Herding behavior and board effectiveness

Maximiliano González
Abstract

In this study, I argue that independent directors tend to follow a board leader. I theoretically analyze this behavior and show that under normal circumstances there is a tendency for board members to herd. Herding is inefficient because the information contained in the signals that directors receive is not aggregated and therefore it is wasted. Herding may be one of the reasons that no empirical relation exists between board composition and firm performance.
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I. Introduction

Three empirical facts motivate this study: First, increasing the number of outside (independent) directors in the board does not increase the firm's performance (Bhagat and Black, 2000; Hermalin and Weisbach, 1991, 1998, 2000). Some of the arguments these authors posit as explanation for their findings is that the proportion of insiders could add more value to firm performance due to the stronger incentives and better access to information they have when compared to outside directors. Also, independent directors are relatively ignorant about the company affairs and are more likely to make mistakes. Finally, these authors discuss the endogeneity between performance and board composition and the fact that firm's performance is a function of too many factors for the effect of the board composition to be noticeable.

Second, disagreements in the boardroom are fairly rare (Noe and Rebello, 1997; Warther, 1998). Sometimes directors, although suspicious about a particular decision, have little evidence to build a strong case for debate (Pound, 1995). The lack of open dissent could also be due to the fact that open criticism could lead to termination. Parrino, et al. (2001) show that large investors are more likely to leave rather than to be involved in forcing changes within the firm, in this sense, liquidity is more important than monitoring.

Third, experimental research has shown that group decision-making dynamics in cohesive and small group of individuals with strong civility and cooperation norms (such as a board of directors) value consensus more greatly than they do realistic appraisal of alternatives (Bainbridge, 2001). Therefore, although there is strong evidence from experimental psychology (e.g., Miner (1984) and Kiesler and Sproul (1992)) and experimental economics (e.g. Blinder and Morgan, 2000) that not only do group decisions outperform average individuals in a given sample, but also they produce synergies that makes experimental groups sometimes outperform even the best individual decision maker, it is also true that groups such as a board of directors emphasize politeness and courtesy at the expense of oversight (Jensen, 2000), so the impact of board decision making in a firm's performance will dependent on whether the desire to maintain group cohesion does not overcome the critical judgment of its members.

I conjecture that one reason why increasing the proportion of outsiders in the board does not produce an increase in the firm's performance, is because independent directors tend to do whatever everyone else is doing in the board even when their private information suggests doing something different (herd behavior).

Because the signals (e.g., project quality) that outside directors receive are imperfect, in the aggregate, residuals cancel out, and therefore the efficient policy must prevail (e.g., approve the good projects and reject the bad ones). However, this is not true in the presence of herding because much of the information brought about in the form of private signals is wasted. In my setting none of the directors knows exactly the quality of their decisions. If they vote against the rest of the board members in a given matter, and the decision proves to be correct, their human capital enhances. But if the decision proves to be wrong, their human capital (reputation) shrinks. However, the weights given to the risk of making the wrong decision are not necessarily linear. In other words, “it is better for reputation to fail conventionally than to succeed unconventionally” (Keynes, 1936; p.158).

Moreover, under conditions of complexity and uncertainty, which are usually the case in board meetings, outside directors with limited information tend to wait and see the actions taken by presumptively better inform directors (e.g., CEO or more experienced outside directors) and free ride by following the latter decision (Bainbridge, 2000).

The remainder of this study is organized as follows: in section II, I present a literature review on the existing theoretical models on board of directors; in section III, I present my model; in section IV, I develop the main implication of the model; in section V a present an example; and in section VI, I conclude and discuss my findings.

1 Mueller put the matter very graphically when he stated that “...outside directors are birds of uncommon plumage, but they tend to flock together even though they may represent separate individual interest” Mueller (1974; p. 75).
II. Literature review on theoretical models on boards of directors

In this section I will comment on the existing theoretical literature on board of directors and contrast it with the main argument of my model.


The paper discusses maintenance of management quality through the simultaneous functioning of internal (board dismissals) and external (takeovers) corporate control mechanisms. The information set of the board and the bidder are noisily aggregated, and this situation affects the behavior of the board. The board is treated as a unity and it can be either vigilant or lax. A vigilant board will sometimes oppose takeovers, and this opposition can be good news for the firm in the sense that shareholders' interests are well served. In the model I present below, I concentrate on the board's dynamics rather than the board monitoring abilities. However, in both models the individual belief is updated after observing the actions of other actors. In the setting of my model, the board members do not act as an unity and each director gets individual signals.


The paper analyzes the combination of internal and external control mechanisms in a firm in which assets can have alternative uses that might be more profitable than the current one. However, the incumbent manager is potentially opposed to reallocating the assets since he has invested a high level of specific human capital, implying that his value to the outside labor market has decreased. The author shows the cost and benefits for the shareholders of different organization structures. The optimal governance is a function of the restructuring potential and the cost of information acquisition. Independent directors are optimal solutions if two conditions are satisfied: 1) assessing manager's decision by obtaining information must be positive at a sufficiently low acquisition cost; and, 2) the expected restructuring potential must be large. The center of the analysis of this model, as opposed to mine, is the CEO not the directors and the board is also assumed to act as a unity.


Outside directors are effective when they possess sufficient votes to block management proposals and are able to coordinate their actions. This holds true even when they are uninformed about the quality of the project and even when they do not have any monitoring abilities. The optimality of the board structure is based on the formation of factions (insiders and outsiders decision groups). An interesting feature of this model is that under normal circumstances board members exhibit passive behavior. In my model, although I do not include inside directors, also the board will exhibit passive behavior (unanimous decision making); however, they do receive signals about the quality of the project, but sometimes they decide not to use this information and just do whatever other board members are doing.


This paper evaluates management's power in the selection and retention of board members and their focus on the effect of this power on board discussion and effectiveness in disciplining management. As in my model, this analysis focuses on the frequency of open dissent, and it is shown that there are critical levels for which board members are willing to dissent with management no approving the projects management propose. Boards swing between the extremes of passivity and action. The main differences between this model and mine will be outlined below.


Board effectiveness is a function of its independence, which is in turn a function of negotiations between existing directors and the CEO who will fill vacancies on the board. The CEO bargaining power will come from his perceived ability relative to a potential successor. The model concentrates on the intensity with which the board monitors the CEO. They showed that this monitoring intensity is decreasing on the mean value of the prior estimates of CEO's ability, the precision of this ability estimate and the collective lack of independence of the board. However, this monitoring intensity is increasing in the quality of the signal the board (as a whole) receives about the CEO. In the bargain game between the CEO and the board,
they agree on the level of independence and the CEO's salary. The more independent the board, the higher the cutoff point for which the CEO will not be fired. But, if board does not fire the CEO, the new board (after the bargain game) will be less independent so in the long run the board will tend to be passive if the CEO stays in the job. The center of the analysis of this model, as opposed to mine, is the CEO and his ability to bargain with the board. In this case, the board is assumed as a compact unity.

Using laboratory experiments with business students, the authors showed that multi-agent voting mechanisms could implement an efficient policy that is, accepting projects after receiving good signals and rejecting projects after receiving bad signals. The two conditions for the implementation of the efficient policies is that there are penalties when insiders dissent and the existence of what they call “watchdogs”, with majority voting rights, who are uninformed agents but their interests are aligned with those of the shareholders. Also, these watchdogs have incentives to veto the policy choice made by insiders. This result encourages organizational designs that give independent directors majority voting power in boards. The authors showed that insiders and watchdogs each act as if each group were a single agent. In my model, I allow outside directors to receive signals but also, as in this study, I give them the possibility of blocking management proposed projects. However, the insider plays no role in my analysis because I am concentrating only on the dynamics of the outside directors.

This is an unpublished working paper that deals with the interaction between inside and outside members of a corporate board and studies how board composition affects the board monitoring abilities. She considers two board functions: monitoring and selection of the new CEO. The main point in her argument is that the competition among insiders to become the CEO’s successor and the risk involved (getting fired) if they decided to back up an inferior project, motivates insiders to inform outside board members about the quality of the project to be approved. In this model, outside board members receive the benefit of reputation from higher firm values, but the monitoring cost and the CEO influence prevent them from always monitoring. This model differs with mine in the sense that it deals mainly with board composition and all outside members behave as a cohesive group; my model, in contrast, deals more with the voting dynamics of outsiders.

This is an unpublished working paper that analyzes the consequence of the board's dual role as an advisor as well as a monitor. As a result of this dual role, the CEO faces a tradeoff concerning the amount of information he disclose to the board. The more information he provides, the better the advice he can receive from the board, but also, if he gives too much information, the board will adjust their belief whether he is a good or bad CEO. This revision could lead to termination and because the CEO does not know exactly his own type, giving up too much information to the board is risky for him. This model predicts why sometimes the boards are “friendly” and why sometimes they are not. The more friendly is the board, the more information the CEO is willing to reveal and therefore the better the policy decisions the firm will make. Also, the author showed that in some circumstances the board-monitoring role should be separated with the board-advising role, giving some merits to the two-tier systems of corporate governance in some countries.

This unpublished working paper very similar in spirit to Adams (2000) with the difference that she explicitly modeled the advisory role of the board. In her model, the CEO obtains private benefits from undertaking a project and he, strategically, provides information to the board in order to get the project approval. The presence of independent directors has two effect in the information flow; on the one hand, a high proportion of outsiders will improve the advisory role of the board; but on the other, a high proportion of independent directors will make more difficult for the CEO to get bad project approved.
of the ones that only himself will benefit from). This analysis differ from mine, not only in that she assumes that the outside board members as a cohesive group, but also, she assumes that a greater fraction of outside directors translate directly into a better decision making group due the expertise they bring into it; however, this is exactly my argument, if they herd among themselves, then this value added they bring to the board is wasted.

10. Almazan and Suarez (2002)
They modelled the relation between CEO entrenchment and turnover policy in firms where severance pay are used. The key insight in their analysis is that in certain circumstances shareholder (through the use of weak or strong board of directors) find it convenient to let go some power in favor to the CEO in order to save on overall compensation cost for the firm. Using adequate levels of severance payments, strong board are prevented to replace too frequently the CEO; when weak boards are in place, an adequate level of severance payments prevent the CEO to resist excessively his own replacement. Among the predictions of this models are that strong boards are optimal governance structure when incentive compensation is effective or when control rents are large. In the case when incentive compensations are not effective, or when control rights are not too large, weak boards are preferred. As opposed to my model, the board here is analyzed as a unity.

### III. Model
This model is similar in spirit to those of Warther (1998) and Grenadier (1999), and specially that of Warther because we both focus on open dissent among board members. However, the model presented below differs in the way directors acquire information, the voting setting, and the costs and benefits of dissent. Although my analysis supports many of the conclusions of Warther (1998), my model generates an additional set of empirical implications. The differences and similarities of both models will be stressed as I proceed with the analysis. The technology that I will use to represent the dynamics of the boardroom is a signaling game that very closely follows Scharfeinstein and Stein (1990).²

#### III.1 Setting and players
Consider a project that must be approved by the board of directors, which represents a diffuse group of shareholders.

A manager who proposes a project and has private information about it runs the firm. The manager extracts private benefits from the project even when it is a NPV<0 venture. Assume the interest rate is zero (r=0).

The board is composed of only two risk neutral independent directors (A and B) and the manager³.

The sequence of events is as follows:

In t=0 the manager proposes the project to the board. The project is state-contingent and it can be of high quality (high payoff), which generates a net cash flow equal to xₜ>0, or of low quality (low payoff), which generates a net cash flow equal to xₜ<0. It is common knowledge that P{xₜ}=α and P{xₜ}=1−α.

In t=1 each director gets private signals about the quality of the project⁴. Let us suppose that there are only two possible signals, a good signal (sₜ), which will be perceived as conveying positive information about the project, and a bad signal (sₜ), which will be perceived as conveying negative information about the project. However, the directors will interpret the signals differently depending on their types (see for similar approaches Berjarre, 1992; Warther, 1998; Grenadier, 1999). Let’s suppose that directors can be competent (smart) with probability θ or incompetent (dumb) with probability 1−θ. These prior

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² Other general models on herding behavior are Banerjee (1992) and Bikhchandani, et al. (1992).
³ You can also think of this as being a special committee set up by the rest of the board members to evaluate the project. It is common practice for boards in the US to set up special committees for purposes such as nomination, compensation, and auditing (Lorsh, 1989). Normally, the rest of the board members follow the recommendations of these committees.
⁴ Usually directors appointed to these committees get a package of information about the project. This package may include demand estimates, cost structures, cash flow projections, and other financial information. However, management prepares this package and it may not include all the relevant information due to the management’s desire to invest in the project. Similar assumptions are made in Gutierrez (2000) and Adams (2000).
probabilities are common knowledge to all players, even the directors themselves; that is, the only difference between the information set of the directors and the information set of the labor market is the private signal received by each director. Also, if both directors are competent they will receive exactly the same signal.

In t=2 the directors vote to accept or reject the project. It is assumed that director A votes first, and director B, after observing A's vote, follows. Note that the voting protocols are not modeled here; the critical feature, however, is that from the discussion preceding the actual voting, director B can infer correctly director A's vote. We will assume that the manager, who is also a member of the board, will always vote in favor of the project.

In t=3 the state of nature is realized. Let's define \( \hat{\theta} \) as the revised probability belief about outside director i's competence. Let's suppose that the market value of these directors is a function of this revised probability (see Holmstrom and Ricart i Costa, 1986). Therefore the decision they made when they voted for the project is geared to maximizing the expected value of \( \hat{\theta} \).

III. 2 Information acquisition

As I mentioned above, the precision of the information conveyed by the signal depends on the director's type, \( d \). If they are competent directors (\( d=C \)) the signal will convey the necessary information to make the right decision (accepting or rejecting the project). However, if they are incompetent directors (\( d=I \)), the signal will convey no information at all. To formalize these arguments, let me define the probability of receiving a good signal, given a high value state and being a competent director, as:

\[
P \{ s_g | x_h, d = C \} = p
\]

In other words, if a director is competent and the project is in fact of high value, there is a probability \( p \) that he will receive a good signal. Let's also define the probability of a competent director receiving a good signal when the project is in fact of low value as:

\[
P \{ s_g | x_l, d = C \} = q
\]

Let \( p>q \). In other words, when a competent director receives a good signal, there is a higher chance that the project is of high value.

For an incompetent director, the signals will convey no information at all. That is, if he receives a good signal, it could be either that the project is of high value or that the project is of low value. Formally:

\[
P \{ s_g | x_h, d = I \} = P \{ s_g | x_l, d = I \} = z
\]

8 The compensation of board members (even including the stock options) are a small fraction of the directors' current and expected wealth; therefore prestige and other intangibles seem to play an important role in the decision to join a board of directors (see Sahlman, 1990).

9 In this setting, \( 1-p \) represents the probability of a competent director receiving a bad signal when the project is of high value and \( 1-q \) represents the probability of a competent director receiving a bad signal when the project is of low value.

10 You can think of this as the signal's precision (see for similar treatment Bikhchandani et al., 1992; Gutierrez, 2000).IV. 2 Reputational considerations
Using the same rationale, if he receives a bad signal, it must be the case that:

\[ P\{s_b|x_d, d = 1\} = P\{s_b|x_I, d = 1\} = 1 - \alpha \tag{4} \]

I can now define these probabilities as 
\[ z = \alpha p + (1 - \alpha)q \], which represents the likelihood of a competent director receiving a good signal, and 
\[ 1 - z \] which represents the likelihood for a competent director receiving a bad signal.

Both directors use Bayes's rule to update their belief about the quality of the project after observing their signal. Before going to the analysis of the specific problem I am trying to solve in this study, let me review the mechanics of how beliefs are updated.

Consider first the case of a director who had received a good signal (\(s_g\)); what is the probability that the project is of high value given this signal and his uncertainty about his own type (\(d\))? Formally, how could he calculate \(P\{X_h|s_g\}\)?

We can represent this problem by using figure 2. Now, we can directly apply Bayes's rule. Formally

\[ P\{X_h|s_g\} = \frac{P\{s_g|X_h\} P\{X_h\}}{P\{s_g|X_h\} P\{X_h\} + P\{s_g|X_I\} P\{X_I\}} \]

\[ = \frac{[\theta p + (1 - \theta)z] \alpha}{[\theta p + (1 - \theta)z] \alpha + [\theta q + (1 - \theta)z](1 - \alpha)} \]

\[ = \frac{\theta p + (1 - \theta)z}{\alpha} = \mu_h \tag{5} \]

which represents the probability of a project being of high quality given that a good signal was received and the director is uncertain about his ability.

Consider now the problem of updating the belief about the quality of the project when a bad signal is received. Formally

\[ P\{x_i,s_b\} = \frac{P\{s_b|x_i\} P\{x_i\}}{P\{s_b|x_i\} P\{x_i\} + P\{s_b|x_i\} P\{x_i\}} \]

\[ = \frac{[\theta (1 - p) + (1 - \theta)(1 - z)]x}{[\theta (1 - p) + (1 - \theta)(1 - z)]x + [\theta (1 - q) + (1 - \theta)(1 - z)](1 - \alpha)} \]

\[ = \frac{\theta (1 - p) + (1 - \theta)(1 - z)}{1 - z} = \alpha = \mu_h \]

Assume that only positive signals will make the independent directors vote in favor of the proposed project (efficient policy). That is:

\[ \mu_x x_h + (t - \mu_x)x_j > 0 > \mu_x x_j + (t - \mu_x)x_h \tag{7} \]

Also assume that director A moves first. If the two independent directors are competent, the signals they receive are the same. However, when they are incompetent directors, both signals are independent.

Directors have market value that depends on their perceived quality (Holmstrom and Ricart i Costa, 1986). Let \(\theta_i\) represent the market's revised probability that director \(i\) is competent (which is related to the director's market value).

Suppose each state has equal probability of occurring (\(\alpha = 0.5\)) and note that \(p = 1 - q\). Remember that \(z = \alpha p + (1 - \alpha)q\) and therefore \(z = 0.5\). That is, when the incompetent director gets signal \(z\), there is equal probability that the signal refers to a high quality or to a low quality project.

\[ 11 \] I am assuming explicitly that directors care about their reputation. There are many theoretical and empirical arguments in favor of reputation factors being one of the most important considerations for outside directors. See for example Fama (1980), Fama and Jensen (1983), Lorsch (1989), Sahlman (1990), Kaplan and Reishus (1990), and Kaplan (1994).

\[ 12 \] Consider the case when the signal is received after analyzing financial information. If both directors are competent financial analysts, it is natural to assume that both will receive the same signal.
IV Analysis

IV. 1 No reputational considerations
To begin, let me suppose there are no reputational concerns and both directors are risk neutral. Director A will choose to vote in favor of the project only if he receives a good signal (see equation 7). Then, director B will infer director’s A signal just by observing his actions13, but he will still have uncertainties about director’s A competence.

Suppose director B receives a bad signal but he observes director A voting in favor of the project. In this case, his decision will be based on the following information set \( (s_g, s_b) \). The probability that the project is high quality given this information set is given by

\[
P\{s_g \cap s_b\} = \frac{P\{s_g \cap s_b|s_a\}P\{s_a\}}{P\{s_g \cap s_b|s_a\}P\{s_a\} + P\{s_g \cap s_b|s_b\}P\{s_b\}}
\]

(8)

where (refer to figure 2)

\[
P\{s_g \cap s_b|s_a\} = P\{s_a|s_b\} = \left[ p\theta + z(1-\theta) \right] \left[ (1-p)\theta + z(1-\theta) \right]
\]

(9)

and

\[
P\{s_g \cap s_b|s_b\} = P\{s_b|s_b\} = \left[ q\theta + z(1-\theta) \right] \left[ (1-q)\theta + z(1-\theta) \right]
\]

(10)

Plugging (9) and (10) into (8) and using the assumption stated before that \( \alpha = 0.5 \) and \( p = 1 - q \) yields14

\[
P\{s_g \cap s_b\} = 0.5
\]

(11)

therefore, director B will also vote in favor of the project whenever:

\[
0.5s_g + 0.5s_b > 0
\]

(12)

By symmetry, I can show that if director B’s information set is given by \( (s_b, s_g) \), the decision will also depend on the expected value given in (12). In summary, whenever there are no reputational considerations involved in the decision, the project will be accepted if its expected value is positive (efficient policy).

IV. 2 Reputational considerations
Now consider the case when director B is concerned about his reputation. The directors are primarily concerned about their market value15; therefore, their objective is to maximize \( E\{\theta_i\} \). In this regard, I will study director B’s decision conditional to director A’s actions16.

From (7) we know that director A will approve the project only when he receives a good signal. Because the manager will always vote in favor, the project will be accepted whenever one of the independent directors votes to accept it. Although the market cannot observe the individual voting of the board, it can see whether or not the decision was unanimous among the independent directors17. In the rest of this section, I prove that director B will follow the decision made by director A regardless of his own signal; that is, director B will herd.

From the above discussion, it will be common knowledge that if both directors are competent they will both receive the same signal (they both interpret the same information in similar ways). How-

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14 This and all other results are available from the author in .nb format (Mathematica file).
15 See Holmstrom and Ricard i Costa (1986) to support this assumption.
16 We will assume that the market for directors is competitive but sufficiently large, therefore the market assessment of quality of director B is independent of the market assessment of quality of director A.
17 Although it is very difficult for an outside observer to distinguish whether a given decision is approved or rejected unanimously, usually it can be inferred analyzing subsequent actions of directors such, as for example leaving the board. director’s turnover after critical events have been studied in Warner et al. (1988) and Gilson (1989). In the theoretical literature on board behavior it is usually assumed that unsuccessful dissent parties are fired (see Noe and Rebello, 1997 and Warther, 1998). Also, the popular press has documented many cases where a director’s dissent leads to termination, e.g., Pound (1995).
ever, if the market observes a divided decision in the outcome (in this case the approval of the project), the reason can be because director A is competent and director B is not, which I will present as \((A_C, B_I)\), director A is incompetent and director B is competent \((A_I, B_C)\), both directors are incompetent \((A_I, B_I)\) or both directors are competent \((A_C, B_C)\). Because the market cannot observe each director’s decision, the probability that the director B is competent after an unanimous decision has been observed will be

\[
p[B_C] = p[A_C, B_C] \cap (A_I, B_C)\]

with these assumptions and market beliefs, I present the first result.

**Theorem 1:** In a board composed of the CEO and two independent directors and where voting is sequential, whenever reputation is valuable \(\theta > 0\), director B, regardless of his own signal, will mimic director A’s decision to accept or reject the project.

**Proof.** Suppose both parties vote based on their signals\(^{18}\). Rational expectations require that the market correctly conjecture this behavior. Consider the problem of director B who has received a bad signal but sees director A voting to approve the project. If director B votes based on his signal, the market will know that \((\xi_y, \xi_b)\). In this case, the market makes the following belief assignment: \(\hat{\theta}(B_C | g, s_B)\). If director B deviates (herds) and follows the decision made by director A, the market will think that the probability of director B being competent is: \(\hat{\theta}(B_C | g, s_B)\). Therefore, if a separating equilibrium exists, it must be the case that:

\[
\hat{\theta}(B_C | g, s_B) > \hat{\theta}(B_C | g, s_B)
\]

From (6) we know that director A received a good signal and voted to approve the project. The Bayesian update made by the market when director B separates is given by

\[
\hat{\theta}(A_I \cap B_C | g, s_B) = \frac{\xi (L-y)(L-\theta) \alpha}{\xi (L-y)(L-\theta) + \phi (L-y)(L-\theta)(L-\alpha) + \xi (L-\alpha)}
\]

\[
\hat{\theta}(B_C | g, s_B) = \frac{(L-y)(L-\theta) \alpha}{(L-y)(L-\theta) + \phi (L-y)(L-\theta)(L-\alpha) + \xi (L-\alpha)}
\]

(14)

and

\[
\frac{(L-y)(L-\theta) \alpha}{(L-y)(L-\theta) + \phi (L-y)(L-\theta)(L-\alpha) + \xi (L-\alpha)} = \frac{(L-y)(L-\theta) \alpha}{(L-y)(L-\theta) + \phi (L-y)(L-\theta)(L-\alpha) + \xi (L-\alpha)}
\]

(15)

From (14) and (15), inequality (13) does not hold for any value of \(\theta > 0\). Q.E.D.

The intuition is straightforward: on the one hand, if the market recognizes a split decision, then the signals are different. Therefore, one or both directors are incompetent. On the other hand, if the market perceived a unanimous decision among directors, then the signals are the same. Therefore, both directors are likely to be competent. Director B, who is unsure about his own abilities, knows this logic. In this case, he receives a different signal than director A received, and director B will be safer herding on A’s decision.

Next, I will show that there is a pooling equilibrium for which director B always herds; that is, he votes to reject the project if director A rejects it or to accept the project if director A accepts it.

**Theorem 2:** In a board composed of the CEO and two independent directors, and where voting is sequential and reputation is valuable \(\theta > 0\), a pooling equilibrium exists where director B always follows director A’s decision.

**Proof.** In a pooling equilibrium director A votes based on his signal. Director B votes whatever director A has voted. Thus, rational expectations require that the market correctly conjecture this behavior. Thus, if director A votes yes (accepts the project) and director B follows the equilibrium path strategy of voting yes, then the market updates its probability belief that director B is competent, calculating

\[
\hat{\theta}(B_C | g, s_B) = \frac{(L-y)(L-\theta) \alpha}{(L-y)(L-\theta) + \phi (L-y)(L-\theta)(L-\alpha) + \xi (L-\alpha)}
\]

(16)

but \(\theta > 0\), and therefore it is greater than the probability belief for all out-of-the-equilibrium path strategies, which is zero, then the pooling equilibrium holds. The exact same argument works for the case when director A votes to reject the project. Q.E.D.
This result corroborates that director B will have incentives to herd, not only when his signal is different than the signal received by director A, but also, when the signals are the same.

V. Example
Let us imagine a world with the following parameters:

$p = 0.6$

$\theta = 0.7$

In this setting, the probability of a competent director getting a good signal, when the project is in fact of high value is 0.6 (signal precision). Also, the markets for directors assign a prior probability of 0.7 that director B is competent and remember that I assume $p=1-q$.

There are four cases to analyze:

Case 1: Director B receives a good signal and observes director A voting in favor of the project.

The information set of this situation is given by $(s_b, s_g)$. If director B also vote to approve the project will get a new evaluation from the market about his competence. Particularly, the new market’s assessment about director B’s competence will be given by (15). In the case of a high output this equation becomes:

$$\theta_B = \frac{q\theta + q^2\theta^2}{2q\theta^2 + q^2\theta^2} = 0.8068$$ (17)

and in the case of low output, this equation becomes:

$$\theta_B = \frac{q\theta + q^2\theta^2}{2q\theta^2 + q^2\theta^2} = 0.7868$$ (18)

In both cases the ex-post probability belief about director B’s competence will increase from the prior probability; therefore, he does not have incentives to deviate from the equilibrium path.

Case 2: Director B receives a bad signal but observes director A voting in favor of the project.

The information set of this situation is given by $(s_b, s_g)$. If director B votes also to accept the project (herd) the market’s new assessment of his competence is 0.8068 in the case of a high output and 0.7868 in the case of low output (see equations 18 and 19). If he decides to deviate (rejecting the project) the ex-post market assessment of his quality will be given by (14). If the state of the world proves high, then

$$\theta_B = \frac{q\theta + q^2\theta^2}{2q\theta^2 + q^2\theta^2} = 0.3294$$ (21)

and if the state of the world proves low, then

$$\theta_B = \frac{q\theta + q^2\theta^2}{2q\theta^2 + q^2\theta^2} = 0.4941$$ (22)

In both cases the ex-post probability belief about director B’s competence will decrease substantially, therefore he will always be better off herding.

Case 3: Director B receives a bad signal but observes director A voting in favor of the project.

The information set of this situation is given by $(s_g, s_g)$. If director B votes also to reject the project (herd) the market’s new assessment of his competence is 0.8068 in the case of a high output and 0.7868 in the case of low output (see equations 19 and 20). If he decides to deviate (accepting the project) the ex-post market assessment of his quality is given by (14) which, after using the similar calculations as in (21) and (22) yields if the state of the world proves high and

$$\theta_B = \frac{q\theta + q^2\theta^2}{2q\theta^2 + q^2\theta^2} = 0.4941$$ (23)
if the state of the world proves low. In any case, director B will be better off herding.

VI. Conclusion

Three empirical facts motivate this study: First, increasing the number of outside (independent) directors in the board does not increase the firm’s performance (Bhagat and Black, 2000; Hermalin and Weisbach, 1991, 1998, 2000); second, disagreements in the board room are fairly rare (Noe and Rebello, 1997; Warther, 1998); and, third, the dynamics of group decision making in cohesive and small groups with strong civility and cooperation norms (such as a board of directors) value consensus over realistic consideration of alternatives (Bainbridge, 2001). The model I present in this study is consistent with these empirical facts.

It is not surprising that performance does not improve when new independent directors are appointed on the board. If the new directors herd, then the decision will still be based on the signal of the leader of the board, and the others will follow whatever decision this leader made. With this setting, there is no surprise either that disagreements will be rare. The new comer will likely agree to accept or to reject the board plans (projects) regardless of his own signals. And finally, this is an example that supports the thesis that dynamics of small and cohesive groups value consensus more than the critical evaluation of alternatives.

This model is difficult to test empirically because the participant voting and signals received by directors are not observable from the outside. However, the model provides several useful implications for the design of corporate board of directors. These implications can be tested using experimental designs:

1. Board members who are industry experts will have better correlated signals. Therefore, outside directors will be more effective in the decision-making process when they have industry-related expertise.
2. Boards can benefit with the appointment of an expert as the lead director.
3. The formation of board committees will have a positive effect on board decision because these groups tend to be composed of people competent in the area.
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APPENDIX

Figure 1
Summarizes the sequence of events in the model

\[ t=0 \]
- Manager presents the project
- The possible pay-offs are:
  \[ x = \begin{cases} 
  x_h \text{ w.p. } \alpha \\
  x_l \text{ w.p. } (1-\alpha) 
\end{cases} \]

\[ t=1 \]
- Signals are received:
  \[ s = \begin{cases} 
  s = s_k \\
  s = s_b 
\end{cases} \]
- Quality of directors is considered

\[ t=2 \]
- Directors vote sequentially:
  \[ A \rightarrow B \]
- They accept or reject the project:
  \[ \max \left( E \{ \hat{\theta}_1 \} \right) \]

\[ d = \begin{cases} 
  d = C \text{ w.p. } \theta \\
  d = d \text{ w.p. } (1-\theta) 
\end{cases} \]

Figure 2
Updating of belief