

Endogenous Social Norms In the Boardroom

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Abstract

We develop a model in which individuals within a group are influenced by an endogenous social norm, which is determined by the group members' incentives, preferences, and responsiveness to the social norm. We structurally estimate the model to assess the influence of an endogenous norm of behavior on corporate board member insider trading. Our estimates suggest that the social norm is a material determinant of insider trading behavior, with the norm comprising about one-third of the perceived cost of insider trading for the median director. Furthermore, the estimated determinants of individual personal norms and individual sensitivity to the social norm are consistent with individual characteristics identified in antecedent moral reasoning literature, which provides some validation that our measures reflect the underlying constructs of interest. Overall, our findings suggest that endogenous social norms can be a material determinant of behavior, and that the social norm mechanism should be considered when selecting individuals for a group or when devising incentives for individuals within that group.

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1 Introduction

Individual behaviors within an organization are generally assumed to be determined by financial incentives associated with compensation contracts, internal control and monitoring systems, labor market concerns, and regulatory and litigation exposures. In addition to these incentive mechanisms, individual behaviors are potentially shaped by social norms present within the organization.¹ The social norms mechanism is attributed to human desires or incentives to fit into a social group, which, in turn, causes individual behaviors to conform to some degree with the behaviors exhibited by their peers within the organization. Because each individual influences and is influenced by the behavior of peers within the organization, however, the norm arising from the norm mechanism is inherently endogenous. In this study, we employ an approach for assessing the impact of endogenous social norms on individual behavior, and we apply this approach to assess how social norms within a corporate board affect board members' insider trading behavior.

Inferring the effect of a group norm on an individual group member's behavior is challenging empirically for at least two reasons. First, a norm effect cannot be easily inferred from correlations in behavior within the group because such a correlation could always be due to an omission of an individual determinant of behavior common to the group ([Angrist \(2014\)](#)). Second, as discussed above, any norm is inherently endogenous and is a function of exogenous determinants of behavior, which can make isolating any norm effect difficult. We endeavor to address this challenge by using structural estimation. In particular, we explicitly model the endogenous formation of norms within a group and impose this structure on the data to identify the impact of the group norm on individual behavior.

We develop a model where individuals within an organization can engage in some undesired

¹For example, the theory of moral development proposed by [Kohlberg \(1984\)](#) relies upon a notion of a social norm as a determinant of behavior. According to [Kohlberg \(1984\)](#), people at different stages of moral development differ in how much their social circle influences their moral reasoning and associated decisions. Multiple studies (e.g., [Gilligan \(1982\)](#), [Trevino \(1986\)](#), [Rothbart et al. \(1986\)](#), [Ford and Lowery \(1986\)](#), [Gilligan and Attanucci \(1988\)](#)) that build on Kohlberg's theory of moral reasoning have found that individuals generally do adhere to the norms of their social groups, and the degree of individuals' sensitivity to social norms varies with demographic, education, or context characteristics. In the context of organizations, multiple studies have considered how to incorporate social norms into corporate decision-making. See, for example, [Posner \(2000\)](#), [Smith \(2003\)](#), [Smith \(2007\)](#), and [Bicchieri \(2005\)](#).

behavior. When choosing whether to do so, individuals weigh the benefits of the undesired behavior against its costs, which have two components: (1) personal costs of undesired behavior, driven by financial, legal, or regulatory costs, as well as any psychic cost of violating one's personal code of conduct, and (2) psychic costs stemming from behaving in conflict with the norm established by their peers within the organization. We allow individuals to exhibit different personal costs as well as different sensitivities to the social norm. In equilibrium, the organization's norm of undesirable behavior arises endogenously. This norm is stronger if individuals in the organization have, on average, higher personal costs and higher sensitivities to the social norm. The organizational norm, in turn, enters each individual's decision to the extent that the individual is sensitive to the norm. As a result, individuals with higher personal costs, individuals who are more sensitive to the organization's norm, and individuals within organizations with stronger norms are less inclined to engage in undesirable activity.

We apply the model to assess the role of social norms in corporate boardrooms as determinants of one undesirable behavior – insider trading. We apply the model to board behavior because norms, to the extent they influence behavior, could potentially be important to optimal board construction and incentive structure, which ultimately affect a firm's economic value. Whether norms are relevant within the boardroom, however, is far from assured for at least two reasons. First, board members tend to be quite accomplished individuals and, as a consequence, they may be quite independent-minded and not subject to peer-determined norms. Second, boards are professional organizations that do not meet particularly frequently, so the board members might be less inclined to strongly identify with the board. Hence, even if board members are influenced by norms established by a peer group, the relevant peers might not be their fellow board members. Finally, the insider trading setting is selected because it offers sufficient data to permit the estimation of an average norm effect. Although the individual trading behaviors might not be viewed as having first-order effects on firm value, they can still be useful for identifying a norm effect that can influence other behaviors having first-order effects on firm value.

To identify instances of potential insider trading, we use directors' trading activities during the 8-

K trading gap (Cohen et al. (2015)) – an up to four day window between a material event happening at a company and this event being reported in an 8-K. For each material event and each company, we identify whether each director traded the company’s stock, which is a proxy for whether they engaged in an undesirable activity, and what return board members could obtain had they traded on the event (i.e., the benefit of engaging in the undesirable activity).

To determine individual-level personal costs of undesirable behavior and sensitivity to social norms, we rely on evidence from prior literature in Psychology, Ethology, and Management to identify characteristics associated with individuals’ moral choices in general and individuals’ adherence to their peers’ behavior when faced with a moral choice. We identify several characteristics associated with personal costs – demographic characteristics, education, framing, and firm characteristics – and individuals’ sensitivity to social norms – demographics and education, and the degree of attachment to the social group (i.e., the board). In the first specification, for each individual, we make personal costs a linear function of the characteristics and make sensitivity to social norms the same for all individuals. In the second specification, we make the individual sensitivity to the norm a linear function of individual characteristics identified in antecedent literature as determinants of norm sensitivity. The second specification also allows us to validate our analysis to some extent. In particular, if the estimated coefficients on individual characteristics in the social norm specification are consistent with prior evidence, our model is more likely to capture the construct of interest – endogenous social norms.

When structurally estimating the model, we find strong support that endogenous social norms are a material determinant of board member insider trading activities. In terms of economic magnitudes, for a median director, about 34.6% or 31.3% (depending on specification) of their perceived total costs of insider trading are driven by the desire to adhere to the norm at the board. For a director at the 25th percentile, this statistic is 34.3% or 27.7%; for a director at the 75th percentile, this statistic is 35.1% or 33.8%. The test assessing the model’s ability to explain the data strongly suggests that the model that includes endogenous social norms explains observed board members’ behavior better than the model without social norms.

Additionally, the coefficients on factors affecting sensitivity to social norms inform us about various characteristics associated with directors' sensitivities to board social norms. In particular, females appear less sensitive to norms at the board than males. Given that corporate boards are largely male-dominated (in our sample, 86.4% of observations are male), female's lower reaction to board norms is consistent with females not perceiving different-gender colleagues as peers and/or role models (Bosma et al. (2012), Markussen and Røed (2017), Gioia (2017)). Directors who are American nationals are less sensitive to norms on the board compared to non-Americans, echoing the effects of more individualistic cultures (Gelfand et al. (2011)). Individuals with professional designations (i.e., CPA, CFA, or a law degree) are less sensitive to social norms, consistent with prior evidence of the effects of training or professional background on individuals' moral development (Trevino (1986)). Directors who have spent less time with the board – and are thus less integrated with it – appear more sensitive to the board's social norm. Blau (1960) finds in a series of experiments that less integrated individuals feel greater pressure to follow along with the group and are less likely to deviate from group norms. Board members who sit on more boards at a time are less sensitive to the norm in a given board, suggesting that they are influenced by multiple potentially conflicting norms of behavior. Finally, independent directors seem to be more reactive to social norms, perhaps because they are chosen to be on the board in the first place because other board members see them as more likely to comply with the board's traditions. Supporting our finding, Clune et al. (2014) interview board nominating committees and find that they often select individuals with whom they and CEOs feel "the right chemistry".

As for personal costs, some common factors affecting moral reasoning appear to hold in the corporate boardroom setting. We find that females perceive insider trading as more costly, consistent with the evidence in McCabe et al. (1991) and Borkowski and Ugras (1998). Directors with a Law degree or those who were subject to ethical training (holding a CFA or a CPA) also perceive insider trading as more costly (McCabe et al. (1991), Hildebeitel and Jones (1992), Eynon et al. (1997)). Finally, directors in larger and more established firms appear to perceive insider trading as more costly, probably because of increased public scrutiny of these firms and because larger established

firms have more internal rules and monitoring systems governing insider trading.

Our study contributes to several streams of literature. The first category is broad empirical literature in Economics and Business on social norms and individual behavior. These studies generally document the existence of social norms and evaluate their effects on economic agents' decisions, corporations, and the whole economy. [Lindbeck \(1997\)](#) provides a comprehensive review of the literature on the interaction of social norms with household behavior. As a more recent example of this stream of literature, a recent study by [Guiso and Zaccaria \(2023\)](#) estimates the effect of gender norms in Italian households on stock market participation and returns on investment. The authors use regional and spouses' cohort variation to identify the degree to which households adhere to gender norms in society. [Hong and Kacperczyk \(2009\)](#) also study the effect of norms constraints on stock market participation, but in a different setting: they find that institutional investors who are more constrained by norms (e.g., pension funds) tend to hold fewer "sin" stocks (e.g., tobacco producers). Another set of studies covers individuals' decisions and the effects of norms in day-to-day situations. For example, [Fisman and Miguel \(2007\)](#) find that cultural norms related to corruption in countries diplomats originate from significantly affect diplomats' tendency to accumulate unpaid parking tickets. [Viscusi et al. \(2011\)](#) use survey data to study whether social norms play a role in promoting recycling in a neighborhood and do not find a significant effect of social norms. Another large literature in Economics (see reviews by [Epplé and Romano \(2011\)](#) and [Sacerdote \(2011\)](#)) studies peer effects in education. In the Accounting space, [Young \(2021\)](#) finds that social norms and the extent to which an individual identifies with them can constrain aggressive reporting behavior. As a number of prior studies highlight, social norms are endogenously developed in a household, organization, or country. This feature of social norms may render findings from simple association tests questionable as it is unclear whether the social norm drives individual behavior or whether both individual behavior and the social norm are driven by common factors. We tackle this issue by employing structural estimation and can evaluate how important social norms are in individuals' decision-making given the norms' endogenous nature. In addition, our study is the first to analyze social norm effects in the corporate boardroom setting.

Second, we structurally estimate a model of individual behavior with endogenous social norms and test whether this model is more descriptive of the data than a model without social norms. These findings complement theoretical literature on social norms and individuals' adherence to the behavior of their peers (e.g., [Akerlof \(1997\)](#), [Brock and Durlauf \(2001\)](#), [Fischer and Huddart \(2008\)](#)).

Another large relevant stream of literature concerns trading by insiders (see [Bainbridge \(1998\)](#) for one of the earliest overviews of the issue). Numerous studies in Law, Finance, and Accounting have documented instances of insider trading. We enrich their evidence by documenting an important driver of corporate directors' insider trading decisions – social norms in a boardroom.

Finally, we contribute to the extensive empirical literature on boardroom diversity. Previous studies have examined how diversity on various dimensions impacts corporations' social performance ([Hafsi and Turgut \(2013\)](#)), corporate governance and financial performance ([Campbell and Mínguez-Vera \(2008\)](#), [Adams and Ferreira \(2009\)](#), [Kang et al. \(2022\)](#)), and innovation ([Deore et al. \(2021\)](#)). We demonstrate another important effect of diversity – diversity of norms – on constraining (or fostering) directors' undesirable behavior.

2 A Model of Undesirable Activity with Social Norms

The model employed for our structural analysis is in the spirit of [Fischer and Huddart \(2008\)](#) in that it considers social norms as an endogenous construct. Our formalization of social norms is grounded in the premise that individuals have innate preferences to adhere to the norms established by peers in their organization, and that the strength of those preferences to conform varies across individuals. Such innate preferences might be evolutionary in nature, in the sense that individuals who are connected to social groups might fare better than those who are not in some circumstances.² Because of our empirical setting, we focus on a norm that influences an undesirable action from an organization's or society's perspective, as opposed to a norm that influences a desirable action. Our

²Our premise is an established one in the social psychology literature, and has been employed in the framework of moral development of [Kohlberg \(1984\)](#) and the locus of control construct of [Rotter \(1966\)](#).

modeling framework, however, can be relatively easily altered to consider a norm that influences a desirable action by flipping signs and relabeling parameters.

2.1 Model

Consider an organization with N individuals. Each individual i in the organization can engage in an undesirable action or not. If i chooses to engage in the undesirable action, they incur a cost $c_i + \omega_i s_i$ where $c_i > 0$ represents individual specific costs imposed by the organization, regulators, or a court as well as any psychic cost of violating one's personal norm of behavior. The part $\omega_i s_i$ represents a psychic cost attributable to the norm of behavior established by i 's peers, $s_i > 0$, where $\omega_i \in [0, 1)$ represents i 's sensitivity to the organization's social norm. In our primary model, the norm $s_i > 0$ is determined by the average anticipated behaviors of i 's peers within the organization.

If i decides to take an undesirable action, they obtain a benefit, b_i , which is the realization of some random variable with support R^{++} . The benefit can be monetary or non-monetary in nature. For instance, in one of our empirical settings, if an individual trades on their inside information, the benefit represents the expected return from trading. Alternatively, if an individual chooses to shirk at work, the benefit represents time spent on leisure and other non-work activities. Given the cost of the undesirable action, it follows that an individual i will engage in the undesirable action if and only if

$$b_i > c_i + \omega_i s_i. \quad (1)$$

Hence, i 's decision is defined by a threshold $b_i = \beta_i$ that satisfies

$$\beta_i = c_i + \omega_i s_i \quad (2)$$

such that i undertakes a level of undesirable action if and only if $b_i > \beta_i$.

To endogenize the organization's social norm, and characterize the equilibrium solely in terms of exogenous variables, we assume the norm faced by individual i is the average threshold they anticipate for their peers in the organization. Hence, we endogenize the norm by implicitly assuming

that individuals are influenced by their beliefs about how others in their organization will behave and, as is common in formal models, assume those beliefs must be equilibrium consistent (i.e., what individuals believe about the behavior of others is consistent with the equilibrium behavior of others). Modeling the social norm as an equally weighted average of individual behaviors is arguably a reasonable one for a board of directors in the sense that board members are likely to view each other as a group of equal peers, as opposed to a hierarchy in which a select few are deemed to be in charge. With that said, in an extension we allow for the possibility that one individual, a focal leader, can have greater weight.

Let a $\hat{\cdot}$ over a threshold denote a conjecture for that threshold. Substituting in a conjecture for the average threshold for i 's peers, $\frac{\sum_{j \in \Omega, j \neq i} \hat{\beta}_j}{N-1}$, in for s_i in expression (2) yields i 's threshold as a function of their conjecture of their peer's thresholds:

$$\beta_i = c_i + \omega_i \frac{\sum_{j \in \Omega, j \neq i} \hat{\beta}_j}{N-1} \quad (3)$$

In equilibrium, $\hat{\beta}_j = \beta_j$ for all j and that observation, coupled with rearranging the above equation, implies that the equilibrium value for β_i satisfies

$$\beta_i = c_i + \frac{N}{N-1} \omega_i \frac{\sum_{j \in \Omega, j \neq i} \hat{\beta}_j}{N} \quad (4)$$

or

$$\beta_i = \frac{N-1}{N-1+\omega_i} c_i + \frac{N\omega_i}{N-1+\omega_i} \bar{\beta} \quad (5)$$

where $\bar{\beta} = \frac{\sum_{j \in \Omega} \hat{\beta}_j}{N}$ is the average threshold for all individuals in the organization, which we refer to as the organization's social norm.

To solve for the equilibrium $\bar{\beta}$, we divide both sides of equation (5) by the number of individuals

in the organization:

$$\begin{aligned}\frac{\beta_i}{N} &= \frac{1}{N} \frac{N-1}{N-1+\omega_i} c_i + \frac{1}{N} \frac{N\omega_i}{N-1+\omega_i} \bar{\beta} \\ &= \frac{1}{N} \psi_i + \frac{1}{N} \chi_i \bar{\beta}\end{aligned}\tag{6}$$

where $\psi_i = \frac{N-1}{N-1+\omega_i} c_i$ and $\chi_i = \frac{N}{N-1+\omega_i} \omega_i$. Summing these equations across all individuals in the organization implies that the equilibrium $\bar{\beta}$ must satisfy

$$\bar{\beta} = \bar{\psi} + \bar{\chi} \bar{\beta}\tag{7}$$

where $\bar{\psi} = \frac{\sum_{j \in \Omega} \psi_j}{N}$ and $\bar{\chi} = \frac{\sum_{j \in \Omega} \chi_j}{N}$. Solving for $\bar{\beta}$ yields

$$\bar{\beta} = \frac{\bar{\psi}}{1 - \bar{\chi}}.\tag{8}$$

To provide some intuition regarding the organization's social norm, $\bar{\beta}$, we consider two comparative statics. First, the social norm, $\bar{\beta}$, is increasing in each individual i 's personal cost, c_i , which directly increases i 's threshold by increasing the cost of the undesirable activity, and indirectly increases all group members' thresholds through the peer effect mechanism arising from the change induced in the endogenous norm. The norm is also increasing in each individual i 's sensitivity to the norm established by their peers, ω_i . The increase in i 's sensitivity to the norm directly increases i 's threshold by increasing the cost to i of taking the undesirable action when at least some of their peers not taking the undesirable action. This direct effect, in turn, indirectly increases all group members' thresholds through the peer effect.³ Finally, note that, if we allow N to be infinitely large so that each individual has an arbitrarily small impact on the social norm, the equilibrium social norm satisfies $\bar{\beta} = \frac{\bar{c}}{1 - \bar{\omega}}$, where $\bar{c}$ is the average individual specific cost, c_i , and $\bar{\omega}$ is the average sensitivity to the norm, ω_i . This observation provides, perhaps, a clearer depiction of the comparative statics intuition just described.

³The formal comparative static for a change in c_i is algebraically straight-forward. The comparative static comparative static for a change in ω_i requires a bit of algebraic manipulation.

To conclude the model characterization, we use the equilibrium norm, $\bar{\beta}$, to fully characterize each individual i 's equilibrium threshold:

Proposition 1 *An individual i will engage in an undesirable activity if and only if:*

$$b_i > \frac{N-1}{N-1+\omega_i} c_i + \frac{N\omega_i}{N-1+\omega_i} \frac{\bar{\psi}}{1-\bar{\chi}} \quad (9)$$

Individuals with higher personal costs of an undesirable activity (higher c_i), individuals who are more sensitive to their organization's norm (higher ω_i), and individuals in an organization with a stronger social norm, $\frac{\bar{\psi}}{1-\bar{\chi}} = \frac{\sum_{j \in \Omega} \frac{N-1}{N} \frac{c_j}{N-1+\omega_j}}{1 - \sum_{j \in \Omega} \frac{\omega_j}{N-1+\omega_j}}$, will be less inclined to engage in the undesirable activity.

2.2 Model Adaptation for Empirical Estimation

Estimating personal costs c_i and sensitivity to a social norm ω_i at the individual level is challenging for two reasons. First, both parameters cannot be identified at an individual level because of the model's linear structure. Second, estimating individual-level parameters requires a sample with sufficient individual-level variation in behavior and introduces a great deal of computation demands.

Instead of estimating individual-level personal costs and sensitivities to social norms, we augment the model by assuming the individual costs are a linear function of individual-, or firm-level characteristics. For sensitivities to social norms, we estimate two specification: one where all individuals have the same level of sensitivity to social norms – ω – and one where individuals' sensitivities to social norms are, like personal costs, a linear function of individual-level characteristics.

Formally, we set

$$c_{ift} = \Lambda'_c X_{ift}$$

$$\omega_{ift} = \omega \quad \text{or} \quad \omega_{ift} = \Lambda'_\omega Z_{ift}$$

where i is a subscript for an individual director, f is a subscript for a firm, and t is a subscript for a time period. $X'_{ift} = [x_{1ift}, x_{2ift}, \dots, x_{nift}]$ is a vector of characteristics that may influence personal

costs of engaging in an undesirable activity, and $\Lambda'_c = [\lambda_{1c}, \lambda_{2c}, \dots, \lambda_{nc}]$ is a vector of coefficients in front of these characteristics; ω is a constant, $Z'_{ift} = [z_{1ift}, z_{2ift}, \dots, z_{nift}]$ is a vector of characteristics that may influence individuals' sensitivities to social norms, and $\Lambda'_\omega = [\lambda_{1\omega}, \lambda_{2\omega}, \dots, \lambda_{n\omega}]$ is a vector of coefficients in front of these characteristics.

The individual characteristics we anticipate would be determinants of personal costs and sensitivity to a social norm are suggested by theories and evidence in the Psychology, Ethology, and Management literature. First, experimental findings in [Borkowski and Ugras \(1998\)](#) and [McCabe et al. \(1991\)](#) suggest that women make different moral judgements than men. Western cultures have been shown to perceive morality differently (e.g., [Buchtel et al. \(2015\)](#), [Graham et al. \(2016\)](#)). Other studies examine the impact of education and training and document that differences in educational backgrounds and training can influence moral judgments (see, for example, [McCabe et al. \(1991\)](#), [Hiltebeitel and Jones \(1992\)](#) and [Eynon et al. \(1997\)](#)). Relying on this evidence, we include directors' gender, citizenship, and professional training into characteristics in the personal cost function. Another important determinant of individuals' moral decision-making is the framing of moral dilemmas ([Petrinovich and O'Neill \(1996\)](#)). In particular, in our setting, individuals might perceive insider trading differently when trading on negative firm news versus positive firm news. Trading on negative firm news may be perceived as more immoral and thus more costly. At the same time, because directors are typically highly exposed to the firm through their holdings in the first place, it might be easier and more beneficial for them to trade on negative information, i.e. sell the stock. To account for these possibilities, we include an indicator for negative abnormal returns around the 8-K form in the personal cost function. Finally, firms might vary in the extent to which they are monitored by the public and police their directors' behavior. To capture these aspects, we include firm size and age in the personal cost function.

For individuals' sensitivities to social norms, prior literature has identified a number of potential determinants. Antecedent studies suggest that men are generally more concerned with justice and individual rights, while women are generally more concerned with questions of care and relationship with others ([Gilligan \(1982\)](#), [Rothbart et al. \(1986\)](#), [Ford and Lowery \(1986\)](#), [Gilligan and](#)

[Attanucci \(1988\)](#)). A woman, therefore, is likely to be more sensitive to how other members of a social group behave when making her own moral choice. However, [Bosma et al. \(2012\)](#), [Markussen and Røed \(2017\)](#), and [Gioia \(2017\)](#) have shown that individuals are substantially less influenced by their peers if the peers are of different gender. Given that corporate boards are largely comprised of men, women may be less sensitive to board norms. Another important factor in individuals' adherence to social norms is culture and national identity, with individuals from more individualistic cultures (e.g., the United States or the United Kingdom) being less sensitive to social norms than individuals from more socialistic cultures (e.g., Japan or South Korea) (see [Gelfand et al. \(2011\)](#)). In addition, [Trevino \(1986\)](#) suggests that people who often face moral dilemmas in their profession (e.g., doctors), or who are trained to be able to think in an unbiased manner (e.g., law school graduates or those who receive ethical training), have more independent moral reasoning. Similar to personal costs, we include gender, nationality, and professional training in the individual norm sensitivity function. Next, the level of individuals' attachment to a group has been shown to affect whether individuals behave more similarly to the group members. [Harris \(1990\)](#) finds that individuals who have spent more time in an organization are more responsive to the organization's norms. At the same time, [Blau \(1960\)](#) finds that newcomers to an organization feel more pressure to adhere to established norms of behavior and are less likely than old group members to act in disagreement with traditions. Overall, the effect of the time an individual spent on board on their sensitivity to board norms is ex ante ambiguous. Another variable that might affect a director's level of attachment to a given board is the number of other boards the director currently sits on. Finally, independent directors might feel less attached to a board because they are not firm insiders. At the same time, [Clune et al. \(2014\)](#) interview board recruiting committee members and find that they often rely on the like-mindedness of potential candidates and prefer to hire someone who has the right "chemistry" with the board and the CEO. This finding suggests that independent directors might be more likely to go along with the board's established norms of behavior. Based on these studies, we include directors' time spent on the board, the number of other boards, and indicators for independence in the norm sensitivity function.

3 Setting and Data Sources

We apply our model to consider how social norm affects board member insider trading activity. The undesirable action in this setting is a director's choice to insider trade, which statistical studies suggest does occur without regulatory or legal consequences for offending parties. Such trading, however, is thought to have negative consequences for investor perceptions of corporate governance and market fairness and, as a consequence is discouraged at the level of the firm through, say, blackout periods, and more broadly by insider trading laws. Such formal rules are difficult to apply and enforce in many contexts, however, so the decision to trade is likely influenced by a board member's personal ethical compass, and we conjecture, by the social norm established by their peer group, which we will believe is defined by the board members as a group.

As a specific instance of potential insider trading, we use board of directors' trading activities during the 8-K trading gap ([Cohen et al. \(2015\)](#)). Starting from 2004, a public company is required to file an 8-K form within four days after a material event has occurred. This formulation implies that, for any material event, there exists an up to a four-day period, the 8-K trading gap, when the company's board members, or at least some subset of them, have inside information and the associated profitable trading opportunities. [Cohen et al. \(2015\)](#) finds evidence consistent with some insiders exploiting these opportunities. In particular, [Cohen et al. \(2015\)](#) documents that insiders earn, on average, a systematic abnormal return of 42 basis points per trade during the 8-K trading gap, and that these trades do not lead to adverse regulatory or legal consequences.

3.1 Data Sources

We restrict our sample to public companies operating in the United States and events that happened after January 1 of 2005 – the first year after the SEC adopted the four-day gap rule. For the 8-K filings, we use data collected by the Wharton Research Data Services Analytics (WRDS Analytics). For each 8-K form filed by a company, we gather the Items in the form, the date and time the form was filed, and the date an event happened. When the filing time is after 4 pm or the filing date is

a non-trading day, we set the filing date to the next closest NYSE day. We calculate the trading gap as the day difference between the filing date and the event date. We drop observations where the gap is zero and observations with more than a 4-business-day gap. Following [Cohen et al. \(2015\)](#), we remove Item 5.02 filings, which are typically stock or option awards granted to the company's management. We remove Item 5.07 filings, reporting results of shareholder voting at annual meetings, which are rarely material and are disclosed at least at the meeting itself. We follow [Niessner \(2015\)](#) and remove Item 1.03 filings, which are bankruptcy or receivership and can be anticipated in advance, Item 2.02 filings, which are earnings announcements that are prescheduled and generally subject to blackout periods imposed by companies, and Item 7.01 filings, which relate to Regulation FD and have a 24-hour reporting period.

We obtain data on board members' insider trading from Thomson Reuters, who collect data from Form 4 filings that public company's directors, officers, and beneficial owners of 10% of the stock are required to file within 2 business days of any stock transaction. The filings report transaction dates, prices, and other details. We keep only transactions classified as sales or purchases, and transactions unrelated to exercising options. For every board member and every 8-K filing, we record the trading instance as 1 if the member traded during the trading gap and 0 if the member did not trade.

To proxy for the benefit of trade for a given board member, we employ a cumulative abnormal return during the 8-K trading gap, which we calculate using the WRDS Event Study tool. For observations for which a board member traded, we proxy for the board member's benefit of trading using the cumulative abnormal return between the day the member traded and the day the 8-K form was filed. The benefit is then proxied for by multiplying a positive return by 1 and a negative return by -1 to capture the benefit from buying in advance of good news and selling in advance of bad news. We throw out any observation in which a board member sold (purchased) when the cumulative abnormal return was positive (negative) because that suggests a trade that did not appear to be motivated by the exploitation of inside information. For observations when a board member did not trade, we calculate stock market return as cumulative abnormal return between the day the

event happened and the day the 8-K form was filed. We measure the potential benefit of trading on the 8-K news by using the return if the return is positive and the return multiplied by -1 if the return is negative.⁴

We collect data on board members' characteristics and employment history from BoardEx, and data on firms' characteristics from Compustat.

3.2 Descriptive Statistics

We remove 8-K filings for Items 5.02, 5.07, 1.03, 2.02, and 7.01. We also remove cases where insiders traded is less than 1 day before or more than or exactly 5 days after an event in the 8-K. Next, to have a sufficient proportion of observations where we observe a trade, we keep companies that have at least 1 trade by an insider during the 8-K trading gap within any given decade. As noted above, we also only keep 8-K events where, if an insider traded, they traded in the direction of the realized return. We remove firms with missing data, firms with total assets less than \$10 million, events with firm return in the upper or lower 1% of the distribution, and firm size, directors' time with the board, and directors' number of other boards in the upper 1% of the distribution. Table 1 shows sample reduction at each step. We end up with a total of 1,605,934 observations for 3,326 firms with 8-K filings from 2005 to 2022.

Summary statistics for the length of the trading gap, instances of trading, and abnormal returns from potential trading during the gap are provided in Table 2. The average length of the trading gap in our sample is 2.15 days. About 0.3% of director-firm-event-level observations in our sample are cases when a director purchased or sold the firm's stock. A potential cumulative abnormal return that can be earned is on average 4 percentage points, with 1 percentage point at the 25th percentile and 5.1 percentage points at the 75th percentile. When we restrict the sample to only trading observations (Table 3), the actual cumulative abnormal return directors earn is slightly higher: on average 4.2 percentage points.

⁴Instead of throwing out observations for which a board member traded in the opposite direction of the news proxy, we could also classify and include those observations as a non-trade. In future analysis, we intend to do so.

Table 4 presents summary statistics for individual-level and event-level characteristics. About 13.6% of our observations are female members of the board of directors. Americans constitute about 37.2% of observations. 24.0% of observations either have a Law degree, are a CPA, or are a CFA. About half of the sample are events with negative news about the firm. A median director has spent about 5 years on the board; a director at the 25th percentile has spent about 2 years; a director at the 75th percentile has spent about 10 years. Even though there are observations where a director sits on as many as over 10 boards at a time (untabulated), on average, a director in our sample sits on 1.17 boards at a time. 33.2% of directors in our sample are independent. Finally, a median firm has \$1,970 million in total assets.

4 Estimation

We estimate the model using Maximum Likelihood. We maximize the likelihood of observing the set of individuals who do and do not engage in advantageous trade at a given firm during a given 8-K gap. We assume that an individual's decision to trade is determined by: (1) the return she expects to earn from the trade, which is proxied for using the realized cumulative abnormal returns described above, (2) the costs of engaging in insider trading stemming from her personal costs and sensitivity to the norm on the board, and (3) an error in either predicting the return or determining the cost of trading. Those errors are assumed to be identically distributed realizations of a standard normal random variable $\tilde{\varepsilon}$.⁵ Let $F(\varepsilon)$ denote the cumulative distribution function for $\tilde{\varepsilon}$. An individual will trade if $r_{ft} - \frac{N-1}{N-1+\Lambda'_\omega Z_{ift}} \Lambda'_c X_{ift} - \frac{N\Lambda'_\omega Z_{ift}}{N-1+\Lambda'_\omega Z_{ift}} \frac{\bar{\psi}}{1-\bar{\chi}} - \varepsilon_{ift} > 0$ and not trade otherwise. The likelihood of observing a trading choice for observation of an individual i at a firm f during the event in period t is:

⁵The standard error of $\tilde{\varepsilon}$ equal to 1 as a normalization, and all the parameters will be estimated per standard error of the noise term. Note that the distribution of the noise term is not non-parametrically identified in discrete choice theory (McFadden (1974), McFadden (1981)).

1. If $Trade = 1$

$$L_{ift}(Trade=1) = F \left(r_{ft} - \frac{N-1}{N-1+\Lambda'_\omega Z_{ift}} \Lambda'_c X_{ift} - \frac{N\Lambda'_\omega Z_{ift}}{N-1+\Lambda'_\omega Z_{ift}} \frac{\bar{\psi}}{1-\bar{\chi}} - \varepsilon_{ift} \right),$$

2. If $Trade = 0$

$$L_{ift}(Trade=0) = 1 - F \left(r_{ft} - \frac{N-1}{N-1+\Lambda'_\omega Z_{ift}} \Lambda'_c X_{ift} - \frac{N\Lambda'_\omega Z_{ift}}{N-1+\Lambda'_\omega Z_{ift}} \frac{\bar{\psi}}{1-\bar{\chi}} - \varepsilon_{ift} \right),$$

where $\bar{\psi} = \sum_{j \in \Omega} \frac{N-1}{N} \frac{\Lambda'_c X_{jft}}{N-1+\Lambda'_\omega Z_{jft}}$ and $\bar{\chi} = \sum_{j \in \Omega} \frac{\Lambda'_\omega Z_{jft}}{N-1+\Lambda'_\omega Z_{jft}}$.

The maximum likelihood estimator (MLE) identifies the set of model parameters $\Lambda'_c, \Lambda'_\omega$ that maximize the joint log-likelihood of the observed trading decisions:

$$\sum_{ift} \log L_{ift}(Trade_{ift}).$$

$\Lambda'_c = [\lambda_{c,const}, \lambda_{c,Female}, \lambda_{c,American}, \lambda_{c,Prof. \text{ designation}}, \lambda_{c,Bad \text{ news}}, \lambda_{c,Firm \text{ size}}, \lambda_{c,Firm \text{ age}}]$, and $\Lambda'_\omega = [\lambda_{\omega,const}, \lambda_{\omega,Female}, \lambda_{\omega,American}, \lambda_{\omega,Prof. \text{ designation}}, \lambda_{\omega,Time \text{ with the board}}, \lambda_{\omega,Nu \text{ both boards}}, \lambda_{\omega,Independent}]$, where $\lambda_{c,const}$ and $\lambda_{\omega,const}$ are constants, for which the corresponding x_{ift} and z_{ift} are always equal to 1.

The only restriction we place on the estimated parameters is that, for any given observation, the estimated $\omega_{ift} = \Lambda'_\omega Z_{ift}$ must be between 0 and 1.

4.1 Estimation Results: Common Sensitivity to Social Norms

In the first specification of the model, we make individual costs linear functions of individuals' characteristics and set the same sensitivity to social norms for all directors. The purpose of this specification is to test whether directors seem, on average, sensitive to social norms. The estimated parameters are presented in Table 5. The estimates suggest that social norms are a meaningful determinant of directors' insider trading behavior. In particular, the estimated sensitivity of individuals to social norms is 0.345 with a standard deviation of 0.082.

The estimated coefficients in front of individuals' personal costs are mostly consistent with expectations derived from prior literature. Consistent with prior literature (Borkowski and Ugras (1998) and McCabe et al. (1991)), female directors' personal costs of insider trading are higher, implying that female directors are less likely to insider trade. In addition, directors who have a law degree, are a CPA or a CFA, perceive insider trading as costlier, consistent with their professional training. Americans appear to perceive insider trading as less costly. When the firm's news in an 8-K is negative, directors perceive insider trading on this information as less costly, which contradicts the established effects of framing on individuals' moral choices (Petrinovich and O'Neill (1996)). However, as we discussed above, trading on negative news may be relatively more beneficial for board members because they are already highly exposed to their firms through their holdings. The negative effect of bad news that we find might be capturing the increased benefits of trading on bad news net of the perceived additional costs due to framing. Finally, directors at larger and older firms perceive insider trading as more costly, consistent with potentially greater public scrutiny and the strength of internal controls.

4.2 Estimation Results: Social Norms and Individual Characteristics

In the second specification, we make individuals' sensitivities to social norms a linear function of individuals' characteristics. The primary purpose of this specification, in addition to testing the presence of the social norms effect, is to examine which factors might drive directors' sensitivities to social norms.

The estimation results are presented in Table 6. First, corroborating the results of the first specification, in the second specification the constant term in the directors' sensitivity to social norms is of a similar economic magnitude. The constant term in the sensitivity to social norms is 0.356, implying that when directors make insider trading decisions, they take into account the choices made by their colleagues at the board.

Multiple factors appear to explain director sensitivity to the board's norm. Female directors appear less sensitive to norms at the board compared to their male colleagues. This finding is at

odds with women generally being concerned about other people than men (Gilligan (1982), Rothbart et al. (1986), Ford and Lowery (1986), Gilligan and Attanucci (1988)). However, corporate boards are largely male-dominated: for instance, in our sample, 86.4% of observations are male. Female's lower reaction to board norms is consistent with findings that people are substantially less likely to perceive their different-gender colleagues as peers and/or role models (Bosma et al. (2012), Markussen and Røed (2017), Gioia (2017)). Directors who are American nationals are less sensitive to norms on the board compared to non-Americans, a result expected from more individualistic cultures (Gelfand et al. (2011)). Individuals with professional designations appear less sensitive to other people's choices, consistent with prior evidence of the effects of training or professional background on individuals' moral development (Trevino (1986)). Directors who have spent less time with the board appear more sensitive to the board's norms than directors who have been with the board for some time. This result supports experimental evidence that people who are less integrated with an organization feel greater pressure to comply with established norms of behavior (Blau (1960)). Board members who sit on more boards at a time are less sensitive to the norm in a given board, suggesting that they are influenced by multiple potentially conflicting norms of behavior. Finally, independent directors seem to be more reactive to social norms, probably because they are chosen to be on the board in the first place because other board members see them as more likely to follow along with the board's norms (Clune et al. (2014)).

5 How Important Are Social Norms?

Our coefficient estimates suggest that social norms influence insider trading activities, but the estimates themselves do not provide much insight into the magnitude of their influence. Hence, we endeavor to provide some insight into the importance of social norms from three perspectives.

5.1 Relative Importance of Social Norms

First, using the model structure, we compute the relative importance of social norms in determining directors' choice to insider trade. To do so, we compute the fraction of the total costs of insider trading that is due to directors' sensitivity to social norms. For director i at a firm f at time t , the importance of social norms is computed as:

$$\text{Importance of social norms}_{ift} = \frac{\omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}{c_i + \omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}, \quad (10)$$

where $c_i = \hat{\Lambda}'_c X_{ift}$ and $\omega_i = \hat{\Lambda}'_\omega Z_{ift}$, and β_j is the equilibrium threshold for individual j 's decision to insider trade.

Tables 7 and 8 and Figures 1 and 2 present the distribution of the estimated relative importance of social norms in the board of directors population for the two model specifications. Based upon the estimates, social norms appear to play a substantial role in directors' decisions to insider trade. For a median director, about 34.6% or 31.3% (depending on the specification) of their perceived cost of insider trading comes from the desire to adhere to the norm in their social group, i.e., the board. For the director at the 25th percentile, about 34.3% or 27.7% of the cost comes from social norms; for the director at the 75th percentile, about 35.1% or 33.8% of the cost comes from social norms. Finally, the standard deviation of the relative importance of social norms is 0.008 or 0.047, suggesting a relatively small variation in the importance of social norms to director decisions.

The histogram of the first specification suggests that the sensitivity to the social norms has a two-modal distribution: one mode is about 0.327, and another mode is about 0.345. The histogram of the second specification shows a unimodal distribution with a mode at about 0.34.

5.2 Benchmark without Sensitivity to Social Norms

Second, we adopt a statistical perspective and evaluate whether including social norms in the model of individuals' undesirable behavior significantly enhances the model's explanatory power. To do

so, we estimate an alternative model in which we set individuals' sensitivity to social norms to zero. Table 9 presents the likelihood ratio test for models with and without individuals' sensitivities to social norms. The test strongly rejects the null hypothesis that directors are not sensitive to norms on their boards.

5.3 A Counterfactual: Absence of The Social Norms Effect

Third, we consider a counterfactual scenario where we remove the effect of social norms by setting individuals' sensitivities to zero. To evaluate how this change would worsen insider trading behavior, we compute an increase in the direct (personal) costs of insider trading required to compensate for the absence of social norms.

Specifically, we look for a constant that helps achieve the same likelihood of insider trading in the scenario without social norms as in the baseline scenario. We find that this level of the additional cost needed to compensate for the absence of social norms is about 52.18 or 42.47% of the average personal costs individuals already have, depending on the model specification. This finding highlights the importance of social norms: if directors did not consider their peers' actions in choosing their actions, regulators or corporations would need to increase the cost of insider trading by about a half to reduce insider trading to the level we observe in the data.

6 Conclusion

We have offered a structured approach for estimating the importance, if any, of endogenous social norms in individuals' moral decision-making. We apply this approach to the corporate boardroom setting by estimating how an endogenous social norm influences directors' decisions to insider trade. We find that the endogenous norm, on average, accounts for about one-third of the perceived cost of insider trading for the median board member, suggesting that an endogenous social norm is a relatively important determinant of insider trading behavior. Furthermore, we find that individual's personal (e.g., psychic) costs of trading and individual sensitivities to a social norm regarding trad-

ing are consistent with individual characteristics highlighted in antecedent moral reasoning literature, which suggests that our measures reflect to some extent the underlying constructs of interests. Hence, within a boardroom setting, our analysis suggests that endogenous norms are present, and in the case of trading decisions, economically significant.

The approach we offer is generic enough that, given appropriate data, it could be applied in different corporate and non-corporate contexts, such as managers or partners in local corporate offices, households in a neighborhood, teachers in a school, or law enforcement officers in a precinct. The application of the approach to a broader set of settings would add insight into whether endogenous social norms are important determinants of behavior more generally, and help identify when and, if so, why the social norm mechanism plays an important role in influencing behaviors.

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Figures and Tables

Table 1: Sample selection procedure. One observation is at the 8-K filing-director level.

	Sample size	Number of firms
Initial sample with non-missing data on board composition and 8-K filings	21,074,185	6,485
Exclude 8-K filings with Items 5.02, 5.07, 1.03, 2.02, 7.01	9,028,389	6,484
Exclude 8-K events when SEC filing date and 8-K reporting date are the same	4,553,676	6,452
Exclude 8-K events when there are more than 4 business days between SEC filing date and 8-K reporting date	4,199,127	6,446
Exclude 8-K events with missing data on returns	3,347,512	6,153
Exclude 8-K events where the firm has less than one trade or less than two 8-K events in our sample	2,788,411	3,804
Exclude 8-K events with missing data on director characteristics	2,317,329	3,689
Exclude 8-K events with missing data on firm characteristics	2,145,802	3,512
Exclude 8-K events with firms with less than \$10 million total assets or younger than 1 year old	2,135,442	3,495
Exclude 8-K events with realized return below the 1st percentile or above the 99th percentile of the distribution, and with firms' total assets, directors' age, and directors' number of other boards above the 99th percentile of the distribution	1,605,934	3,326

Table 2: Summary statistics for trading gap and potential returns. *Trading Gap* is calculated as day difference between the day an 8-K form was filed and the day an event described in the 8-K occurred. *Traded* equals one if an individual purchased or sold a company's stock during the trading gap. *CAR* is cumulative abnormal return calculated using the Market-Adjusted Model. The market returns for the model are taken for 100 days 50 days before the start of the cumulative abnormal return window. For instances when a board member traded, the cumulative abnormal return is calculated between the day the member traded and the day the 8-K form was filed. This return is kept if the board member purchased the stock and multiplied by -1 if the board member sold the stock. For instances when a board member did not trade, the cumulative abnormal return is calculated between the day the event happened and the day the 8-K form was filed. This return is kept if the return is positive and multiplied by -1 if the return is negative.

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
<i>Trading Gap</i>	1,605,934	2.145	1.187	1	2	3
<i>Traded</i>	1,605,934	0.003	0.057	0	0	0
<i>CAR</i>	1,605,934	0.040	0.046	0.010	0.024	0.051

Table 3: Summary statistics for trading gap and realized returns, subsample where directors traded. *Trading Gap* is calculated as day difference between the day an 8-K form was filed and the day an event described in the 8-K occurred. *CAR* is cumulative abnormal return calculated using the Market-Adjusted Model. The market returns for the model are taken for 100 days 50 days before the start of the cumulative abnormal return window. The cumulative abnormal return is calculated between the day the member traded and the day the 8-K form was filed. This return is kept if the board member purchased the stock and multiplied by -1 if the board member sold the stock.

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
<i>Trading Gap</i>	5,205	2.760	1.143	2	3	4
<i>Traded</i>	5,205	1.000	0.000	1	1	1
<i>CAR</i>	5,205	0.042	0.047	0.011	0.025	0.053

Table 4: Summary statistics for board members', firms' and events' characteristics. *Female* is equal to 1 if a director's gender is female. *Prof. designation* is equal to 1 if a director has JD, LLB, LLM or LLD degree, is a CPA, or a CFA. *American* is equal to 1 if a director's nationality is American. *Bad news* is equal to 1 if the cumulative abnormal return of a firm's stock from the event day to the 8-K filing day is negative. *Time with the board* is the time between the event date and a director's start day on the board, in years. *Number of other boards* is the total number of other boards a director currently sits on. *Independent* is equal 1 if a director has a word "Independent" in their role title. *Firm size* is a natural logarithm of the firm's total assets in \$ million. *Firm age* is the time between the event date and the date the firm first becomes available in Compustat, in years.

Statistic	N	Mean	St. Dev.	Pctl(25)	Median	Pctl(75)
<i>Female</i>	1,605,934	0.136	0.343	0	0	0
<i>Prof. designation</i>	1,605,934	0.240	0.427	0	0	0
<i>American</i>	1,605,934	0.372	0.483	0	0	1
<i>Bad news</i>	1,605,934	0.506	0.500	0	1	1
<i>Time with the board</i>	1,605,934	6.749	5.581	2	5	10
<i>Number of other boards</i>	1,605,934	1.172	1.762	0	0	2
<i>Independent</i>	1,605,934	0.332	0.471	0	0	1
<i>Firm size</i>	1,605,934	7.586	2.092	6.249	7.556	8.819
<i>Firm age</i>	1,605,934	19.117	9.890	11	18	27

Table 5: Parameter estimates for the specification where all individuals have the same sensitivity to social norms. The estimates are obtained using Maximum Likelihood. Standard errors are in parentheses. The variance matrix of estimates is computed as the inverse covariance matrix of numeric first derivatives of the likelihood function.

Parameter	Estimate
$\lambda_{c,const}$	1.611 (0.204)
$\lambda_{c,Female}$	0.170 (0.016)
$\lambda_{c,Prof. designation}$	0.020 (0.011)
$\lambda_{c,American}$	-0.068 (0.012)
$\lambda_{c,Bad news}$	-0.040 (0.009)
$\lambda_{c,Firm size}$	0.020 (0.003)
$\lambda_{c,Firm age}$	0.004 (0.001)
$\lambda_{\omega,const}$	0.345 (0.082)
Log-Likelihood	-34,697.58

Table 6: Parameter estimates for the specification where sensitivity to social norms is a function of individual characteristics. The estimates are obtained using Maximum Likelihood. Standard errors are in parentheses. The variance matrix of estimates is computed as the inverse covariance matrix of numeric first derivatives of the likelihood function.

Parameter	Estimate
$\lambda_{c,const}$	1.657 (0.147)
$\lambda_{c,Female}$	0.386 (0.309)
$\lambda_{c,Prof. designation}$	0.126 (0.288)
$\lambda_{c,American}$	-0.005 (0.202)
$\lambda_{c,Bad news}$	-0.049 (0.008)
$\lambda_{c,Firm size}$	0.022 (0.003)
$\lambda_{c,Firm age}$	0.005 (0.001)
$\lambda_{\omega,const}$	0.356 (0.057)
$\lambda_{\omega,Female}$	-0.086 (0.110)
$\lambda_{\omega,Prof. designation}$	-0.043 (0.104)
$\lambda_{\omega,American}$	-0.005 (0.073)
$\lambda_{\omega,Time with the board}$	-0.002 (0.000)
$\lambda_{\omega,Num other boards}$	-0.025 (0.001)
$\lambda_{\omega,Independent}$	0.036 (0.004)
Log-Likelihood	-34,330.84

Table 7: Summary statistics of the relative importance of social norms for directors, specification where all individuals have the same sensitivity to social norms. The relative importance is computed as the fraction of the total costs of insider trading that is due to directors' sensitivity to social

norms given the estimated model parameters: $Importance\ of\ social\ norms_{ift} = \frac{\omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}{c_i + \omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}$. The estimated model parameters are in Table 5.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Median	Pctl(75)	Max
<i>Importance of social norms</i>	1,605,934	0.345	0.008	0.315	0.343	0.346	0.351	0.373

Table 8: Summary statistics of the relative importance of social norms for directors, specification where sensitivity to social norms is a linear function of individual characteristics. The relative importance is computed as the fraction of the total costs of insider trading that is due to directors' sensitivity to social norms given the estimated model parameters: $Importance\ of\ social\ norms_{ift} =$

$\frac{\omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}{c_i + \omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}$. The estimated model parameters are in Table 6.

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Median	Pctl(75)	Max
<i>Importance of social norms</i>	1,605,934	0.300	0.047	0.000	0.277	0.313	0.338	0.377

Table 9: Likelihood Ratio test with the alternative hypothesis of zero individuals' sensitivity to social norms $H_0 : \omega_i = 0 \quad \forall i$. The estimated parameters of the model with sensitivity to social norms are in Table 5.

Log-likelihood of the model with sensitivity to social norms	Log-likelihood of the alternative model ($H_0 : \omega_i = 0 \quad \forall i$)	p-value
-34,697.58	-35,942.35	0.000

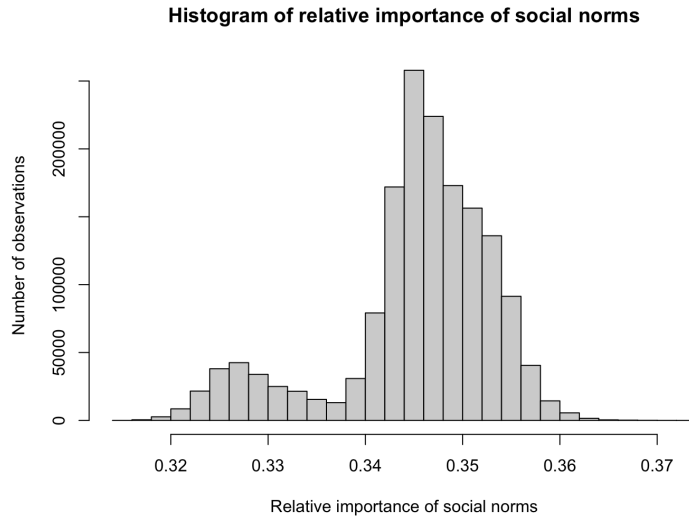


Figure 1: Histogram of the relative importance of social norms for directors, specification where all individuals have the same sensitivity to social norms. The relative importance is computed as the fraction of the total costs of insider trading that is due to directors' sensitivity to social norms given

the estimated model parameters: $Importance\ of\ social\ norms_{ift} = \frac{\omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}{c_i + \omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}$. The estimated model parameters are in Table 5.

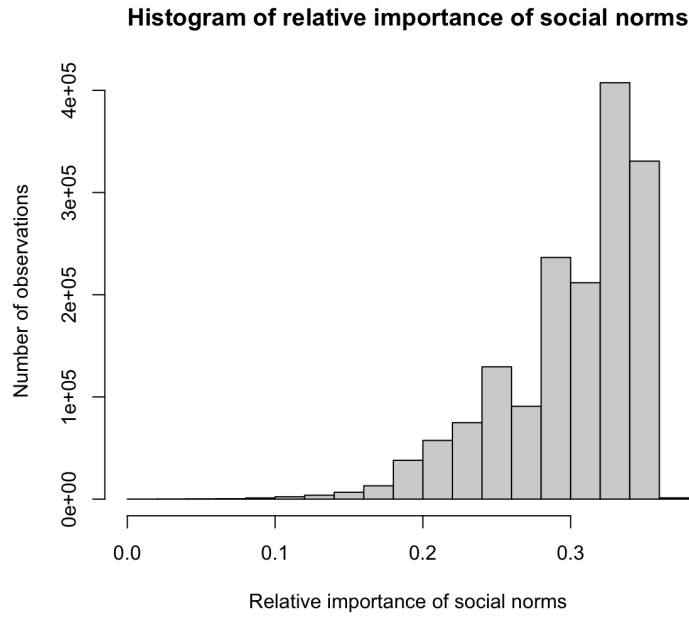


Figure 2: Histogram of the relative importance of social norms for directors, specification where sensitivity to social norms is a linear function of individual characteristics. The relative importance is computed as the fraction of the total costs of insider trading that is due to directors' sensitivity to social norms given the estimated model parameters: $Importance\ of\ social\ norms_{ift} =$

$$\frac{\omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}{c_i + \omega_i \frac{\sum_{j \in \Omega, j \neq i} \beta_j}{N-1}}. \text{ The estimated model parameters are in Table 6.}$$