

Is Gender in the Pocket of Investors?

Identifying Gender Homophily Towards CEOs in a Lab Experiment

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Abstract

Women suffer from glass ceiling barriers to reach CEO positions. We argue that the stock market reaction to CEO appointments constitutes a barrier that is external to the firm and that is important to understand because investors can influence appointment decisions by buying or selling stocks. We build a trading experiment to causally identify the role of preferences and we find evidence of gender homophily among participants. This behavioral trait combined with the lack of gender diversity in the stock market can explain both the negative stock market reaction to female CEO appointments and the rarity of female CEOs.

Keywords: CEO appointments, gender diversity, gender homophily, gender stereotypes.

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1 Introduction

That women are a numerical minority in CEO positions in the major world economies is nothing new under the sun. For example, in the European Union, they represent only 7.5 % of the largest publicly listed companies' CEOs (EIGE, 2020) despite substantial resources being invested in fighting gender inequality as part of the EU gender equality strategy. What explains the persisting rarity of women at the top?

Supply-side factors in the CEO job market including objective and intrinsic differences between men and women are increasingly less relevant as women have recently reversed the gender gap in educational attainment and have significantly narrowed the gap in years of professional experience (Blau and Kahn, 2017). Furthermore, these factors may be less relevant for female CEOs which are a selected pool (Adams and Ragunathan, 2017). Demand-side factors including barriers to women advancement in corporate hierarchies, also known as the glass ceiling, are receiving increasing attention by scholars and policy makers. Because demand-side factors have nothing to do with female candidates' qualifications or competence, they are costly to society and important to understand.

The glass ceiling has been prominently documented within organizations. Studies have shown evidence of gender biases among decision-makers involved in the selection process of the CEO (Matsa and Miller, 2011). Theoretical explanations for such biases include discrimination against women in the form of preferences (Becker, 1957) and of gender stereotypes involving non-conscious heuristics such as the 'think manager-think male' (Schein, 1973). Contextual factors also play a role in reinforcing or mitigating such biases. Regarding reinforcing factors, biases against female CEOs are more prevalent in stereotypically male industries (Glass and Cook, 2016). On the contrary, women CEOs are perceived as more suitable in industries with a bigger share of female workers. Regarding mitigating factors, Ryan and Haslam (2005) argue that poorly performing firms are more likely to appoint women (a phenomenon coined as the 'glass cliff effect').

In this paper we posit that the reaction of stock market investors to the appointment of female CEOs may constitute a demand-side barrier that is *external* to the firm. Because investors can sell their stocks, they can vote with their feet to express discontent with the appointed CEO. Their trading activity may, therefore, influence firm's CEO appointment decisions: the firm may partly choose its CEO to avoid downward pressures to its market valuation. Such concerns are not only hypothetical. Lee and James (2007) have shown that stock markets in the US react

more negatively to the appointment of a female CEO than to that of male CEO. This result has been also documented in China particularly in male to female CEO transitions (Zhang and Qu, 2016). Interpreting why the stock price falls significantly when a company announces the appointment of a female CEO is not an easy task. It is hard to disentangle the pure effect of gender vis-à-vis other characteristics of the CEO. Doing so involves controlling for appointment conditions (such as the existence of a nomination committee and the involvement of the departing CEO) and for contextual factors (such as the past performance of the firm). Yet, because in the long-term companies led by female CEOs are not underperforming those led by male CEOs (Wolfers, 2006), understanding the short-term reaction of stock market participants to female CEO appointments may provide important societal benefits. To do so, we focus our analysis on the *primitives* of market behavior. That is, we study investors' reaction to the CEO appointment at the individual level, which we see as essential to better interpret aggregate stock market fluctuations. Indeed, aggregate stock market data cannot tell us how any particular investor assesses any particular CEO.

Our theoretical framework draws from existing theories about the negative stereotypes of female leadership abilities and about decision-makers' in-group preferences. In particular, our theory is based on the concept of gender homophily developed in sociology (see Sherif and Sherif, 1953; Lazarsfeld and Merton, 1954; and McPherson, Smith-Lovin and Cook, 2001). At the individual level, gender homophily describes a preference for interacting with individuals of one's own gender, leading to homosocial reproduction. Matsa and Miller (2011) show that gender homophily among decision-makers internal to the firm may explain the lack of promotion of female CEO. We argue that gender homophily can also explain the reaction of stock market investors to the appointment of female CEOs. We make the hypothesis that the gender of investors mediates their preferences towards female CEOs.

We test our hypothesis through a lab experiment. Our main motivation to choose this research approach is to study the market reaction to the appointment of the new CEO at the *individual* level. We analyze the market reaction according to the gender of the CEO and, crucially, according to the gender of individual market participants. Our experimental approach allows us to precisely map the gender of the participant to his or her trading activity and to identify the pure effect of the gender of the CEO. The experiment is based on a trading simulation platform that mimics the environment of practitioners in financial markets. It also allows us to contextualize the trading decision of participants. In addition, the choice of a lab experiment overcomes two main challenges in empirical studies: the paucity of real data and the difficulty to

make causal inference.

We find evidence consistent with our hypothesis that the preference towards the gender of the CEO is mediated by participants' gender homophily. This means that the gender of investors matters. Given the lack of gender diversity among stock market participants, our hypothesis also provides an explanation for the negative stock market reaction to female CEOs appointments. Our contribution is to highlight a demand-side barrier external to the firm explaining the rarity of women at the top. Women aiming to access CEO positions then face barriers that are not only internal but also external to the firm.

The major policy implication of our finding is that alleviating demand side barriers originating in the stock market requires to increase gender diversity in the financial industry by attracting more women into investment occupations. It may also require changing individual and collective stereotypes about female leadership. In terms of future work, we discuss how researchers interested in studying minorities from the standpoint of intersectionality may also find value in using an experimental approach (Cook and Glass, 2014).

The remainder of the paper proceeds as follows. Section 2 discusses our theory development, Section 3 lays out our methods, Section 4 presents the data and measures, Section 5 displays our results, and Section 6 draws implication from our results. Section 7 concludes discussing implications and future work.

2 Theory development

In this section, we present our theoretical development, our hypothesis and its operationalization. We actively engage with the existing literature about the demand-side factors constitutive of the glass ceiling. We start discussing research documenting the glass ceiling within organizations (factors related to the firm's corporate governance, performance and sector) and outside organizations (factors related to the stock market and the media). We argue that barriers originating outside organizations can play an important role but remain poorly understood. We then discuss research about discriminatory preferences against women which may be at the root of the glass ceiling. This includes a discussion of the role of gender homophily among firm's decision-makers that has been shown to explain homosocial reproduction within organizations. We argue that the concept of gender homophily may be useful to understand barriers that originate outside organizations stemming from the behavior of stock market investors in reaction to the appointment of female CEOs. This leads us to posit our hypothesis of gender homophily among stock market investors. Last, we discuss the

operationalization of our theoretical construct and hypothesis.

2.1 Theory development

That women rarely make it to the top due to invisible barriers impeding them to access CEO positions is a well-known phenomenon. The glass ceiling has been explained as the result of internal barriers documented within organizations and related to the corporate governance of the firm. Indeed, CEO nominations and appointments are influenced by the firm corporate governance. For example, the result of such decisions may directly depend on whether the board of directors is independent vis à vis the current CEO, and on whether a hiring board is put in place (Shivdasani and Yermack, 1999). Other internal factors are related to the firm performance and its sector. Regarding the firm performance, Ryan and Haslam (2005) show that negative company performance in the months leading to the CEO transition predicts the appointment of female CEOs in FTSE 100 companies. Regarding the firm sector, Harrigan (1981) shows that female directors are more likely to be appointed in labor-intensive, service-oriented firms catering to female consumers. They are less likely to be appointed, on the contrary, in capital-intensive sectors, including manufacturing or in sectors with a male workforce such as mining (Davidson and Cooper, 1992; Goodman et al., 2003).

Less studied are the glass ceiling barriers that are external to the firm. These barriers include the role of the media and the behavior of stock market investors. Considering the role of the media, Lee and James (2007) show that the media tends to portray men and women CEO differently, reinforcing existing gender stereotypes. Similarly, Dixon-Fowler et al. (2013) show that female CEOs are perceived as belonging to minority groups defined by stereotypical characteristics rather than by their individuals' singularities. Considering stock market investors, they can influence firms' CEO appointments by voting with their feet and selling stocks when a CEO they do not like is appointed. Indeed, empirical work by Lee and James (2007) and Zhang and Qu (2016) documents in the US and Chinese contexts respectively that stock markets tend to react more negatively to the appointment of a female CEO than to that of a male CEO. Because the expected financial benefits and costs from changes in leadership are borne by investors, their trading decisions can exert a subtle and invisible influence on the firm CEO choices. As a consequence, fluctuations in the stock price following the appointment of male and female CEOs may be strategically important from a firm's standpoint. In publicly traded companies, investors' reaction to the appointment of a female CEO may be anticipated by the board and may strategically affect ex-ante the board's decision to appoint a female or a male CEO

potentially constituting an external barrier to women advancement. Yet, external barriers originating in the stock market remains poorly understood partly due to methodological challenges in identifying a causal mechanism.

Negative stereotypes and beliefs about female leadership abilities among firm's decision-makers may be at the root of these demand-side barriers that are internal and external to the firm and that impede women to be appointed CEO. For example, Schein (1973) puts forward the existence of an automatic 'think-manager think-male' stereotype that may explain the lack of female promotion to CEO roles. Theoretically, Becker (1957) studies discrimination based on the assumption that decision-makers exhibit taste-based discrimination as a result of a preference against interacting with members of certain groups, for example women. Empirically, Adams et al. (2017) uncovers evidence of discrimination in an experiment which studies the secondary art market. They show that art market buyers place a discount on female art. Importantly, they also show that buyers are unable to say whether a man or a woman makes an art piece unless they know the name of the artist. This implies that the discount on female art is neither due to objective differences between the art made by men and women nor to differences in the information available to art buyers which could lead to statistical discrimination (Phelps, 1972). Instead, the discount on female art reflects preferences exhibiting a dislike of female art because it is made by women.

Research studying the role played by preferences in preventing the career progression of female managers and their appointment to top leadership positions has also emphasized the role of in-group preferences and associated gender biases. Indeed, these have been shown to be detrimental to women's advancement. In particular, decision-makers in hiring committees have been shown to reserve leadership positions for in-group members (Powell and Butterfield, 2002). In-group bias is closely related to homophily. Homophily refers to a sociological concept asserting that individuals prefer to interact with individuals of their own type and that share similar traits. Such preference is socially reproduced, a phenomenon coined by Kanter (1977) as 'homosocial reproduction'. Interestingly, factors such as race, ethnicity, social class and gender have been shown to serve as a basis for in-group biases or homophily. Regarding gender homophily, research studying barriers that are internal to organizations has claimed that the prevalence of men in decision-making and leadership positions, and their preferences towards members of their own group (other men) has represented a hurdle for women aiming to access top leadership roles (Pfeffer and Davis-Blake, 1989). Similarly, research about the impact of gender diversity within corporate boards seems to suggest that adding women to the board eases

the hurdles posed by men who tend to favor their in-group member and reproduce social structures (Matsa and Miller, 2011). While homophily implies that male-dominated boards are more likely to appoint male CEOs, more diverse boards can tilt the favor towards female board members whose homophily would instead favor female CEO appointment undoing some of the hurdles that women face (Ely, 1995).

2.2 Theoretical hypothesis

So far, gender homophily has been used as a lens to describe the preferences of decision-makers internal to the firm leading to homosocial reproduction at the top. In particular, gender homophily has been documented among members of the board or hiring committee to explain the glass ceiling. No research has studied, to the best of our knowledge, the potential explanatory power of gender homophily to explain the preferences of stock market investors towards female and male CEOs. Yet, stock market participants trading reaction to female and male CEO appointments may reveal evidence of gender homophily. We argue that the concept of gender homophily may describe the preferences of stock market participants. This leads us to formulate our theoretical hypothesis:

Theoretical hypothesis: Stock market participants' preferences towards CEOs exhibit gender homophily.

Theoretically, participants' preferences towards CEOs may reflect both rational and behavioral factors. Rational factors include participants adjusted perceptions, following the announcement of the appointed CEO, of the CEO's impact on the firm's future cash flows (Fama, 1970) and more generally on the firm's future performance. Behavioral factors include psychological processes that result in the use of decision-making heuristics rather than rational and deliberate decision-making. Decision-making heuristics are automatically triggered and often non-conscious, often based on a combination of expertise and stereotypes (Kahneman and Tversky, 2000).

2.3 Operationalization of our theoretical construct and hypothesis

Operationalizing our theoretical construct requires us to address three elements: first, to use individual level data; second, to mute the role of endowments and information available to participants; third, to rely on a revealed preference argument. Operationalizing our hypothesis requires us to identify the two dimensions of gender (the CEO gender and the participants' gender).

Our theoretical construct is the participants' preference towards the appointed CEO gender. Operationalizing the role of preferences towards the CEO gender is challenging. Indeed, most research studying the stock market reaction to the CEO appointment is unable to clarify the causal structure of the relationship between individual preferences and the trading of stocks following the appointment of a male or a female CEO. This is the case because of two reasons. First, because understanding the role of preferences towards the CEO gender requires going from aggregate level data to individual level data. Indeed, existing research based on archival data uses changes in the stock price as a "barometer for how investors assess the decision's potential effect on a corporation's short- and long-term economic viability" (Cook and Glass, 2011, page 503). Using stock market data, researchers cannot directly observe individual trading decisions and therefore cannot tell how any particular investor assesses any particular CEO. To address this first issue, we build a lab experiment where we can observe participants' decisions at the individual level. Such a research approach allows us to dig into the primitives of the market behavior: the individual trading reaction of investors to the CEO appointment. Understanding the primitives of the market behavior is key to better interpret the aggregate market reaction. To delve into the primitives of price formation, therefore, we study individual decisions to buy or sell stocks following the CEO appointment. A second challenge in identifying the causal link between preferences and the trading reaction to the CEO appointment is due to the fact that the behavior of individual investors depends not only on their preferences but also on their endowment as well as on the information available. Empirical analysis cannot tease out the relative role of preferences, endowments, and information available in accounting for the trading reaction to the appointed CEO gender. To address this second issue, our lab experiment relies on a trading simulation where each participant is endowed with the same initial portfolio (composed of stocks and cash) and faces the same news flow regarding the company. This setting allows us to isolate the role of potential confounding factors other than those related to individual preferences.

Last but not least, to operationalize our theoretical construct, we use a *revealed preference* argument. We do so because we cannot directly observe the preferences of participants towards the appointed CEO gender. The buying and selling of stocks of the company following the appointment of a female or a male CEO reveals the preferences of participants towards the CEO gender. That is, we use trading as a medium to express one's preferences including both rational and behavioral factors. The trading reaction reveals rationally updated beliefs about the impact of the appointed CEO on the firm's future performance. In particular, a participant buying stocks

of the company reveals that he or she perceives the event as good news, while a participant selling stocks reveals that he or she perceives the event as bad news. Yet, because we do not provide information regarding the expected impact of the CEO on the firm value participants are taking a trading decision in a situation of uncertainty. This type of situation is prone to the use of decision-making heuristics in which, according to Kahneman and Tversky (2000), participants may replace the answer to the rational question “Does the appointed CEO create value?” by the answer to an easier question such as “Do I like the appointed CEO?”. The answer to the latter question may mobilize gender stereotypes and depend on the gender of the participant exhibiting gender homophily.

Based on our theoretical construct, our hypothesis argues that the preferences towards the gender of the CEO exhibit gender homophily, that is, they depend on the individual own gender. Operationalizing our hypothesis implies therefore being able to clearly identify the two gender dimensions of our hypothesis related to: the gender of the CEO and the gender of the market participants.

Regarding the CEO, identifying a pure gender effect requires separating gender from other CEO characteristics also known as supply-side factors in the CEO job market. These include objective differences in CEOs career trajectories (e.g., Singh and Vinnicombe, 2003), demographic factors including age and family status (e.g., Harlan and Weiss, 1982) but also of differences in leadership abilities, style (Eagly, Karau and Makhijani, 1995) and behavioral traits that correlate with gender. For instance, gender differences have been documented in the degree of risk-aversion (Crozon and Gneezy, 2009) although recently called into question by (Fillipin and Crosetto, 2016), in overconfidence and optimism (Huang and Kisgen, 2013), taste for competition (Niederle and Vesterlund, 2011) and bargaining styles (Card, Cardoso and Kline, 2016). All these factors make it hard in empirical work to operationalize and study the pure effect of gender of the CEO because no two CEOs in the real world are identical except for their gender. With an experimental approach, we can expose investors to CEOs whose gender is the only manipulated variable. In the trading simulation, the only information provided is the name of the CEO from which the gender of the CEO can be inferred. We chose names that had no connotation other than gender (for instance, they are not associated with particular ethnic minorities in the French context).

Regarding participants, we know participants’ gender at the individual level in the experiment. This allows us to analyze the individual trading reaction to the announcement of a female or a male CEO, our manipulated variable, as a function of the individual’s gender, our mediating

variable.

3 Methods

In this section we start by motivating our choice of methodology—a lab experiment—in relation to our theoretical development. We then discuss our experimental design explaining why we made certain key choices. Next, we describe our choice of participants and the experimental setting in detail. We conclude the section by discussing internal and external validity issues.

3.1 Motivation

As discussed in the previous section, the main motivation for using a lab experiment lies in the ability to observe trading decisions at the individual level. The choice of a lab experiment also overcomes two main challenges of empirical studies: first, the paucity of real data, which makes it hard to obtain significant statistical results in empirical study; second, making causal inference. The paucity of data is caused by the fact that there is a limited number of female CEOs. This makes it hard to use archival data to empirically estimate investors reaction to the appointment of female CEOs. In contrast, lab experiments can be designed to balance the proportion of male and female CEOs. Regarding causal inference, it is challenging to control for firm’s contextual factors, internal or external, that play a role in explaining the appointment and suitability of female CEOs. Indeed, using archival data renders causal inference challenging for two main reasons. First, the researcher may not observe all the relevant variables. This can be problematic because an omitted variable may affect both the stock market activity and the likelihood of appointing a female or a male CEO. For example, according to the glass cliff hypothesis firms performing badly are more likely to appoint female. Because of their negative performance they are also more likely, regardless of their CEO, to be shorted by traders. This may cause observers to conclude that there is a causal link between the two factors while there is none. Another concern is that firms may choose their CEO strategically taking into account the expected market reaction using backward induction. Firms may also choose strategically when to release information to either maximize or minimize investors’ and media attention on the news. A related but distinct informational issue include the fact that some market participants may hold private information regarding the CEO appointment, making it hard to determine exactly when investors learn and therefore react about the CEO appointment (Malatesta and Thompson, 1985). Finally, market participants’ limited attention means that traders may not immediately react to the news (Hirshleifer and Teoh, 2003). In short, using archival data to study managerial changes is likely to suffer from omitted variable bias and reverse causality

concerns. Therefore, randomized experiments may be best suited to unpack causal mechanisms behind much of the theories in the field of gender leadership and more concretely in testing for our hypothesis.³

3.2 Design

While we describe in detail the experiment in the next section, we now discuss four key experimental design choices and their rationale: first, we adopt a between-subject design; second, we define our control and treatment groups, third, we carry an experiment with mixed gender participants; and fourth, we use a consequential experiment.

Applied to our setting, a between-subject design means that each participant to the experiment launches the simulation once and, in a random manner, faces with equal probability either the variant of the simulation where the firm appoints a male CEO or the variant where the firm appoints a female CEO. While both between-subject and within-subject design methods have their advantages and drawbacks (Charness, Gneezy and Kuhn, 2012), we made the choice of following Greenwald (1976) who pointed out that when exposure to multiple experiments makes the individual sensitive to the variations between experiments, a between-subject approach should be chosen. Indeed, in a within-subject experiment, participants would have been confronted to the two variants and, therefore, by changing the gender of the CEO between the two consecutive variants, they would have been made aware (implicitly) of our variable of interest. This could lead to a ‘demand effect’ which is a spurious effect reflecting the attempt of participants to behave in a way to satisfy their perception of the experimenter’s expectations.

The second choice involved the definition of the control and treatment groups. A question that we asked ourselves when building the experiment was how to define what constitutes the control group relative to the CEO gender. For the control group, we decided to use the simulation variant with an appointed male CEO because it corresponds to the baseline case that investors have in mind. Such a definition is consistent with the statistics about the number of male/female CEOs observed in real firms; it is also in line with prevailing gender stereotypes about CEOs and the ‘think manager-think male’ heuristic. Furthermore, since the departing CEO is chosen to be male, the appointment of a male CEO does not lead to a gender change in the management of the firm. On the contrary, the appointment of a female CEO leads to a CEO transition involving a gender change, and therefore constitutes our treatment. This is also representative of most

³ Experiments have already been used to study topics related to ours such as the glass cliff phenomenon (Ryan and Haslam, 2009 and Ryan et al., 2009) and to investigate the role of psychological mechanisms in explaining risk-taking decisions in financial markets (Eckel and Füllbrunn, 2015).

CEO transitions frequently involving male to male CEO changes, and rarely involving male to female transitions.⁴ Participants to our experiment are, therefore, randomly exposed either to the appointment of a male CEO (our control group) or to the appointment of a female CEO (our treatment group). Gender is the only dimension of the intervention in our experiment. There is no confounding factor.

The third choice we made was to run a mixed-gender experiment (with female and male participants together) and to have randomization of the treatment (with some participants facing the ‘male CEO variant’ of the experiment, our control group, and other participants facing the ‘female CEO variant’, our treatment group). The reason for using a mixed-gender approach is that by mixing both female and male participants, we avoid a signaling effect about the relation of our research project to the gender of participants. Should we have chosen to run an all-male or all-female experiment, this could have also created a demand effect by signaling to participants that their gender was important for their participation to our experiment and ultimately for our research question. Furthermore, Kanter (1977) points out that in mixed groups, the salience of gender stereotypes and gender differences may be less prominent, reducing a potential demand effect operating among participants.

Our fourth design choice was to run *consequential* experiments. As Lonati et al. (2018) explain, it is important to build experiments where participants’ behavior has real consequences in the form of incentives. This increases both motivation and attention from participants and decreases behavior that aims to conform to the expectations of the experimenter or to what is socially acceptable. In our experiment, therefore, we incentivize participants by granting them with a grade bonus for their *Finance* course as a function of their trading performance in the experiment. We decided to grant a grade bonus rather than a monetary compensation because students GPA (grade point average) in their first year is key for selection into prestigious exchange programs or highly demanded internships, involving real stakes for students.

3.3 Choice of participants

We recruited our participants among the students enrolled in the *Finance* course at a leading French business school. Relying on a sample of students has the advantage of avoiding biases that affect the selection of male and female investors (Eckel and Füllbrunn, 2015; Adams and Raganathan, 2017). Furthermore, because all students follow the same course track and have the

⁴ We did not choose for the control group a simulation where no information was given about the gender of the CEO-a “neutral” simulation- because such a case does not correspond to a possible value for our manipulated variable (the CEO gender) and more importantly because it would not address our research question which is to explain investors reaction to the appointment of a female CEO in a world where they replace a male CEO.

same background in finance, this rules out confounding factors such as field of study (or education) and experience.⁵ The experiment was carried out in the school experimental lab, specially designed for conducting experiments in a *controlled* environment. The experiment was presented to students as an opportunity to contribute to a research project studying how economic agents take financial decisions. Following common practice, the gender aspect of the research project was not revealed to the participants to avoid disclosing our research subject.

3.4 Experimental setting

The experiment is based on a trading simulation platform called SimTrade. Compared to out-of-context experiments (such as lotteries used to measure preferences), this platform allows us to contextualize our variable of interest: the gender of the CEO (manipulated variable). It also increases the psychological realism of the experiment and mimics the environment of practitioners in financial markets. At the launch of the simulation, participants are introduced to a simulation scenario that contextualizes the CEO appointment within a company named SunCar. SunCar is a fictitious company described as designing, producing and selling low-speed electric vehicles for city use. The choice of a company in the automotive industry means that the appointment takes place in a traditionally male industry. This is coherent with our definition of the control group as the simulation variant where a male CEO is appointed. The downside of contextualization is that our results may not generalize to other industries, an issue discussed in the next section and that could be addressed in future research with alternative scenarios that manipulate the sector.

The reason for the CEO appointment is the sickness of the departing CEO. This choice is made to have an exogenous reason for the appointment of a new CEO. We named the departing CEO Jacques Dallara. We chose the male gender for the departing CEO in line with prevailing stereotypes about CEOs and with our definition of the control group.

The following extract from the scenario shows how information is presented to participants: “Due to a severe illness, Jacques Dallara, founder and CEO, will be relinquishing his operational duties soon. At midday, SunCar is expected to announce the name of his successor. The two candidates for the CEO position are Anna Farrell and Henry Villa.” We manipulate the gender of the CEO and set a 50% ex ante probability that a participant faces either of the two variants of the simulation. Regarding the firm performance, the company is said to experience an upward trajectory in the months previous to the CEO change. This choice was made to avoid setting the

⁵ In the discussion of validity issues (see next section) we further discuss our sample choice by explaining why it is appropriate to test our hypothesis.

appointment in a company in crisis ('glass cliff' context) which has been shown to lead to the automatic 'think crisis-think female' heuristic.

We next present the experiment instructions given to participants as well as their initial endowment, choice set, incentives and information set. Regarding the general instructions given to participants they were read out-loud before the start of the experiment. Participants were asked to act as investors whose objective is to maximize their gains out of the trading day. Regarding their initial endowment, participants are endowed with an identical initial portfolio which involves a combination of SunCar stocks and of cash.⁶

Similar to traders in an investment bank, the choice set of participants includes decisions about trading (to trade or not to trade), the direction of trading activity (buy or sell stocks), the quantity of stocks bought or sold, the type of order sent (market order or limit order), and the timing of the reaction. This set of choices is available to participants throughout the duration of the experiment which replicates a 24-hour trading day, and which lasts 20 minutes in real time.

As an incentive, participants receive a compensation in the form of a bonus for their course grade related to their trading performance during the simulation.

We next discuss the information set available to participants throughout the duration of the simulation. Our research design, based on a controlled experiment, allows us to minimize the series of informational problems previously discussed and present in archival research.

Participants learn in the simulation scenario, read at the launch of the simulation, that the company is going to announce the appointment of a new CEO. Yet, they do not know *who* will be appointed. That is, we separate information regarding the appointment of a new CEO and the gender of the newly appointed CEO. This is important because it means that participants are already aware that a new CEO will be appointed when the actual appointment is made public. At the time of announcement, the only news concerns the name of the appointed CEO from which participants can unambiguously infer the gender (this point was discussed with a student's group prior to the experiment). Furthermore, in the French context, the names do not have connotation of ethnic or religious minorities. This is important since there are other minorities than women among CEOs. Importantly, no information is given to the participants about the qualifications of the candidates. This means that we mute supply-side factors related to female CEOs formal and informal qualifications and experience. Therefore, the reaction of participants to the CEO appointment can be attributed to a pure gender effect. In parallel to Adams et al. (2017),

⁶ There is only one company in the trading environment.

therefore, if participants sell following the appointment of a female CEO, this should reflect a dislike of a female CEO precisely because of her gender.

Participants also know *when* the appointment of the new CEO will be made. This is an advantage compared to empirical studies where researchers face the challenge of determining exactly when investors learn about the CEO succession (Malatesta and Thompson, 1985). The information of the appointment, regardless of the gender of the CEO, is presented as an important piece of information in the ticker of the trading platform. This aims at maximizing market participants' attention.⁷ In other words, the problem of limited attention implying that traders may not immediately react to the news (Hirshleifer and Teoh, 2003) is minimized. Our experimental design also allows us to neutralize the role of the media. Indeed, female CEO appointments may attract higher media attention and different media treatment (Lee and James, 2007 and Dixon-Fowler et al., 2013).

Before launching the simulation, all participants are informed of the news flow that will unfold during the trading day. With respect to the CEO appointment, it is clearly stated that at midday, SunCar will announce the newly appointed CEO. However, before the official announcement by the firm (no information leakage), the participants cannot possibly anticipate the result of the announcement, i.e., whether the appointed CEO will be a man or a woman. Our lab simulation approach also allows us to disentangle the effect of the CEO appointment from other confounding news which may affect the reaction of market participants as the CEO appointment is the only news released at the point in time. Because the time of announcement is fixed *ex ante* (it is the same regardless of the CEO being appointed and it is announced to participants before the trading day starts), it is therefore independent of the gender of the CEO being appointed eliminating potential biases linked to a strategic timing choice by the firm.

In synthesis, in building the simulation scenario, we follow a unity of time (precise date of the event), unity of action (unique event) and unity of place (the experimental setting). As in theatre, this makes the CEO appointment a *salient* event, allowing us to measure a pure gender effect.

3.5 Validity issues

To conclude our presentation and discussion of the methodology, we now discuss internal and external validity issues. To minimize internal validity concerns, we followed best practice and chose to design a consequential experiment by giving incentives to participants in the form of a

⁷ This was confirmed in a pilot study by using an eye tracking tool available in the lab of our institution. The heat map obtained from the data showed that the ticker where information is retrieved was one of the elements of the screen that attracted attention.

bonus on their course grade as function of their trading performance. We have also made choices to minimize unwanted demand effects. In particular, we have chosen a between-subject design to avoid participants second guessing the main variable of interest in our hypothesis, the CEO gender. Along these lines, we have also used an experiment with mixed-gender participants to minimize participants second-guessing the mediating variable, their own gender. Importantly, while we did not reveal the hypothesis being tested to participants, we told them that the experiment was part of a research project aiming to understand individual financial decisions. This means that we avoided using deception.

External validity relates to the generalizability of our experiment. Our trading simulation scenario depicts a company that is said to experience an upward trajectory in the months previous to the CEO change. This means that our results may not generalize to firms in crisis circumstances. That is, our results do not speak to the glass cliff phenomenon. The other important aspect of our simulation scenario was to consider a setting where the departing CEO is a male, which characterizes most CEO transitions, and which fits our definition of the control group. Therefore, our results may not apply to the study of female-female transitions and of female-male transitions, an issue that Zhang and Qu (2016) considers using archival data despite the smaller occurrence of such transitions.

Another important aspect for generalizability concerns the choice of participants and whether they constitute a relevant sample to study our main hypothesis. In particular, it is important to answer the question: are business school students an appropriate sample to deal with the study of gender and leadership? Beyond the obvious fact that students can be easily mobilized for experiments and incentivized with relatively small stakes, the choice of business school students is particularly relevant for three substantive reasons: work experience, career choices, and acquisition of stereotypes. While students in general have limited work experience, students in French business schools have a significant exposure to the corporate world during their compulsory internship period in their first academic year. Corporate immersion for the students in our sample indeed starts in the first term with direct contact with firm top management (“Go pro” experience with the school alumni). We believe that the participants in our experiment have, therefore, enough work experience and the relevant educational background to be able to analyze corporate news. They also have the knowledge and skills (acquired in the *Finance* course) to implement their analysis in their decision to buy and sell stocks in the market on the simulation platform. Regarding career choices, students in our sample come from a leading French business school. They represent a relevant population because they are likely to take on

leadership positions, such as that of CEO, in their future professional careers. Furthermore, an analysis of the specialization choices of our students (finance, marketing, communication, etc.) in their second and third year reveals a choice consistent with stereotypes (e.g. most students choosing the finance track are male). As academic research shows, gender stereotypes and roles are acquired during childhood and persist over time (see for example Hicks, Santacreu-Vasut and Shoham, 2015). This means that our sample is suitable to study the effect of preferences towards gender and associated stereotypes on the reaction of market participants to the appointment of male and female CEOs. In that sense we expect that the qualitative aspect of our results (the direction of the trading reaction revealing the preferences of market participants) is generalizable. As for most experimental research, it is harder to claim generalizability for the quantitative aspects, involving the amount of stocks bought or sold (Kessler and Versterlund, 2015).

To conclude, we do not claim to have designed the perfect experiment, but our choices followed best practices (see Lonati et al., 2018). We have developed a rigorous approach to optimize the internal validity of the design of our experiments (consequential experiment, no deception, minimized unwanted demand effects), and we rely on a relevant approach to optimize the external validity (use of a realistic simulation platform in financial markets, relevant sample of participants).

4 Data and statistical model

4.1 Data collection and measures

We collect data at the individual level for all participants. Before launching the simulation, we ask participants to fill in their profile including their gender, our mediating variable.⁸ Their entire trading activity (orders sent to the market) and the evolution of their portfolio and trading performance during the simulation was collected via the SimTrade platform. We also collect information regarding the simulation variant faced by each participant (defined by the gender of the CEO appointed during the simulation). From the data collected, we build different variables measuring the dependent variable (the trading activity of participants following the news about the CEO appointment), the independent variable manipulated in the experiment (the gender of the CEO), and the mediating variable (the gender of the participant).

⁸ At the beginning of the experiment, we asked students to read and sign a form explaining the context of the experiment and the use of personal data, as required by the French authority (Cnil) in charge of digital issues. The experiment was also approved by the school Research Ethics Committee.

More specifically, the gender of the CEO and the gender of the participants are coded with dummy variables as follows: *CEO gender* (0 for male and 1 for female) and *Participant gender* (0 for male and 1 for female).

We capture the trading reaction of each participant along two dimensions: a qualitative one and a quantitative one. Qualitatively, buying, selling or not trading stocks following the appointment of the CEO reveal the nature of the preference towards the appointed CEO. Yet, this measure does not allow to assess the strength of this preference. The quantitative nature of the reaction (its strength) can provide additional information regarding *how much* the trader likes or dislikes the appointed CEO.

We call the qualitative dimension of the trading reaction the *extensive margin* and the quantitative dimension of the trading reaction the *intensive margin*.⁹ The word margin refers to the margin of choice of the trader. This includes, at the qualitative level, whether to trade or not, and whether to buy or sell, and at the quantitative level, how fast, how large, and how aggressive the reaction of the market participants is.

These two margins constitute the two components of our dependent variable. Formally, we define the extensive margin—the participation or non-participation in the stock market—as the participant’s qualitative decision to buy or sell after the news of the appointment of the CEO or to do nothing. It is measured using two variables: *Trading activity*, which is a dummy variable equal to 1 if the participant traded after the news, and 0 otherwise, and *Order direction* which is a dummy variable equal to -1 if the participant sold stocks and equal to +1 if the participant bought stocks. We combine these two measures to build the extensive margin given by Equation (1):

$$\text{Extensive margin} = \text{Trading activity} \times \text{Order direction}$$

We define the intensive margin—the intensity of the participation in the stock market—as a multifactorial measure of the trading reaction *strength*. Formally, its different factors are measured as follows. *Quantity of stocks* is the quantity of stocks in the buy or sell order. *Probability of execution* is estimated from the type of order (market order or limit order) specified by the participant in his/her order; it is equal to one for a market order and less than

⁹ Extensive and intensive margins are commonly used in economics to describe the participation of individuals to a market. The extensive margin refers to the participation or non-participation of individuals to the market; it is a qualitative measure. The intensive margin refers to the intensity of the participation to the market; it is a quantitative measure. For example, in the labor market, these two components are classically used to know how many people work (extensive margin) and how many hours do people work (intensive margin).

one for a limit order.¹⁰ *Time lapse* is the (inverted) time lapse between the CEO appointment announcement and the order sent by the participant and captures the promptness of the order. Defining a time-window to observe the reaction of the participants, it is equal to 1 for an order sent at the beginning of the window just after the announcement of the new CEO and to 0 for an order sent at the end of the window. We combine these measures to define the intensive margin component of our dependent variable as given by Equation (2):

$$\text{Intensive margin} = \text{Extensive margin} \times \text{Quantity of stocks} \times \text{Probability of execution} \times \text{Time lapse}$$

We now present our control variables. Including control variables is important because there could be variables other than gender that could explain why a person bought or sold stocks. Furthermore, some of these factors may correlate with gender, leading to incorrect inference if omitted. We aim at controlling for the academic knowledge in finance and practical trading skills of the participants for the following reasons. Participants' academic knowledge may correlate with their ability to process information and therefore their reaction to the appointment news. To control for this possibility, we use participants' grade in the *Finance* course (*Course grade*) as a measure of academic knowledge and a control in our regressions. Similarly, participants' trading performance (their practical trading skills) may also vary by gender of participants, leading us to incorrect inference. Therefore, we add participants' trading performance in the simulation (*Trading performance*) as another control variable.

4.2 Statistical model and hypothesis

We estimate two statistical models corresponding to the two components of our dependent variable. For the extensive margin (EM) we use a multinomial logit model with three categories (-1 for a sell order, 0 for no order, and +1 for a buy order). The odds ratio of the probabilities of two different categories (j and k) for individual i is a linear function of the explanatory variables given by Equation (3):

$$\ln \hat{\omega} = \alpha_0 + \alpha_1 \cdot \text{CEO gender}_i + \alpha_2 \cdot \text{Participant gender}_i + \beta \cdot \text{CEO gender}_i \times \text{Participant gender}_i + \gamma_1 \cdot \text{Course grade}_i + \gamma_2 \cdot \text{Trading performance}_i + \varepsilon_i$$

¹⁰ The market environment proposed by the trading simulation platform SimTrade is based on the limit order book. This type of market microstructure is currently mostly used by exchanges around the world, as electronic markets are progressively taking over physical markets. In a market with a limit order book, investors can send orders of different types, mainly market orders and limit orders. With market orders, investors want to buy/sell as soon as possible at the market price. With limit orders, investors want to buy at a maximum price and to sell at a minimum price (the price limit). With market orders, investors favor quantity over price, as they control the quantity executed; inversely, with limit orders, investors favor price over quantity, as they control the execution price. The use of market orders (compared to limit orders) reflects the aggressiveness of investors in trading.

or the intensive margin (IM), we use a linear regression model given by Equation (4):

$$\begin{aligned} \text{IM}_i = & \alpha_0 + \alpha_1 \cdot \text{CEO Gender}_i + \alpha_2 \cdot \text{Participant gender}_i + \beta \cdot \text{CEO gender}_i \times \text{Participant} \\ & \text{gender}_i \\ & + \gamma_1 \cdot \text{Course grade}_i + \gamma_2 \cdot \text{Trading performance}_i + \varepsilon_i \end{aligned}$$

Our manipulated variable is the gender of the CEO and our mediating variable is the gender of participants. To identify gender homophily, our variable of interest is the interaction term between the manipulated variable and the mediating variable, *CEO gender* \times *Participant gender*, which is equal to 1 when both the CEO in the simulation and the participant in the experiment are female. Figure 1 illustrates the link between these variables and our theoretical hypothesis. We formulate our statistical hypothesis as follows:

Statistical hypothesis: The coefficient for the interaction term *CEO gender* \times *Participant gender* is positive ($\beta > 0$).

We next present our results.

5 Results

5.1 Descriptive statistics

{Insert Table 1 about here}

Table 1 presents descriptive statistics for the main variables of interest and for the control variables in the regression sample. On average, 56% of participants are women, and 44% of the simulations have a female CEO being appointed (close to the ex-ante probability of 50% set in the simulation model). Regarding participants' trading activity, the average participant sells stocks (the mean of *Order direction* is negative) and overwhelmingly uses a market order rather than a limit order (average use of 95%). The average standardized time lapse is equal to 0.57 meaning that participants reacted halfway through the time window considered to study the trading reaction. Participants average course grade is 10.34 out of 20 and while the average trading performance is negative, the standard deviation is high.

{Insert Table 2 about here} {Insert Figure 2 about here}

Table 2 provides descriptive statistics separately for the control group (simulation variant with a male CEO) and the treatment group (simulation variant with a female CEO). Figure 2 plots the percentage of buyers and sellers following the announcement of the appointment of a male CEO (Figure 2A) and a female CEO (Figure 2B).

When a new CEO either male or female is appointed, we find that the participants tend to sell the stocks of the company; the Extensive margin variable (buy/sell order) is respectively equal to -0.039 (pooled simulations), -0.056 (simulations with a male CEO) and -0.018 (simulations with a female CEO). As Figure 2A shows, in the control group (when the appointed CEO is male), participants tend to sell (56%). When disaggregating the results by participants gender, 63% of male participants choose to buy stocks, while 67% of female participants choose to sell stocks. As Figure 2B shows, in the treatment group (when the appointed CEO is female), participants tend to sell (57%). When disaggregating the results by participants gender, 55% of female participants choose to buy stocks while 73% of male participants sell stocks. These descriptive patterns are consistent with our hypothesis of gender homophily. Next, we formally test our hypothesis using individual level data in our regression analysis.

5.2 Regression analysis

{Insert Table 3 about here}

Table 3 presents our results. The dependent variable is participant's trading reaction with its two components: the extensive and intensive margins. All specifications include *CEO gender* as our manipulated variable, *Participant gender* as our mediating variable, and the interaction term, $CEO\ gender \times Participant\ gender$ as our explanatory variable. Column (1) for the extensive margin and Column (3) for the intensive margin are replicated into Column (2) and (4) respectively by adding control variables: *Trading performance* and *Course grade*. Across columns, the estimated coefficient for the CEO gender, $\hat{\alpha}_1$, is negative, in line with the existing literature documenting that stock markets tend to react more negatively to the appointment of a female CEO (Lee and James, 2007). Yet, the fact that the coefficient is not statistically significant warrants a cautious interpretation of this result. Also, across columns, the estimated coefficient for the Participant gender, $\hat{\alpha}_2$, is negative, which suggests that female participants are on average more likely to sell than male participants. Yet, the coefficient is not statistically significant leading us to be cautious in our interpretation.

In our main specifications (Column (2) and Column (4)), the estimated coefficient for our variable of interest, the interaction term, $\hat{\beta}$, is positive and statistically significant at 5% level. When a female CEO is newly appointed, female participants (the $CEO\ gender \times Participant\ gender$ dummy variable being equal to 1) are more likely to buy stocks in a qualitative way (+1.712) and in a quantitative way (+40.236). Similarly, male participants are more likely to buy stocks when a male CEO is appointed. Therefore, our statistical results about the trading reaction

of participants are consistent with gender homophily: participants tend to buy stocks when a CEO of their own gender is appointed and to sell stocks when a CEO of the opposite gender is appointed.

6 Implication of our results about gender diversity among stock market participants

This section uses our main results (the primitives of market behavior) to investigate their implication and ask: how would varying gender diversity among stock market participants influence the aggregate market reaction? To answer this question, we calibrate the probabilities of buying and selling using the proportions of buyers and sellers among female and male participants estimated from the data of our experiment (as plotted in Figure 2). Doing so, we assume that the individual buying/selling behavior does not depend on the gender diversity among stock market participants, an assumption supported by Eckel and Füllbrunn (2015).

{Insert Figure 3 about here}

Figure 3 plots the difference between the percentage of buyers and the percentage of sellers after the announcement of the appointment of a male CEO (Figure 3A) and of a female CEO (Figure 3B) as a function of the proportion of female market participants. This allows us to quantitatively estimate the critical threshold of female market participants needed to reverse the sign of the stock market reaction from negative to positive when a female CEO is appointed and symmetrically, from positive to negative when a male CEO is appointed. This critical threshold corresponds to a gender-neutral market composition, that is, a market where the proportion of buyers equals the proportion of sellers after a female CEO appointment and symmetrically, following a male CEO appointment. A departure of the critical threshold from the reference value of 50% indicates a market gender bias. The market gender bias reflects both the female and male participants' preferences as revealed by their trading activity, and the hypothetical composition of market participants (the proportion of men and women participating to the market).

When a male CEO is appointed, the critical threshold of female market participants that makes the market reaction gender-neutral is equal to 43% (Figure 3A). When a female CEO is appointed, the critical threshold of female market participants that makes the market reaction gender-neutral is equal to 82% (Figure 3B). This means that the market gender bias is larger in magnitude (further away from the reference value of 50%) when the appointment concerns a female CEO (a positive value equal to +32%) than when the appointment concerns a male CEO

(a negative value equal to -7%).

In the case of the appointment of a male CEO, the market gender bias (-7%), measured by the difference between the critical threshold of the proportion of female participants of 43% and the reference value of 50%, is explained by the buying trading activity of male market participants (67%), which outweighs the selling trading activity of female market participants (33%). When the proportion of female market participants is equal to this critical threshold of 43%, the market reaction to the appointment of a male CEO is neutral (neither negative nor positive bias). With a proportion of female participants lower than this critical threshold, the market reaction to the appointment of a male CEO would exhibit a positive gender bias in favor of male CEOs, and inversely, with a proportion of female participants higher than this critical threshold of 43%, the market reaction to the appointment of a male CEO would exhibit a negative gender bias in favor of male CEOs.

In the case of the appointment of a female CEO, the market gender bias (+32%), measured by the difference between the critical threshold of the proportion of female participants of 82% and the reference value of 50%, is explained by the selling trading activity of male market participants (73%), which outweighs the buying trading activity of female market participants (55%). When the proportion of female market participants is equal to this critical threshold of 82%, the market reaction to the appointment of a female CEO is neutral (neither negative nor positive bias). With a proportion of female participants higher than this critical threshold, the market reaction to the appointment of a female CEO would exhibit a positive gender bias towards female CEOs, and inversely, with a proportion of female participants lower than this critical threshold, the market reaction to the appointment of a female CEO would exhibit a negative gender bias towards female CEOs.

This thought experiment based on extrapolation suggests that our results have the potential to explain the negative stock market reaction to female CEO appointments. Indeed, the threshold of female market participants that makes the market reaction gender-neutral to the appointment of a female CEO is equal to 82%, well above the current female representation in decision-making positions in the financial sector (for example, only 16% of CFA holders are female, according to Mattia (2018)). Undoing the negative stock market reaction to female CEO appointments would require a complete transformation of the financial industry by diversifying its workforce in terms of gender. In conclusion, our thought experiment implies that the market is 'gendered', meaning that the gender composition of the market participants is not neutral to market outcomes.

7 Discussion and conclusion

Our study contributes to the strategic management research on CEO appointment and gender leadership stereotypes. We explore the role of the demand-side factors in the CEO job market constitutive of the glass ceiling. While most research focuses on demand-side barriers internal to the firm, our contribution is to identify a demand-side barrier external to the firm's management and related to stock market investors. Investors are important for female access to CEO positions because they can vote with their feet to express discontent with the appointed CEO and strategically influence firm's appointment decisions. If the stock market reacts negatively to the appointment of female CEOs, this could discourage firms to appoint female CEOs. Indeed, because stock markets tend to react more negatively to the appointment of a female CEO than to that of male CEO, decisions taken in the stock market may effectively act as a demand-side barrier to female advancement.

We focus on the primitives of the market behavior. That is, we study investors' reaction to the CEO appointment at the individual level, which is essential to better interpret aggregate stock market fluctuations in reaction to the appointment of a CEO. We rely on experimental methodology because disentangling the pure effect of gender in archival data is challenging as gender is often confounded with other characteristics of the CEO that may be hard to observe or to measure. In parallel to Adams et al. (2017), therefore, our experimental design ensures that if participants sell following the appointment of a female CEO, this should reflect a dislike of a female CEO precisely because of her gender.

Our theoretical development engages with the existing theories and proposes a novel hypothesis: stock market participants' preferences towards CEOs exhibit gender homophily. In our experiment, we observe trading decisions at the individual level in a controlled environment. We build a trading simulation around the appointment of the new CEO that mimics the environment of investors. By randomizing the CEO gender, we avoid endogeneity issues and identify the pure effect of the gender of the CEO on the trading activity of the participants as a function of their gender.

We find that preferences revealed by individual participants' trading reaction to the CEO gender are consistent with gender homophily. In particular, we find that male participants tend to buy stocks of the company when a male CEO is appointed, and they tend to sell stocks when a female CEO is appointed. The opposite result holds for female participants. Using these results, we quantify the implications of gender homophily on the relation between gender diversity

among stock market participants and the negative stock market reaction to female CEO appointments. Gender homophily together with the current under-representation of women in financial sector investment occupations can explain the negative stock market reaction. Therefore, decisions taken by investors in financial markets can have negative spillover effects in the corporate world for women advancement in top positions. The gender issue is not only an issue reflected at the corporate level in the need to appoint more female CEOs but also an issue reflected at the financial industry level in the need to increase gender diversity by attracting more women in investment occupations and reflected at the societal level in the need to change individual and collective stereotypes about female leadership.

In conclusion, this paper shows that, gender is in the pocket of investors which implies, at the aggregate level, that the market is 'gendered'. That is, we conclude that the stock market is an institution that is not gender neutral. This implies that specific policies related to the feminization of the profession and to the handling of negative leadership stereotypes about female CEOs need to be devised in the financial sector.

As part of future work, our experiment could be implemented in different environments. This would be particularly useful to increase the external validity of our results. In our case, this seems even more interesting because countries vary greatly in terms of gender inequality both at the societal level and in the financial sector (World Bank Group, 2018). These differences may be the consequence of economic and institutional factors but could also be due to cultural norms (Fernández, 2013) and linguistic variations (Santacreu-Vasut, Shenkar and Shoham, 2014). Our experiment could be implemented in different countries, taking into account different cultural and linguistic origins of participants. To that end, the experiment that we developed on the SimTrade platform is available for the research community upon request.¹¹

In our paper, we focus on the male/female choice for the CEO. Research could also explore how identity dimensions of an individual other than gender, such as age group, handicap status, religious belonging or social class among others, intersect with gender. Indeed, intersectionality could be explored in our experimental setting by building CEO candidate profiles that vary in these other dimensions as well. Finally, another line of future work could involve the study of gender as a non-binary biological and social construct. While in this paper we used a binary representation (male/female) corresponding to the way the current business world portrays gender, scientific research and political activism are increasingly conceiving gender as a continuous spectrum. Our experimental setting is fit to also study investors' reaction to CEOs

¹¹ For more details about the research design and to submit a proposal visit <https://bit.ly/2xnwMSL>

that belong or self-identify as neither of the two traditional gender categories.

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References

- Adams RB, Kräussl R, Navone MA, Verwijmeren P. 2017. Is gender in the eye of the beholder? Identifying cultural attitudes with art auction prices. Working paper. Goethe University.
- Adams RB, Ragunathan V. 2017. Lehman sisters. Working paper. University of South Wales.
- Becker G. 1957. *The Economics of Discrimination*, Second Edition, The University of Chicago Press Economics.
- Blau F, Kahn L. 2017. The gender wage gap: Extent, trends, and explanations. *Journal of Economic Literature* **55**(3): 789-865.
- Card D, Cardoso AR, Kline P. 2016. Bargaining, sorting, and the gender wage gap: Quantifying the impact of firms on the relative pay of women. *The Quarterly Journal of Economics*, **131**(2): 633-686.
- Charness G, Gneezy U, Kuhn MA. 2012. Experimental design methods: Between-subject and within-subject design. *Journal of Economic Behavior & Organization*, **81**(1): 1-8.
- Cook A, Glass C. 2011. Leadership change and shareholder value: How markets react to the appointments of women. *Human Resource Management*, **50**(4): 501-519.
- Cook A., Glass C. 2014. Women and top leadership positions: Towards an institutional analysis. *Gender, Work and Organization*, **21**(1), 91-103.
- Crosen R, Gneezy U. 2009. Gender differences in preferences. *Journal of Economic Literature* **47**(2): 1-27.
- Davidson MJ. Cooper CL. 1992. *Shattering the Glass Ceiling: The Woman Manager*. Paul Chapman Publishing.
- De Beauvoir S. 1949. *Le Deuxième Sexe*. Gallimard Editions.
- Dixon-Fowler HR, Ellstrand AE, Johnson JL. 2013. Strength in numbers or guilt by association? Intragroup effects of female chief executive announcements. *Strategic Management Journal* **34**(12): 1488-1501.
- Eagly AH, Karau SJ, Makhijani MG. 1995. Gender and effectiveness of leaders: A meta-analysis. *Psychological Bulletin*, **117**(1): 125-145.
- Eckel CC, Füllbrunn SC. 2015. Thar “SHE” blows? Gender, competition, and bubbles in experimental asset markets. *American Economic Review* **105**(2): 906-920.
- EIGE (European Institute for Gender Equality). 2020. Gender statistics database, <https://eige.europa.eu/gender-statistics>, accessed on February 4th 2020.
- Ely R. 1995. The power in demography: Women's social constructions of gender identity at work. *The Academy of Management Journal* **38**(3): 589-634.
- Fama, E. 1970. Efficient Capital Markets: A review of theory and empirical work. *The Journal of Finance* **25**(2): 383-417.
- Fernández R. 2013. Cultural change as learning: The evolution of female labor force participation over a century. *American Economic Review* **103**(1): 472-500
- Filippin A, Crosetto P. 2016. A Reconsideration of Gender Differences in Risk Attitudes. *Management Science* **62**(11): 3138-3160. <https://doi.org/10.1287/mnsc.2015.2294>

- Glass C, Cook A, 2016. Leading at the top: Understanding women's challenges above the glass ceiling. *The Leadership Quarterly*, **27**(1): 51-63.
- Goodman JS, Fields DL, Blum TC. 2003. Cracks in the glass ceiling: In what kind of organizations do women make it to the top? *Group & Organization Management* **28**(4): 475–501.
- Greenwald A. 1976. Within-subjects designs: to use and not to use. *Psychological Bulletin* **83**(2): 314-320.
- Harlan A, Weiss C. 1982. Sex differences in factors affecting managerial career advancement. In P. Wallace (Ed.), *Women in the workplace* (pp. 59-100). Boston: Auburn House.
- Harrigan K. 1981. Numbers and positions of women elected to corporate boards. *Academy of Management Journal*, **24**(3), 619-625.
- Hicks D L, Santacreu-Vasut E, Shoham A. 2015. Does mother tongue make for women's work? Linguistics, household labor, and gender identity. *Journal of Economic Behavior & Organization*, **110**(C): 19-44.
- Hirshleifer D, Teoh SH. 2003. Limited attention, information disclosure, and financial reporting *Journal of Accounting and Economics* **36**(3): 337-386.
- Huang J, Kisgen DJ. 2013. Gender and corporate finance: Are male executives overconfident relative to female executives? *Journal of Financial Economics* **108**(3): 822-839.
- Kahneman D, Tversky A. 2000. *Choices, values, and frames*. Cambridge University Press.
- Kanter RM. 1977. *Men and Women of the Corporation*. Basic Books, New York.
- Kessler JB., Vesterlund L. 2015. The external validity of laboratory experiments: qualitative rather than quantitative effects. *Handbook of Experimental Economic Methodology*, Edited by Fréchette GR. and A. Schotter, Oxford Scholarship Online.
- Lazersfeld PF, Merton RK. 1954 “Friendship as a social process: A substantive and methodological analysis.” In M.Berger, T. Abel, and C.H. Page (eds.) *Freedom and Control in Modern Society*. NY, Van Nostrand.
- Lee PM, James EH. 2007. She-E-Os: Gender effects and investor reactions to the announcements of top executive appointments. *Strategic Management Journal* **28**(3): 227-241.
- Lonati S, Quiroga BF, Zehnder C, Antonakis J. 2018. On doing relevant and rigorous experiments: Review and recommendations" *Journal of Operations Management* **64**(1): 19-40.
- Malatesta PH, Thompson R. 1985. Partially anticipated events: A model of stock price reactions with an application to corporate acquisitions. *Journal of Financial Economics*, **14**(2): 237-250.
- Mattia L. 2018. *Gender on Wall Street. Uncovering opportunities for women in financial services*. Palgrave-Macmillan.
- Matsa DA, Miller AR. 2011. Chipping away at the glass ceiling: Gender spillovers in corporate leadership. *American Economic Review*, **101**(3): 635–39.
- McPherson M, Smith-Lovin L, Cook JM. 2001. Birds of a feather: homophily in social networks. *Annual Review of Sociology* **27**(1): 415-44.

- Niederle M, Vesterlund L. 2011. Gender and competition. *Annual Review of Economics* 3(1): 601-630.
- Pfeffer J, Davis-Blake A., 1987. The effect of the proportion of women on salaries: The case of college administrators. *Administrative Science Quarterly* 32(1):1-24.
- Phelps E. 1972. The statistical theory of racism and sexism. *American Economic Review* 62(4): 659-661.
- Powell GN, Butterfield DA, Parent JD. 2002. Gender and managerial stereotypes: Have the times changed. *Journal of Management* 28(2): 177-193.
- Ryan, MK, Haslam, SA. 2005. The glass cliff: Evidence that women are over- represented in precarious leadership positions. *British Journal of Management* 16(2), 81–90.
- Ryan, MK, Haslam, SA. 2009. Glass cliffs are not so easily scaled: On the precariousness of female CEOs’ positions. *British Journal of Management*, 20(1), 13-16.
- Ryan MK, Haslam SA., Hersby MD, Kulich C, Wilson-Kovacs MD. 2009. The stress of working on the edge: Implications of glass cliffs for both women and organizations. American Psychological Association.
- Santacreu-Vasut E, Shenkar O, Shoham A. 2014. Linguistic gender marking and its international business ramifications. *Journal of International Business Studies* 45(9): 1170-1178.
- Sherif M, Sherif CW. 1953. Groups in harmony and tension; an integration of studies of intergroup relations. Harper & Brothers.
- Schein VE. 1973. The relationship between sex stereotypes and requisite management characteristics. *Journal of Applied Psychology*, 57(2): 95-100.
- Shivdasani A, Yermack D. 1999. CEO Involvement in the selection of new board members: An empirical analysis. *Journal of Finance*, 54(5): 1829-1853.
- Singh V, Vinnicombe S. 2003. The 2002 female FTSE index and women directors. *Women in Management Review*, 18(7): 349–358.
- Wolfers J. 2006. Diagnosing discrimination: Stock returns and CEO gender,” *Journal of the European Economic Association* 4(2-3): 531-41.
- World Bank Group 2018. ‘Women, business and the law 2018’ Washington, DC: World Bank. License: Creative Commons Attribution CC BY 3.0 IGO.
- Zhang YA, Qu H. 2016. The impact of CEO succession with gender change on firm performance and successor early departure: Evidence from China’s publicly listed companies in 1997-2010. *Academy of Management Journal*, 59(5): 1845-1868.

Tables and figures

Table 1. Descriptive statistics

	Mean	Standard deviation	Min	Max	Observations
CEO gender	0.44	0.49	0	1	126
Participant gender	0.56	0.50	0	1	126
Trading activity	0.83	0.37	0	1	126
Order direction	-0.039	0.915	-1	1	105
Quantity of stocks	42.14	66.97	1	400	105
Order type	0.95	0.03	0	1	105
Time lapse	0.57	0.33	0.08	0.95	105
Trading performance	-6,376	9,818	-47,626	4,761	126
Course grade	10.34	3.45	1	18.95	126

Note: This table gives the descriptive statistics (mean, standard deviation, minimum and maximum) for the observed variables of the experiment. The *CEO gender* dummy variable is equal to 0 if a male CEO is appointed in the simulation and to 1 if a female CEO is appointed. The *Participant gender* dummy variable is equal to 0 if the participant in the experiment is a male and to 1 if the participant is a female. The *Trading activity* dummy variable is equal to 0 if the participant did not trade after the announcement of the new CEO and to 1 otherwise. The *Order direction* dummy variable is equal to -1 for a sell order and to +1 for a buy order. The *Quantity of stocks* is the number of stocks in the buy or sell order. The *Order type* dummy variable is equal to 0 for a limit order and to 1 for a market order. The *Time lapse* is the standardized time-difference between the announcement of the new CEO and the order sent by the participant. The *Trading performance*, measured in euros, is the performance of the participant in the simulation. The *Course grade* is the grade of the participant in the *Finance* course with French grading between 0 and 20.

Table 2. Descriptive statistics for the control and treatment groups

	Pooled simulations and pooled participants	Control group: Male CEO simulations			Treatment group: Female CEO simulations		
		Pooled participants	Male participants	Female participants	Pooled participants	Male participants	Female participants
Trading activity	0.833 (0.374)	0.873 (0.335)	0.862 (0.350)	0.881 (0.327)	0.781 (0.416)	0.769 (0.429)	0.793 (0.412)
Order direction	-0.039 (0.915)	-0.056 (0.939)	0.103 (0.939)	-0.166 (0.934)	-0.018 (0.374)	-0.230 (0.262)	0.172 (0.889)
Quantity of stocks	42.14 (66.97)	34.23 (42.66)	38.83 (40.67)	31.05 (44.18)	52.36 (88.52)	65.27 (106.60)	40.79 (68.35)
Order type	0.896 (0.305)	0.971 (0.166)	0.931 (0.257)	1.000 (0.000)	0.800 (0.403)	0.961 (0.196)	0.655 (0.483)
Time lapse	1.140 (0.670)	1.204 (0.642)	1.097 (0.673)	1.278 (0.618)	1.065 (0.702)	0.974 (0.672)	1.146 (0.730)
Trading performance	-6,376 (9,818)	-6,654 (10,339)	-7,039 (11,346)	-6,387 (9,717)	-6,018 (9,183)	-4,633 (6,527)	-7,260 (11,010)
Course grade	11.22 (3.31)	11.15 (2.93)	10.82 (2.65)	11.37 (3.12)	11.31 (3.76)	10.78 (3.26)	11.79 (4.16)
Observations	126	71	29	42	55	26	29

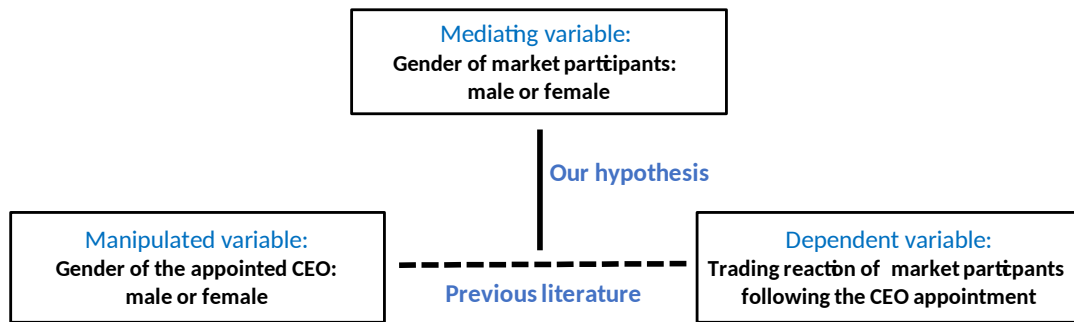
Note: This table gives the descriptive statistics (mean and standard deviation below in parentheses) for the control group (when a male CEO is appointed in the simulation) and the treatment group (when a female CEO is appointed). Furthermore, for each group, we disaggregate statistics by participant gender (male and female). The *Trading activity* dummy variable is equal to 0 if the participant did not trade after the announcement of the new CEO and to 1 otherwise. The *Order direction* dummy variable is equal to -1 for a sell order and to +1 for a buy order. The *Quantity of stocks* is the number of stocks in the buy or sell order. The *Order type* dummy variable is equal to 0 for a limit order and to 1 for a market order. The *Time lapse* is the standardized time-difference between the announcement of the new CEO and the order sent by the participant. The *Trading performance*, measured in euros, is the performance of the participant in the simulation in euros. The *Course grade* is the grade of the participant in the *Finance* course with French grading between 0 and 20.

Table 3. Regression results for the participants' trading reaction following the appointment of the new CEO

Dependent variable: participants' trading reaction				
	Extensive margin		Intensive margin	
	(1)	(2)	(3)	(4)
Intercept	0.241 (0.403)	0.578 (0.817)	2.642 (20.406)	-14.075 (39.240)
CEO gender	-0.860 (0.618)	-0.862 (0.621)	-47.367 (26.679)	-49.737 (29.822)
Participant gender	-0.624 (0.523)	-0.608 (0.527)	-24.957 (26.531)	-26.836 (26.627)
CEO gender × Participant gender	1.685** (0.823)	1.711** (0.828)	78.123* (39.808)	80.472** (40.032)
Trading performance		$5.89 \cdot 10^{-6}$ ($1.96 \cdot 10^{-5}$)		$1.02 \cdot 10^{-3}$ ($1.08 \cdot 10^{-3}$)
Course grade		-0.027 (0.063)		2.210 (2.996)
Pseudo R ² / R ²	0.14	0.15	0.03	0.05

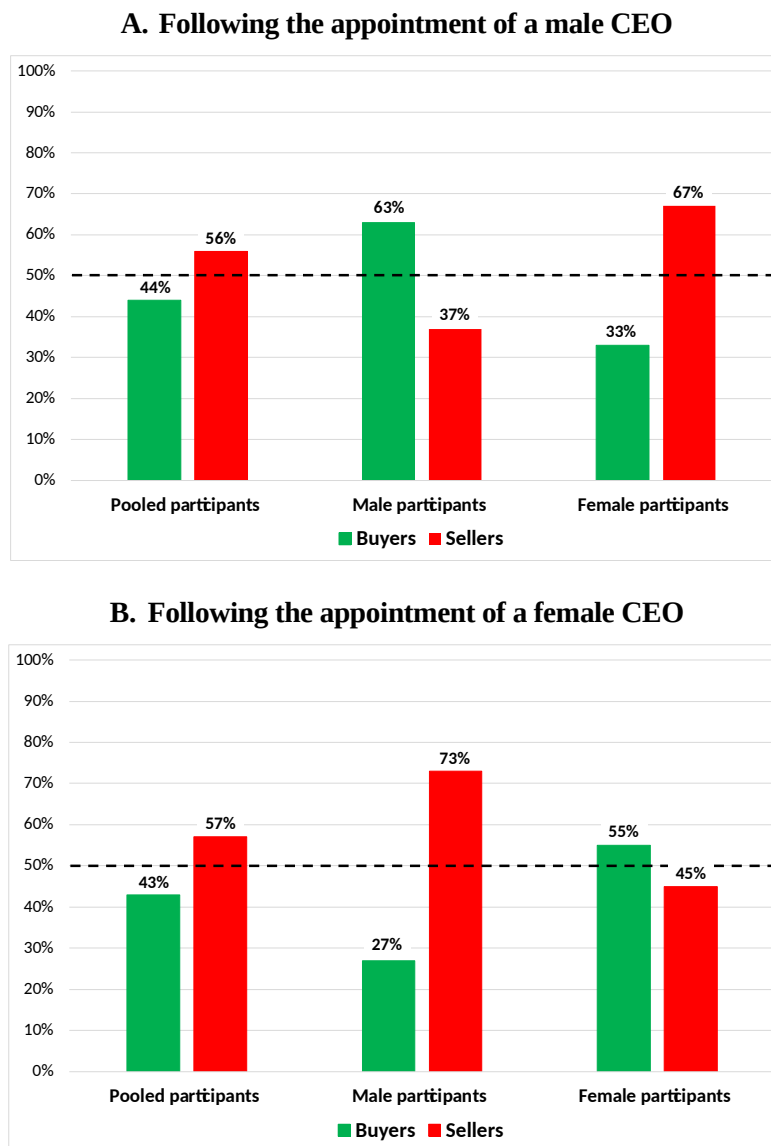
Note: This table gives the regression results for the trading reaction of participants (female/male participants) following the appointment of the new CEO (male/female CEO) in the trading simulations. Standard errors are given in parentheses below the coefficient estimates (following convention, ** represents a significant result at the 5% level, and * represents a significant result at the 10% level). Our dependent variable has two components: the extensive margin, which captures the qualitative nature of the trading reaction and the intensive margin, which captures the quantitative strength of the trading reaction. The extensive margin is modeled with a multinomial logistic regression (we display the pairwise comparison between the buy order and the sell order—the base case of the model specification). The intensive margin is modeled using a linear regression.

Figure 1. Relation between variables and our hypothesis



Note: This figure represents the relation between the dependent, manipulated and mediating variables, and our hypothesis: Stock market participants' preferences towards CEOs exhibit gender homophily.

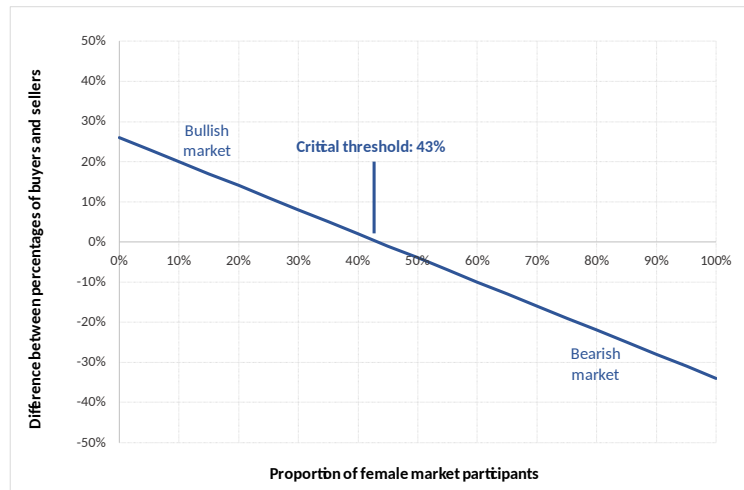
Figure 2. Percentage of buyers and sellers following the appointment of a male CEO and a female CEO



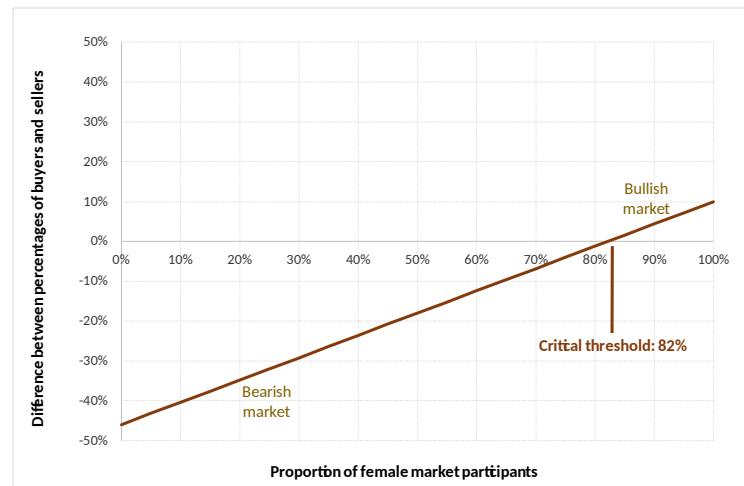
Note: This figure plots the percentage of buyers and sellers following the announcement of the appointment of a male CEO (Figure 2A) and a female CEO (Figure 2B).

Figure 3. Difference between the percentage of buyers and sellers as a function of the proportion of female market participants

A. Following the appointment of a male CEO



C. Following the appointment of a female CEO



Note: This figure plots the difference between the percentage of buyers and the percentage of sellers following the announcement of the appointment of a male CEO (Figure 3A) and a female CEO (Figure 3B) as a function of the proportion of female market participants. When the difference between the percentage of buyers and sellers is positive (negative), the market is bullish (bearish). The critical threshold corresponds to the proportion of female market participants needed to have a gender-neutral market reaction to the CEO appointment: a difference between the percentage of buyers and sellers equal to 0%. A departure of the critical threshold from the reference value of 50% indicates a market gender bias. We set the probabilities of buying and selling using the proportions of buyers and sellers among female and male participants estimated from the data of our experiment as plotted in Figure 2.