 500). And because institutional investors and government quotas act on the *least* diverse boards—irrespective of network structure—we need to isolate the significance of local descriptive norms to determine its separability from the *effects* of institutional investor activism and government regulation.

By creating dummy variables for when a board is below/above the local norm and the global norm, I found evidence in support of this hypothesis. For instance, using the 4th empirical

model, I find when boards are below the global mean and the local mean for gender diversity, they are greater than 55% *more* likely to elect a women director; a roughly 3-fold increase in the base-rate probability of electing a women director. And, when they are above the global mean but below the local mean, boards are greater than 25% *more* likely to elect a woman director: a statistically significant, 2-fold increase to the probability of diversifying a board. Finally, when boards are above the local mean but below the global mean, the effect is insignificant or *negative*. Thus, from 2010 to 2020, a board's relative diversity among its interlocked peers is more relevant to the election of women directors than descriptive norms among comparable global reference groups: sector competitors, index constituents, etc.

Further, no matter if I vary the set of controls or change how I measure the global norm—from mean to median—I find results are robust and generally invariant: if a board is below the local mean, they are more likely to elect a women director, irrespective of how diverse they are in the global context:

***** Please Insert Figure 9 Here*****

H3: *Because of Institutional Investors and the California Quota, descriptive norms among interlocked peers matters more in 2010-2016 and less in 2017-2020. Whereas descriptive norms among non-interlocked boards matters less in 2010-2016 and more in 2017-2020*

The goal of this hypothesis is to see changes in board behavior, as institutional investors and governments intervene, and suss out if this external pressure is a *possible cause* for the significance of local descriptive norms. To test my assumption, that Global DEV captures the effect of institutional investor and regulator activity, I partition the data into periods of low and high influence from these groups: 2010-2016 and 2017-2020 respectively. I find that Global DEV is a significant factor from 2017-2020 but is not from 2010-2016; I attribute this difference

to actions of the "Big 3" and the California Quota. Local DEV, on the other hand, does not vary from 2010-2016 to 2017-2020, showing a persistent effect, seemingly independent of the changing behavior of institutional investors and regulators.

***** Please Insert Figure 10 Here*****

However, because Global DEV is highly correlated with Local DEV, I utilize the same dummy-variable approach from H2 and interact Local DEV and Global DEV in both time periods, to isolate the local effect. After regressing 100 times—on every combination of the 5 global reference groups, 5 empirical models, 2 global descriptive norm definitions, and 2 time-periods (2010-2016 and 2017-2020)—I find relative diversity among interlocked peers to be a significant and persistent determinant in the probability of electing a women director, irrespective of a board's relative diversity in the overall network. Specifically, for the 50 models trained on 2010-2016 data, when boards are below the local mean but above the global mean/median, we reject the null hypothesis 46 out of 50 times and produce a mean effect of ~33%; In 2017-2020, we reject the null hypothesis 49 out of 50 times with a mean effect ~38%. Both variables the base-rate probability of electing a women director by more than two-fold.

***** Please Insert Figure 11 Here*****

Discussion

The primary results of this study are the following: first, I found local DEV to be a significant and robust predictor of diversification, distinct from the traditional determinants of gender-diversity on corporate boards. Second, I isolated the effect of descriptive norms among interlocked peers by forming dummy variables, which capture a board's relative diversity in both the local and global context and found that if a board is relatively un-diverse among its interlocks, it is more likely to elect a woman director—separable of its relative diversity among

other comparable boards (the global reference groups). This suggests local conformance is not caused by institutional investors or regulators—who would act on the *least* diverse boards in the 'global' context—but rather is a separate, semi-independent process where directors infer what is normal on their interlocked boards, and advocate for diversification in the next election. Finally, to test my fundamental assumption on the behavior of institutional investors and regulators as they relate to relative diversity among a board's non-interlocked peers, I partitioned the data into two periods—2010-2016 and 2017-2020—capturing the *Big 3*'s gender-diversification campaigns and California's 'Women Quota' in the latter. I found the effect of relative diversity among non-interlocked peers to increase distinctly and significantly from 2010-2016 to 2017-2020. However, I found the effect of relative diversity among a board's interlock peers to be persistent and consistent, seemingly independent of the actions of institutional investors and regulators.

This research demonstrates strong, albeit observational, evidence that gender diversification is in parts a social and self-organizing process. If taken to be true, directors observe descriptive norms for gender diversity at interlocked firms, using them as guides to decision-making during the next board election. This finding presents a plausible mechanism for the descriptive, experimental, and theoretical foundations by Chang et al. (2019), and demonstrates the role of board interlocks in adaptive and social firm behavior.

Limitations

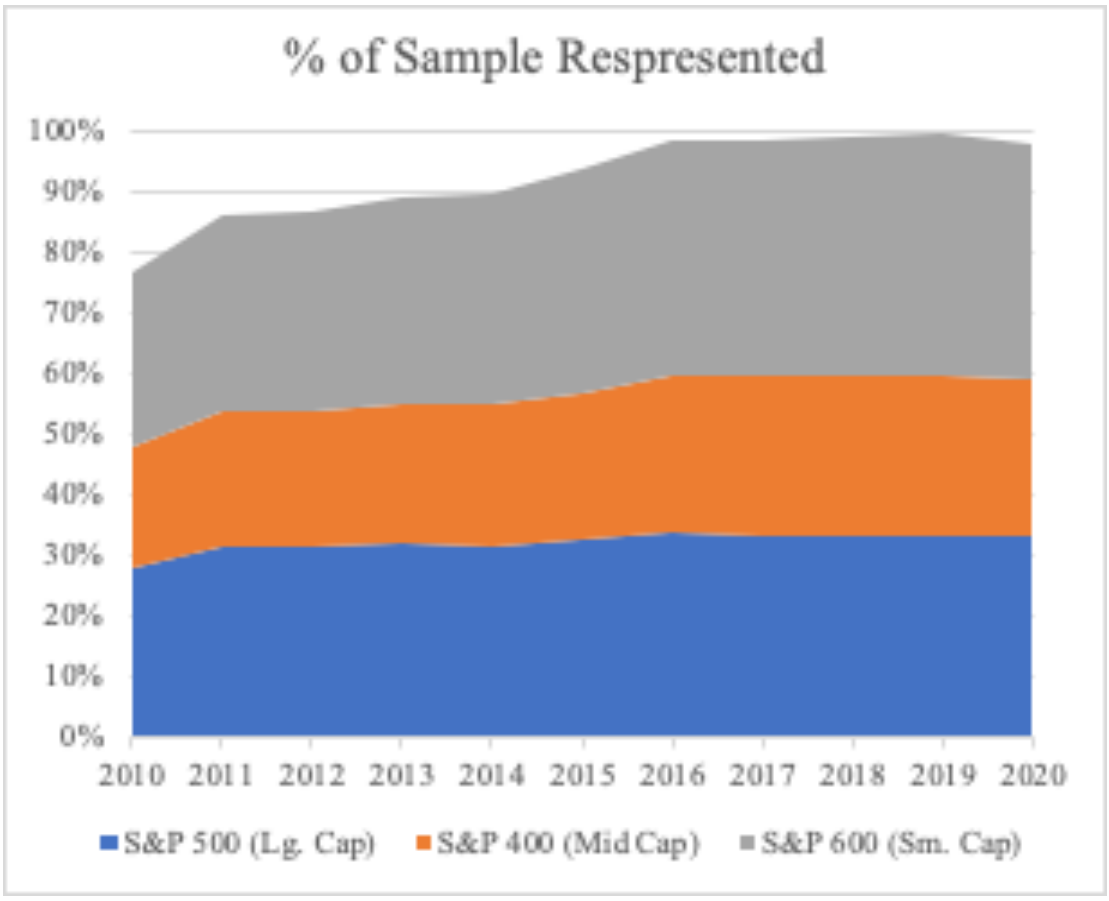
I analyze elections to a specific group of public and well-known companies: the 2021 S&P 1500. Follow-up studies should validate the effect for private companies and non-profit boards to test generalizability. Furthermore, we can see how interlocks between different types of companies—private and public, profit or non-profit—interplay with descriptive norms for gender diversity.

In addition, while interlocks are a clear social mechanism important to existing theories of corporate governance, future research can define new relations between firms to compare the relative power of different stakeholders on election outcomes. For example, one could define a series of networks for each stakeholder type—shareholders, bankers, managers, etc.—and see how descriptive norms in the respective networks determine the probability of electing a woman director. In the same vein, I would like to see how descriptive norms ethnic or racial diversity affect elections to boards of directors, as we would expect this behavior to generalize.

Conclusion

In conclusion, it has been unclear to what degree the general trend towards gender parity on corporate boards has been facilitated by social mechanisms, norms, and board linkages. I hypothesized that board interlocks form a local descriptive norm and facilitate the hiring of female directors; I tested 3 hypotheses and obtained corroborative results for all three. This is strong, albeit observational, evidence that gender diversification is, in part, a social, adaptive, and self-organizing process, in which interlocking directors form an influential learning and information diffusion network, independent of institutional investors or regulators.

Figures

1. 
% of Sample Respresented
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2010
2011
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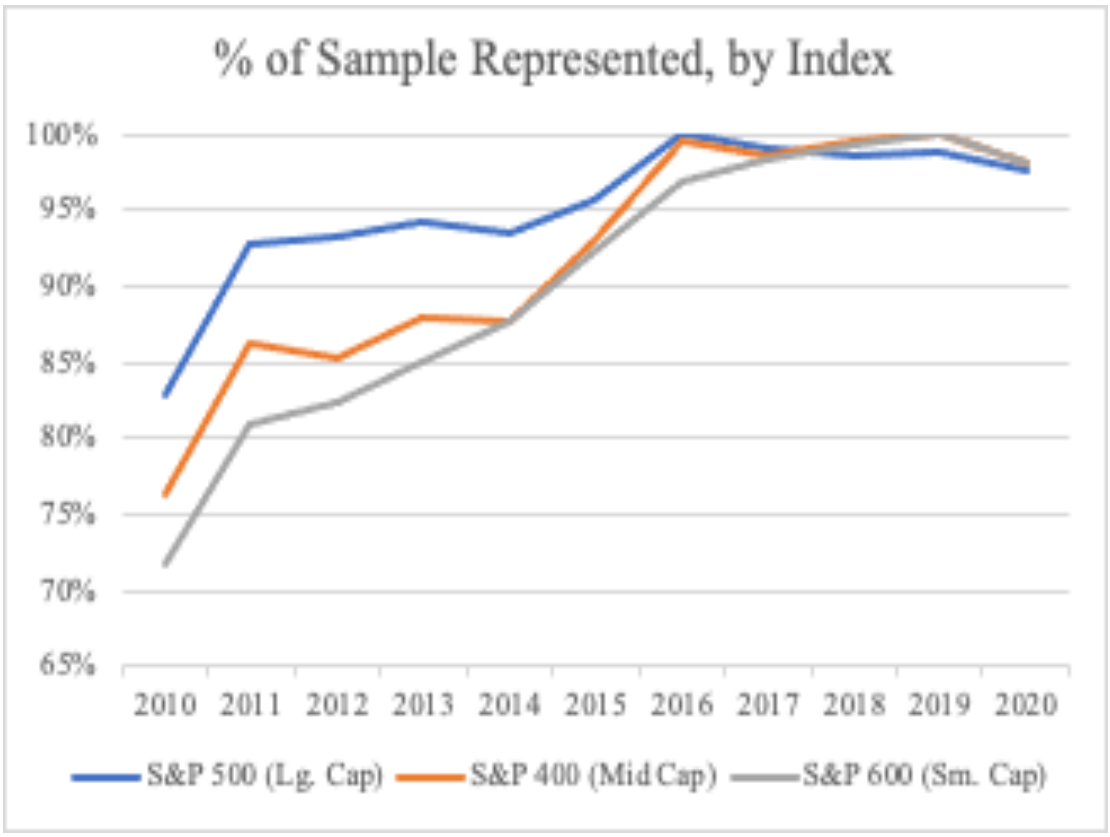
S&P 500 (Lg. Cap)
S&P 400 (Mid Cap)
S&P 600 (Sm. Cap)

2.


% of Sample Represented, by Index
100%
95%
90%
85%
80%
75%
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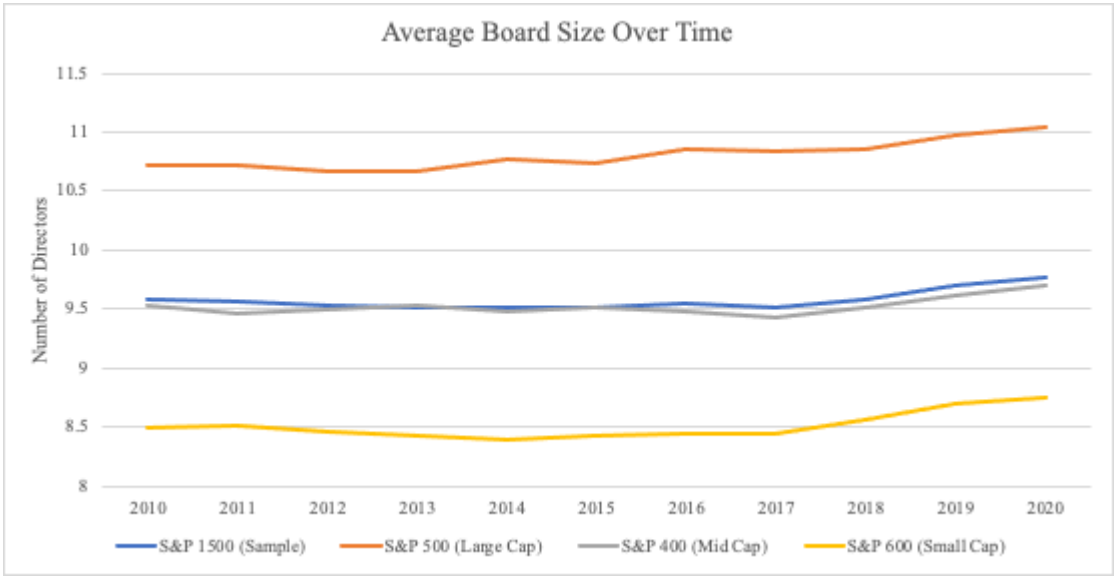
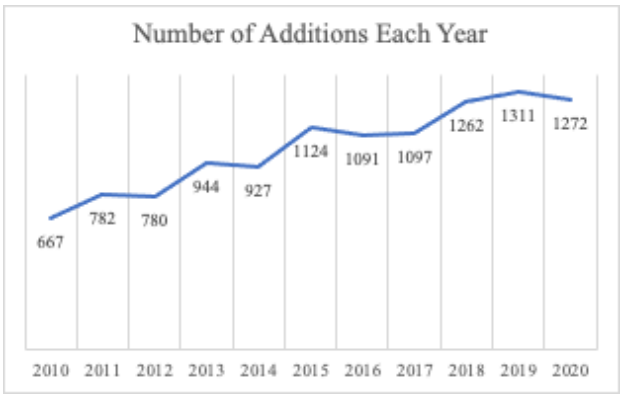
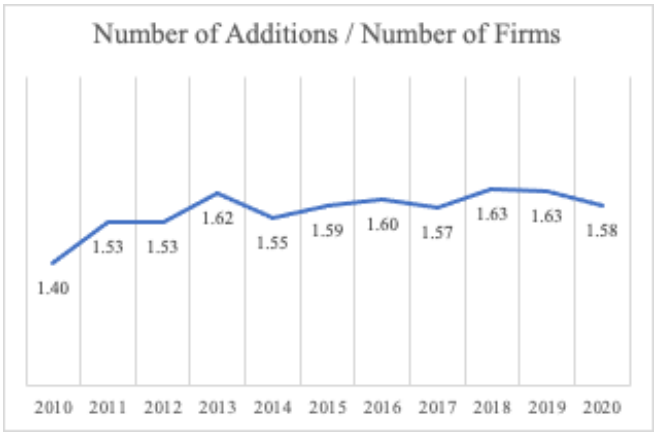
2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
S&P 500 (Lg. Cap)
S&P 400 (Mid Cap)
S&P 600 (Sm. Cap)

3.


Average Board Size Over Time
Number of Directors
11.5
11
10.5
10
9.5
9
8.5
8
2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
S&P 1500 (Sample)
S&P 500 (Large Cap)
S&P 400 (Mid Cap)
S&P 600 (Small Cap)

4. 
Number of Additions Each Year
667
782
780
944
927
1124
1091
1097
1262
1311
1272
2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

5. 
Number of Firms Adding Directors Each Year
478
511
511
582
600
709
681
697
772
804
805
2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

6. 
Number of Additions / Number of Firms
1.40
1.53
1.53
1.62
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1.59
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1.57
1.63
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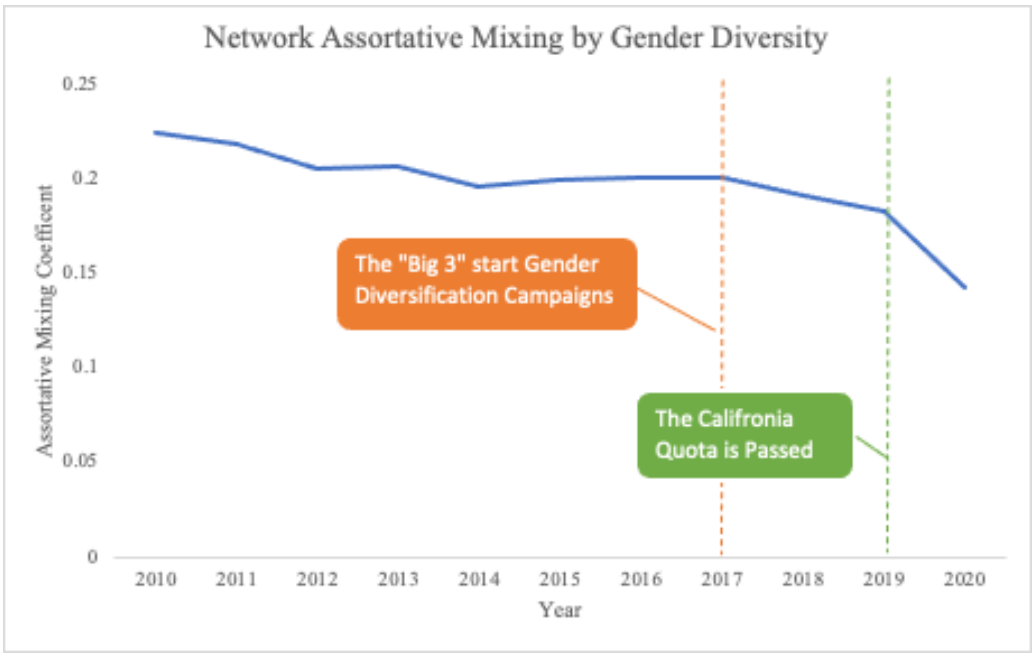
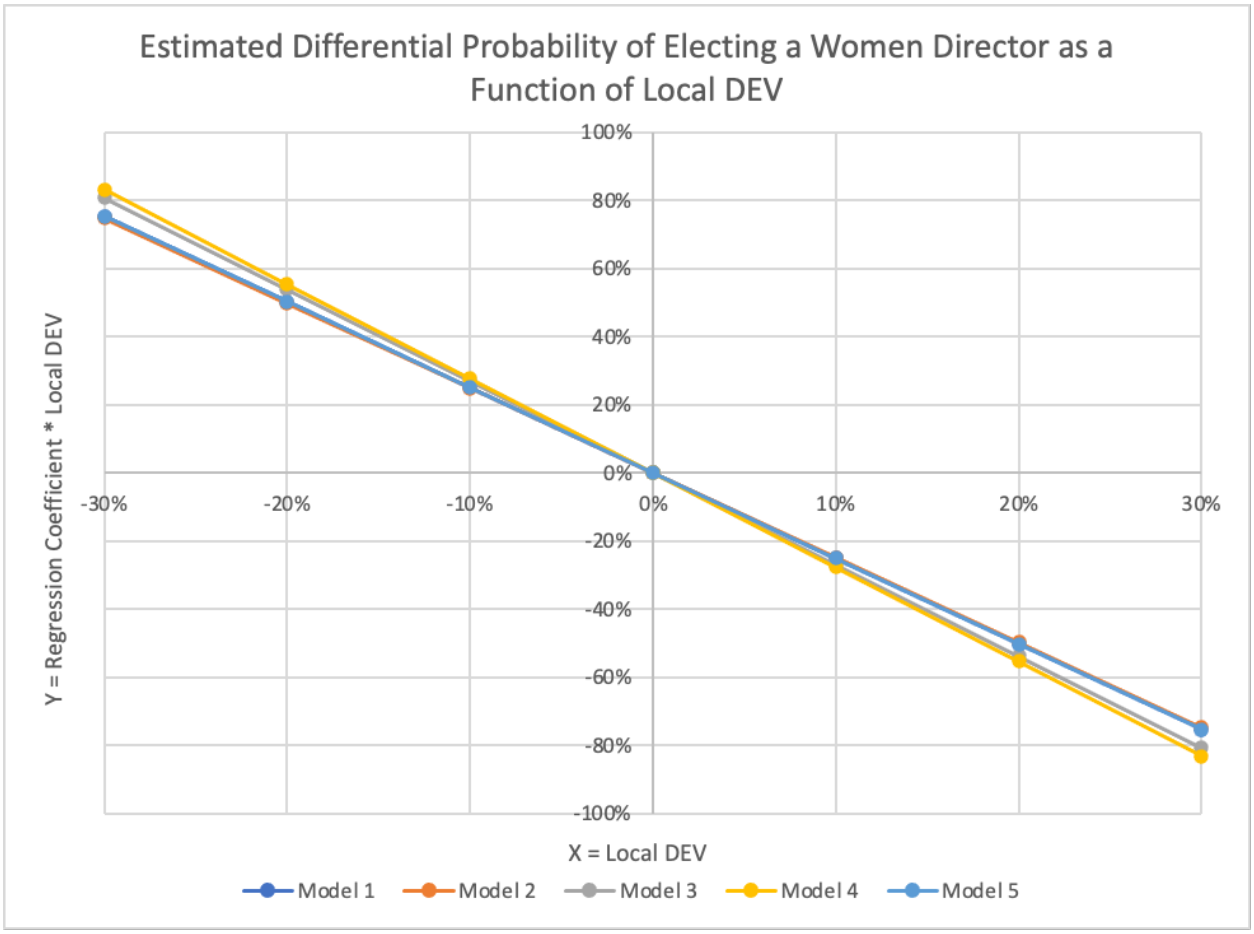
2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

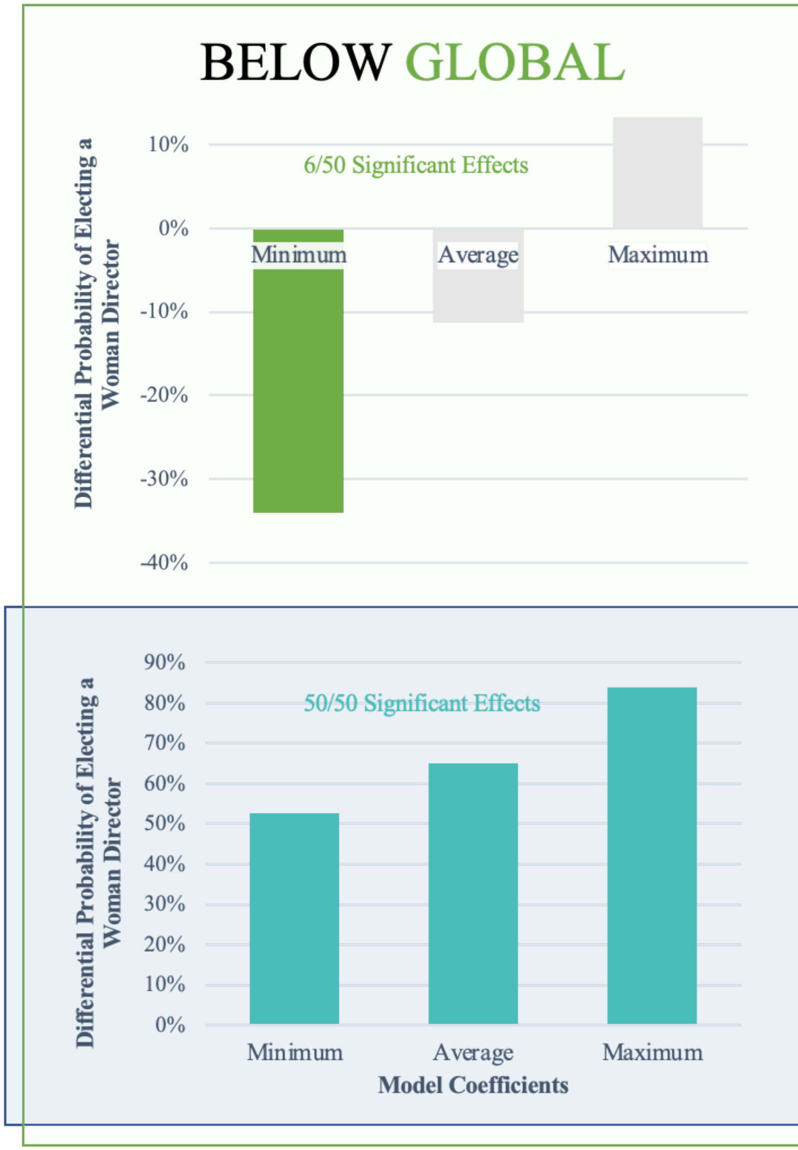
7.


Network Assortative Mixing by Gender Diversity
Assortative Mixing Coefficent
0.25
0.2
0.15
0.1
0.05
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year
The "Big 3" start Gender Diversification Campaigns
The Califronia Quota is Passed

8.

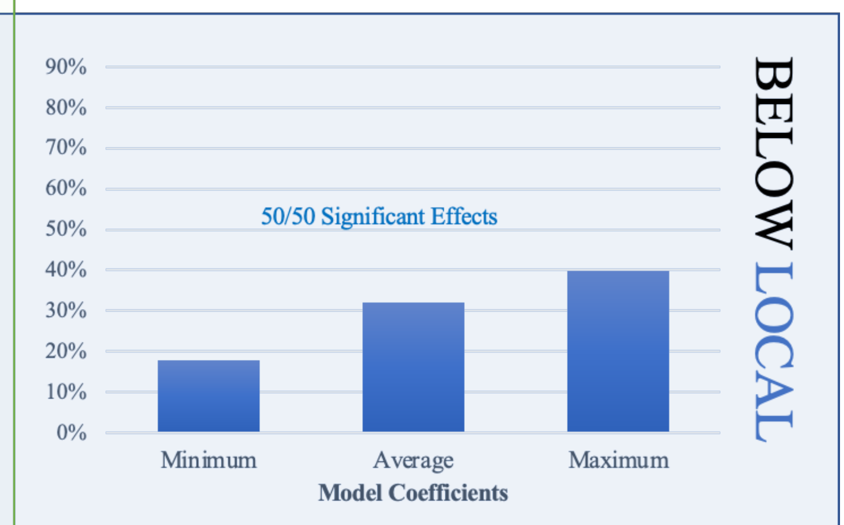

Estimated Differential Probability of Electing a Women Director as a Function of Local DEV
Y = Regression Coefficient * Local DEV
100%
80%
60%
40%
20%
0%
-20%
-40%
-60%
-80%
-100%
-30%
-20%
-10%
0%
10%
20%
30%
X = Local DEV
Model 1
Model 2
Model 3
Model 4
Model 5

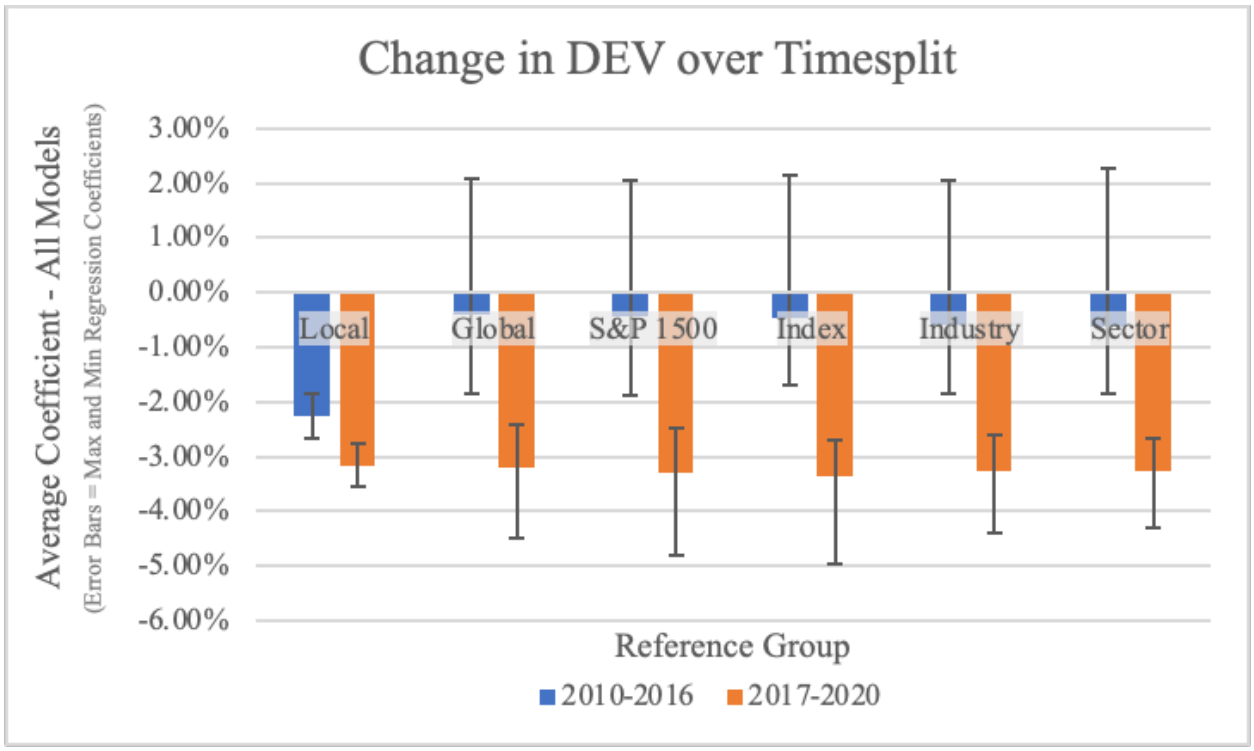
9.



50 GEE Regressions:

- 5 Global Reference Groups
- 5 Sets of Controls
- 2 Definitions of Global Descriptive Norms: Mean & Median



10. 
Change in DEV over Timesplit
Average Coefficient - All Models
(Error Bars = Max and Min Regression Coefficients)
3.00%
2.00%
1.00%
0.00%
-1.00%
-2.00%
-3.00%
-4.00%
-5.00%
-6.00%
Local
Global
S&P 1500
Index
Industry
Sector
Reference Group
2010-2016
2017-2020

11.


BELOW GLOBAL
Differential Probability of Electing a Woman Director
20%
10%
0%
-10%
-20%
-30%
-40%
2010-2016
2017-2020
LEGEND
Orange Bar = Median Coefficient
Blue Bar = Mean of Coefficients
Error Bars = Standard Deviation of Coefficients
BELOW LOCAL
Differential Probability of Electing a Woman Director
80%
70%
60%
50%
40%
30%
20%
10%
0%
2010-2016
2017-2020

Appendices

1.

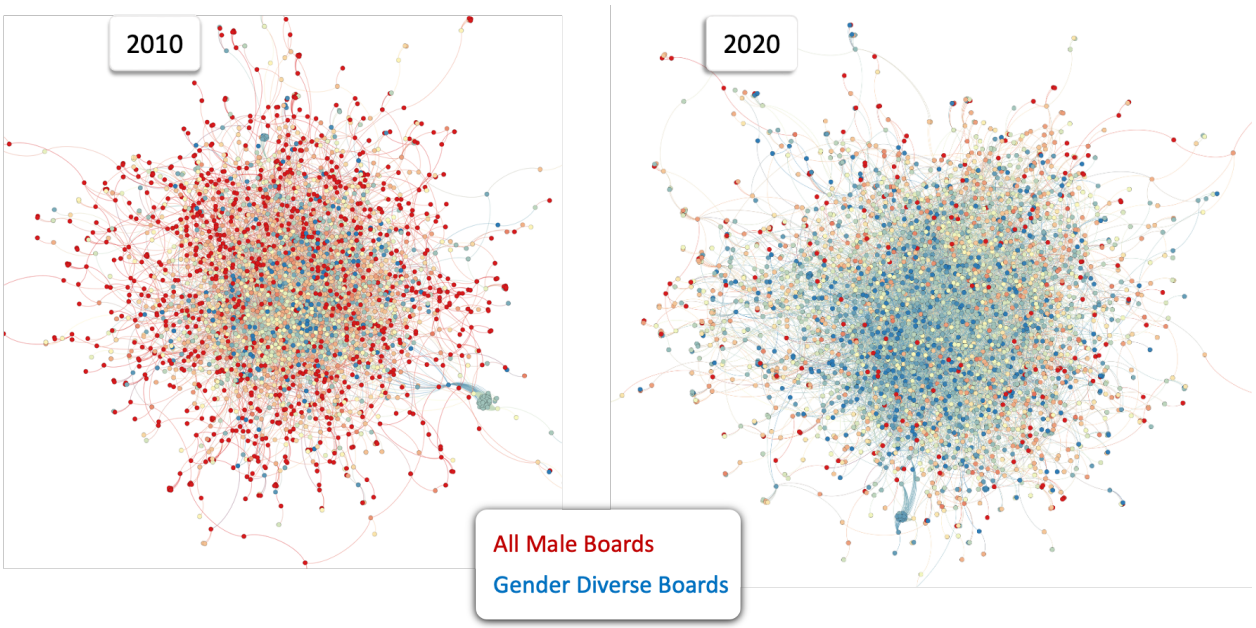
Year	*Nodes*	*Proportion of Nodes in S&P 1500*	*Edges*	*Average Degree*	*Percentage of Nodes in Giant Component*	*Percentage Women Correlation*
2010	**2745**	**42%**	**6432**	**7.69**	**94%**	**22%**
2011	**2730**	**42%**	**6620**	**7.83**	**94%**	**22%**
2012	**2752**	**42%**	**6807**	**7.96**	**95%**	**21%**
2013	**2855**	**40%**	**7114**	**8.08**	**95%**	**21%**
2014	**2949**	**39%**	**7360**	**8.17**	**95%**	**20%**
2015	**3067**	**37%**	**7788**	**8.52**	**96%**	**20%**
2016	**2953**	**39%**	**7640**	**8.41**	**96%**	**20%**
2017	**2912**	**39%**	**7574**	**8.32**	**96%**	**20%**
2018	**2903**	**40%**	**7636**	**8.40**	**96%**	**19%**
2019	**2901**	**40%**	**7818**	**8.62**	**97%**	**18%**
2020	**2965**	**39%**	**7966**	**8.67**	**97%**	**14%**

2.

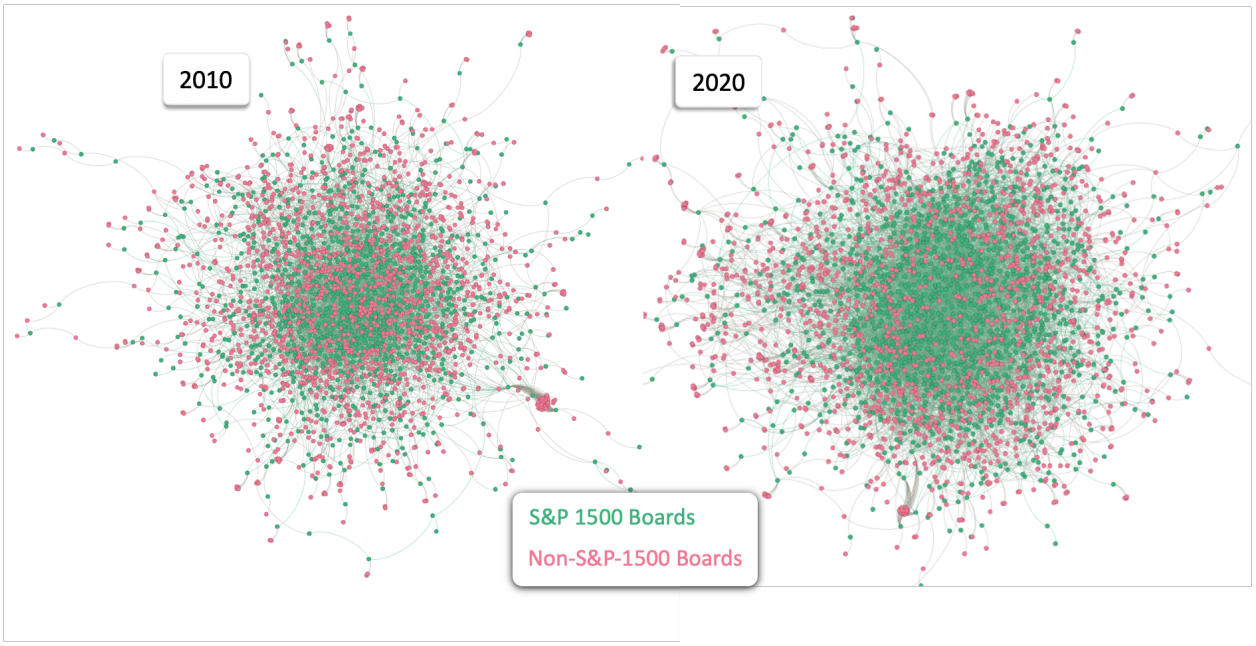
Peer Groups	Models (X representing independent variable)	Descriptive Norm
All Network Members	$\log\left(\frac{P_{woman}}{1-P_{woman}}\right) = b_0 + X$	

The S&P 1500	$\log\left(\frac{P_{woman}}{1-P_{woman}}\right) = b_0 + X + year$	Mean & Median Gender Diversity among Peers
The S&P 500, 400, 600	$\log\left(\frac{P_{woman}}{1-P_{woman}}\right) = b_0 + X + year + \sum sector + marketcap$	
Industry Competitors	$\log\left(\frac{P_{woman}}{1-P_{woman}}\right) = b_0 + X + year + \sum sector + marketcap + women\ exiting + men\ exiting$	
Sector Competitors	$\log\left(\frac{P_{woman}}{1-P_{woman}}\right) = b_0 + X + year + \sum sector + marketcap + women\ exiting + men\ exiting + \sum index + boardsize + women\ directors$	

3.


2010
2020
All Male Boards
Gender Diverse Boards

4.


2010
2020
S&P 1500 Boards
Non-S&P-1500 Boards

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