Regulation and the trickle-down effect of women in leadership roles

The Leadership Quarterly 35 (2024) 101721

Contents lists available at ScienceDirect

The Leadership Quarterly

journal homepage: www.elsevier.com/locate/leaqua

Full length article

Regulation and the trickle-down effect of women in leadership roles

Aaron Page [a,*], Ruth Sealy [a], Andrew Parker [b], Oliver Hauser [a]

[a] University of Exeter Business School, Rennes Drive, Exeter EX4 4PU, United Kingdom
[b] Durham University Business School, Mill Hill Lane, Durham DH1 3LB, United Kingdom

ARTICLE INFO

Keywords:
Gender diversity
Regulation
Women on boards
Trickle-down effect
Exogenous shock

ABSTRACT

We use an event study design to provide evidence demonstrating how the trickle-down effect is influenced by the introduction of regulation on board gender diversity. In 2011, a new regulation was suddenly introduced for firms listed on the United Kingdom's FTSE 350 index, the regulatory intervention put forward recommendations to increase the representation of women on the boards of FTSE 350 listed firms – the most critical recommendation was a voluntary target of having twenty-five percent of board positions held by women. We argue this change in regulation represents an exogenous shock, we utilize this shock to investigate how regulation influences the trickle-down of women's representation from board level to senior management. We find evidence of a positive relationship between women on boards and women's representation in senior management during the pre-regulation era – otherwise referred to as the trickle-down effect. However, the introduction of regulation had the unintended consequence of weakening the relationship between women on boards and women in senior management. Our results suggest that the trickle-down effect varies between different contexts and settings. We discuss the implications for research and practice.

Introduction

Historically, women face barriers as they move up the corporate hierarchy. Those women who overcome these barriers face the implicit and widespread expectation that their representation at board level will "trickle-down" to increase the representation of other women in senior management (Kirsch, 2018). Interestingly, this implicit assumption, commonly referred to as the trickle-down effect[1] (Gould, Kulik, & Sardeshmukh, 2018), is a motivating factor for many national governments to introduce regulation[2] on the representation of women at board level. For example, in a report on their regulatory target, the U.K. government stated, "we hope to see the effect of more women on boards of listed companies cascade out into senior leadership roles" (Department for Business, Innovation & Skills, 2015, p.18). Furthermore, a highly influential study on the trickle-down effect suggests "public policies aimed at increasing female representation on boards of directors, such as the quota recently adopted in Norway, may lead to general spillovers in management" (Matsa & Miller, 2011, p.639). It is therefore widely assumed that a regulatory intervention to increase women's representation at board level should strengthen the trickle-down effect.

The introduction of regulation concerning the representation of women on boards has become widely adopted by many nations across the globe (Terjesen, Aguilera, & Lorenz, 2015). The sudden implementation of regulation in a firm's environment could be considered an exogenous shock,[3] as it reflects an abrupt change event that dramatically affects individuals, firms, and society (Meyer, 1982). Whilst there is evidence to suggest regulation on board gender diversity has a significant impact on women's representation at board level (Bennouri, De Amicis, & Falconieri, 2020; De Cabo, Terjesen, Escot, & Gimeno, 2019; Grosvold & Brammer, 2011; Sojo, Wood, Wood, & Wheeler, 2016; Wang & Kelan, 2013), research focusing on Norwegian firms suggests that, in the post-regulation environment, mandated gender diversity at board level has no association with the representation of women within the firm (Bertrand, Black, Jensen, & Lleras-Muney, 2019). Such findings imply that whilst regulation improved the representation of women in

* Corresponding author.
E-mail addresses: ap486@exeter.ac.uk (A. Page), R.Sealy@exeter.ac.uk (R. Sealy), andrew.parker@durham.ac.uk (A. Parker), O.Hauser@exeter.ac.uk (O. Hauser).

[1] Literature has also referred to this relationship as a gender spillover (e.g., Matsa & Miller, 2011). We chose to not use the term spillover as it has not been ubiquitously adopted across research in this field.

[2] Regulation is typically introduced in two ways, using either hard law (statutory impositions with penalties for violation) or soft law (non-binding regulation with codes of good governance principles).

[3] Exogenous shocks reflect sudden, unexpected, and far-reaching events, such as: economic crises, the occurrence of natural disasters, or changes in regulation (Bernile, Bhagwat, & Rau, 2017; Stoker, Garretsen, & Soudis, 2019; Yang, Riepe, Moser, Pull, & Terjesen, 2019).

https://doi.org/10.1016/j.leaqua.2023.101721
Received 13 March 2021; Revised 5 June 2023; Accepted 30 June 2023
Available online 25 July 2023

focal board level positions, these benefits did not trickle-down into the firm. The empirical findings on Norway's gender quota contradicts prior research that establishes positive trickle-down effects stemming from women at board level (e.g., Bilimoria, 2006; Matsa & Miller, 2011; Skaggs, Stainback, & Duncan, 2012) and challenges the widespread assumption that regulation should strengthen the trickle-down effect, which could be rationalized by well-established theories on an ingroup preference between individuals of the same gender – such as similarity-attraction paradigm (Byrne, 1971), social identity theory (Tajfel & Turner, 1979), and homosocial reproduction (Kanter, 1977).

At present there is a dearth of research exploring whether the introduction of regulation on board gender diversity strengthens or weakens the trickle-down effect. Traditional theoretical literature in sociology and psychology on ingroup preference suggests regulation designed to increase women at board level should improve women's representation in the senior management team (e.g., Byrne, 1971; Kanter, 1977, Tajfel & Turner, 1979), whereas a small body of contradictory empirical research suggests regulation could have a negative impact on the trickle-down effect (Bertrand et al., 2019; Gould et al., 2018). In light of the absence of a comprehensive theoretical explanation that explicitly conceptualizes a clear and concise relationship between regulation and the trickle-down effect, the introduction of regulation on board gender diversity offers a useful empirical opportunity to test contradicting views regarding the impact of regulation on the trickle-down effect. Whilst a growing body of research has explored the impact regulation has on the relationship between board gender diversity and firm financial outcomes (see Ahern & Dittmar, 2012; Arnaboldi, Casu, Kalotychou, & Sarkisyan, 2020; Carbonero, Devicienti, Manello, & Vannoni, 2021; Ferrari, Ferraro, Profeta, & Pronzato, 2021; Garcia-Blandon, Argilés-Bosch, Ravenda, & Castillo-Merino, 2022; Lara, Penalva, & Scapin, 2022; Matsa & Miller, 2011; Nekhili, Gull, Chtioui, & Radhouane, 2020; Yang, Riepe, Moser, Pull, & Terjesen, 2019), there is a lack of research exploring how the introduction of regulation on board gender composition influences the relationship between women's representation on boards and gender diversity in senior management levels.

In the present study, we explore how the gender-based trickle-down effect between the corporate board and senior management team is influenced by unexpected regulation on board gender diversity. The context of our study is the United Kingdom's Financial Times Stock Exchange (FTSE) index from 2007 to 2018. During this period, specifically in 2011, the United Kingdom (U.K.) Government abruptly implemented regulation in which eleven recommendations were proposed to increase women's representation on the boards of FTSE 350 listed firms (Department for Business, Innovation & Skills, 2011), the most critical recommendation was for firms to meet the voluntary target of having twenty-five percent of board positions held by women. This was contrary to the neo-liberal foundations that are deeply embedded in the U.K. with a powerful resistance to radical initiatives of 'meddling' government interventions in the business world. The introduction of regulation could be considered an exogenous shock, an unprecedented and unexpected event, in which corporate boards were abruptly confronted with new external regulatory goals, expectations, and norms concerning the representation of women at board level (Doldor, Sealy, & Vinnicombe, 2016). In the present study, we are able to harness this event, in which regulation was unexpectedly introduced, to explore whether the introduction of regulation on female board representation has a positive or negative impact on the trickle-down effect.

This study makes two contributions to literature. First, we bring a novel perspective to research on trickle-down effects through exploiting the introduction of regulation on female board representation in the United Kingdom. We add to a growing body of literature investigating factors that influence trickle-down effects between board and senior management (e.g., Ali, Grabarski, & Konrad, 2020; Bertrand et al., 2019), an area of research previously identified as needing further investigation (Kirsch, 2018). Our results provide support for the assumption that regulation on board gender diversity leads to the weakening of the trickle-down effect between the corporate board and senior management team – in essence, the representation of women at board and senior management team positions are no longer as strongly correlated after regulation was implemented in the United Kingdom. With respect to theory, our results do not support the view that regulation, through the use of quotas or targets, will strengthen the relationship between the representation of women at board and senior management levels, which has been suggested by theory used by prior literature on the trickle-down effect (e.g., Biswas, Chapple, Roberts, & Stainback, 2021), for instance, similarity-attraction paradigm (Byrne, 1971) or social identity theory (Tajfel & Turner, 1979).

Second, we extend prior research on the effects of regulation. To date, most studies exploring regulation have focused upon financial performance (e.g., Ahern & Dittmar, 2012) and women's access to board positions (e.g., Seierstad & Opsahl, 2011; Sojo et al., 2016). We contribute by exploring the impact of regulation on the trickle-down effect, an area of research which has lacked empirical investigation. We contribute to literature by studying the impact of regulation on unitary board structures in the United Kingdom, rather than the widely studied European mandatory hard law regulation applied to supervisory boards[4] (e.g., Ahern & Dittmar, 2012; Ferrari et al., 2021).

This paper proceeds as follows. First, we provide a review of literature on the trickle-down effect and subsequently explore how this could be influenced by regulation. Second, we describe the data and methods. Third, we investigate if regulation on board gender diversity in the United Kingdom had an impact on the trickle-down effect. Finally, we discuss our results and conclude.

The trickle-down effect: A review

Over the last two decades, researchers have been increasingly interested in trickle-down effects where the perceptions, attitudes, or behaviors of individuals located at one level of the management hierarchy influence the perceptions, attitudes, or behaviors of individuals located in management levels immediately below (for a review see, Wo, Schminke, & Ambrose, 2019). Past work has demonstrated trickle-down effects between management levels across a wide range of phenomena, including justice perceptions (Ambrose, Schminke, & Mayer, 2013; Tepper & Taylor, 2003), transformational leadership (Bass, Waldman, Avolio, & Bebb, 1987; Bormann & Diebig, 2021), ethical or abusive behavior (Aryee, Chen, Sun, & Debrah, 2007; Mawritz, Mayer, Hoobler, Wayne, & Marinova, 2012; Mayer, Kuenzi, Greenbaum, Bardes, & Salvador, 2009), and perceived support (Shanock & Eisenberger, 2006).

A related, albeit separate, body of literature also establishes the presence of trickle-down effects in the representation of women between levels of management (see Ali, et al., 2020; Bilimoria, 2006; Biswas, Chapple, Roberts, and Stainback, 2021; Biswas, Roberts, & Stainback, 2021; Gould et al., 2018; Matsa & Miller, 2011; Skaggs et al., 2012). This form of trickle-down effect suggests that "diversity begets diversity" (Cook & Glass, 2015, p.137). In this fashion, an increase in women's representation in a higher level of management is expected to trickle-down to lower levels of management. In their landmark study Cohen, Broschak and Haveman

[4] Internationally, there are unitary and two-tier models of corporate governance. A unitary board can be defined as one group containing non-executive (i.e., external or outsider directors) and executive directors (i.e., management or insider directors), used for example in the United Kingdom and the United States. The two-tier system separates the board into two distinct groups: the executive board (management) and the supervisory board (non-executive directors), this system exists in, for example, Germany, Austria, and Norway. Both systems exist in France. This difference is pertinent because the executives operate within the firm, working with other senior and mid-level management. The two-tier versus unitary board system could have implications for the impact of regulation on the trickle-down effect stemming from women's representation at board level.

(1998) were amongst the first to identify a trickle-down effect concerning women's representation in the firm, such that women's chances of being hired or promoted into a focal level of management was greater when there is a higher proportion of women in the management level above.

Subsequent research into the trickle-down effect of women's representation in the firm has mainly focused on trickle-down effects stemming from board level. Women's representation at board level has been shown to trickle-down to increase women's representation in executive board positions (Bozhinov, Joecks, & Scharfenkamp, 2021; Matsa & Miller, 2011), executive officer positions (Bilimoria, 2006; Gould et al., 2018), middle management positions (Ali et al., 2020), management positions (Skaggs et al., 2012) and finally, top earner positions (Bilimoria, 2006).

Literature exploring this gendered trickle-down effect draws from a wide variety of established theoretical frameworks, such as similarity-attraction paradigm (Byrne, 1971), social identity theory (Tajfel & Turner, 1979), homosocial reproduction (Kanter, 1977), and homophily (Ibarra, 1993), to argue that women in senior leadership positions can promote the representation of other women within the firm, as people tend to associate and interact with others who they see as having similar attributes, values, and dispositions. The key problem with existing literature using these theoretical frameworks, which promote the concept of in-group preference, concerns the fact that the theoretical mechanisms employed, such as the principle of homosocial reproduction, are seldom (if ever) measured by researchers exploring the trickle-down effect stemming from women at board level. The scale of this issue becomes evident when there is reason to suggest women at board level may not actively promote gender equality or advocate for the promotion of women lower down in the corporate hierarchy, as suggested by the widely debated and criticized "queen bee phenomenon" (e.g., Derks, Van Laar, & Ellemers, 2016; Ellemers, van den Heuvel, de Gilder, Maass, & Bonvini, 2004). This lack of promotion or advocation from women on boards, however, can also be explained by the dynamics of tokenism (Kanter, 1977), when women are in the extreme minority at elite levels. The trickle-down effect could, therefore, be more complex than the simple linear relationship existing between women's representation at board level and women's subsequent representation in senior management.

It appears likely that the two variables of interest when studying the trickle-down effect, i.e., the representation of women at board level and the representation of women in senior management, are endogenously determined. In short, the positive trickle-down effect observed by prior literature (e.g., Bilimoria, 2006; Matsa & Miller, 2011) may actually be the result of omitted variable bias (Antonakis, Bendahan, Jacquart, & Lalive, 2010). For instance, the trickle-down effect could be associated with firm policies designed to benefit women at all levels of the management hierarchy. As a consequence, a growing body of research has explored additional factors that may shape the relationship between women on boards and women's representation in management positions. This small body of research has identified that the trickle-down effect is influenced by: critical mass at board level (Biswas, Chapple, Roberts, & Stainback, 2021), board independence (Biswas, Roberts, & Stainback, 2021), and industry gender composition (Ali et al., 2020). This small, albeit growing, body of literature reflects a move towards understanding factors that influence the trickle-down effect, an area of research recently cited as a critical area for empirical investigation (Kirsch, 2018). At present, there is an assumption that regulation on female board representation could serve as a factor that strengthens the trickle-down effect (e.g., Matsa & Miller, 2011). Given the prevalence of well-established theories suggesting that women, like men, prefer to associate with similar others (e.g., Ibarra, 1993, Kanter, 1977), there is reason to assume regulation designed to increase women on boards is likely to strengthen the relationship between women on boards and gender diversity in senior management. However, empirical research is yet to establish the impact of regulation on the trickle-down effect. Given that regulatory interventions on board gender composition have been widely introduced in nations across the globe, it is important to establish how – and to what extent – the introduction of regulation influences the trickle-down effect.

Regulation on board gender diversity and the trickle-down effect

Across the globe, national regulation on board gender composition often takes one of two forms: hard law regulation or soft law regulation (Terjesen & Sealy, 2016; Terjesen et al., 2015; Terjesen, Sealy & Singh, 2009). Many countries have adopted hard law regulation on board gender diversity, including but not limited to Germany, France, Spain, Norway, and Italy. Whereas other countries, such as the United Kingdom, have adopted soft law regulation on board gender composition.

Soft law regulation is characterized by the absence of legal arrangements concerning compliance with 'standards' or 'best-practice rules' on a focal issue (Abbot & Snidal, 2000). Soft law regulation is based upon the principle that firms are expected to comply with normative standards and rules that are not legally binding but still have relevance to society, governments, or other important firm stakeholders (Terjesen et al., 2015). Examples of soft law regulation include voluntary initiatives, codes of conduct, commitments, guidelines, or recommendations laid down by external institutions with no legally binding force. Soft law regulation on women on boards can be defined as a non-binding recommendation (e.g., a voluntary target or quota) set by an external institution (e.g., a national government), where compliance is driven by the expectation that a firm will conform with normative standards concerning women's representation at board level (Terjesen et al., 2015; Terjesen & Sealy, 2016). For example, in 2013, the Dutch government introduced recommendations that encouraged listed firms to have thirty percent of board level positions occupied by women, with no penalty for non-compliance.

Alternatively, hard law regulation reflects a legal obligation to comply with standards on a focal issue. The mandatory standards set by hard law regulation are characterized by "a high level of formalization and strong sanctions for noncompliance" (Gatti, Vishwanath, Seele, & Cottier, 2019, p. 965). When hard law regulation is imposed on a firm, compliance with rules and requirements are legally binding and non-compliance results in sanctions. Hard law regulation on women on boards can be defined as a legally binding minimum standard (e.g., a mandated target or quota) set by an external institution regarding the representation of women on a firm's board, with penalties for non-compliance. For example, in 2005, the Norwegian government enforced a hard law board gender quota which legally required firms to have a female board representation of forty percent and non-compliant firms faced the punishment of being delisted from the stock exchange (Eckbo, Nygaard, & Thorburn, 2022).

Although this dichotomous segmentation into 'hard law' and 'soft law' is useful to understand regulatory initiatives, given changing environments firms are situated within, the line separating soft law and hard law regulation may actually become blurred (Gatti et al., 2019). For example, the U.K. voluntary target on board gender diversity (soft law regulation) was introduced in a national environment where U.K. listed firms are *legally required* under listing rules to address voluntary codes, because of the U.K.'s 'comply or explain' governance environment (Financial Reporting Council, 2014). Therefore, the introduction of regulation targeting board gender diversity, via either hard law or soft law, reflects a significant change event in a national policy in which firms are pressured to comply with the expectations of the regulatory intervention.

However, it is conceptually relevant to acknowledge that while firms may comply with the principles of regulation, the introduction of regulation could lead to decoupling practices (for a review see,

Bromley & Powell, 2012). That is, firms might be publicly recognized and praised for making efforts for endorsing regulatory requirements, when in fact they do not fully internalize these efforts – meaning the introduction of regulation could have important implications on trickle-down effects observed by prior literature.

Existing studies exploring the impact of regulation on board gender diversity have typically focused upon firm financial performance (e.g., Ahern & Dittmar, 2012) or women's access to board positions (e.g., Wang & Kelan, 2013). With regards to the impact of regulation on firm performance, research on the Norwegian gender quota has found evidence to suggest the quota law led to a decline in accounting returns for mandated firms (Ahern & Dittmar, 2012), as well as a decline in operating profits (Matsa & Miller, 2013). Other studies have also explored the impact of regulation on firm economic performance in Spain (De Cabo et al., 2019), France (Arnaboldi et al., 2020; Nekhili et al., 2020), and Italy (Arnaboldi et al., 2020; Carbonero et al., 2021; Ferrari et al., 2021). With respect to the impact of regulation on women's access to board level positions, research has established that the Norwegian regulatory quota improved women's representation in CEO and chairperson positions (Wang & Kelan, 2013), whilst also creating a small elite of women directors, referred to as "golden skirts", who initially held a disproportionate number of board level positions (Seierstad & Opsahl, 2011). Whilst this growing body of research has improved our understanding of how regulation influences board gender diversity and firm financial outcomes, far less work has examined how regulation influences the relationship between board gender diversity and gender representation below board level.

A limited body of research has started to explore how regulation on board gender composition could have an impact on the trickle-down effect. Most closely aligned to our work is research looking into the Norwegian quota (Bertrand et al., 2019). Alongside exploring gender pay gaps between executives in Norway, Bertrand et al. (2019) found that during the prolonged introduction of the Norwegian quota, the mandated representation of women on boards was not positively associated with proportions of employees who were: women, women with MBAs, women with children, women who were top earners, or women working part time (Bertrand et al., 2019). These results suggest that whilst the Norwegian quota benefited women's representation on boards, it did not have extended benefits for women outside of the regulated board level positions. That said, it is important to consider these findings alongside corporate governance in Norway. Norwegian firms have supervisory boards, meaning they have minimal links to management within firms. This may have broader implications for the trickle-down effect, as there is limited reason to assume an increase in the mandated representation of women on supervisory boards *should* have a link with the representation of women within the firm.

In contrast, in Australia – as is the case in the United States and United Kingdom – firms have a unitary board structure, meaning both non-executive (i.e., outsider) and executive (i.e., insider) directors are present at board level. Given the link between the board and firm management, a trickle-down effect could be observed from women's representation in firms with a unitary board. Consistent with this assumption, research establishes a positive trickle-down effect between the board and executive team of listed Australian firms (Gould et al., 2018). The Australian Stock Exchange introduced new reporting requirements that required the disclosure of information[5] on the issue of gender diversity throughout all levels of the firm (Australian Institute of Company Directors, 2010). Interestingly, despite not focusing on regulation targeting female board representation, the introduction of the new reporting requirements in Australia slowed down the pre-existing trickle-down effect that was present between the board and executive team of Australian listed firms (Gould et al., 2018).

Although the limited body of existing literature (i.e., Bertrand et al., 2019; Gould et al., 2018) has informed our understanding of how the trickle-down effect could be influenced by regulatory interventions, much more remains to be understood regarding the impact of regulation targeting board gender composition. Little is known about how the introduction of regulation on board gender diversity impacts the trickle-down effect. At present, existing literature has investigated how trickle-down effects are influenced by changes in reporting requirements (Gould et al., 2018) or has investigated the time-period after a quota has been introduced (Bertrand et al., 2019). As a result, to the best of our knowledge, it remains unclear how the trickle-down effect between board and senior management positions is influenced by the introduction of regulation on board gender composition.

The exploratory question we ask in the present study is whether the trickle-down effect improves or declines as a result of the introduction of regulation on board gender diversity. Findings, either positive or negative, would have important implications for evidence that women's representation on boards affect women's representation in senior management. First, if there is indeed evidence to suggest a causal relationship between women on boards and women in senior management (i.e., a trickle-down effect), the new regulation should strengthen the relationship between women on boards and the representation of women in senior management, this would be evidence of the trickle-down effect proposed by past research and policy makers (e.g., Department for Business, Innovation & Skills, 2015; Matsa & Miller, 2011). Such findings would be in line with the traditional theoretical concept of in-group preference between individuals of the same gender (Byrne, 1971; Kanter, 1977; Tajfel & Turner, 1979). Alternatively, if firms merely conform with the priorities and pursuit of meeting targets at board level, often referred to as "window dressing", the introduction of regulation will lead to changes in the representation of women on boards having *no impact* on the representation of women in senior management (Bertrand et al., 2019; Gould et al., 2018).

In what follows, we outline the empirical context of our study. This context (i.e., the United Kingdom FTSE 350 index) allowed us to utilize the introduction of regulation on board gender diversity – a change event that could be considered an exogenous shock. In light of the inconclusive empirical reports and the absence of a theory that captures a clear and concise impact of regulation on the trickle-down effect, the empirical context used in the present study granted us the ability to explore how the trickle-down effect is influenced by regulation on board gender diversity.

Method

Corporate governance in the United Kingdom

In September 2010, Lord Davies conducted a brief consultation period with a number of stakeholders, including senior business leaders, entrepreneurs, executive search firms, investors, and women business leaders, concerning the issue of gender diversity on boards. This consultation examined the business case for gender diversity on boards and the obstacles faced by women in seeking to get onto boards (Doldor et al., 2012).

The resulting review was published as a report – titled "Women on Boards" – in February 2011 and put forward eleven recommendations to increase women's representation on the boards of all FTSE 350 listed firms (Department for Business, Innovation & Skills, 2011).

[5] Reporting requirements in Australia required listed firms to disclose the following information within annual reports: 1) the disclosure of objectives for increasing gender diversity throughout the firm; 2) the measurement and progression towards objectives; 3) the disclosure of a diversity policy, as well as a strategy for implementation of the policy (Australian Institute of Company Directors, 2010). It is important to note these new reporting recommendations applied to all levels within listed firms, and also considered the issue of diversity – including gender, age, ethnicity, and cultural background.

The most critical recommendation was for firms to meet the voluntary target of having twenty-five percent of board level positions held by women by 2015.[6] While not legally binding, the report was widely viewed as a regulatory intervention backed by the U.K. government, albeit at arm's length, (e.g., Forbes, 2011; Peev, 2011) and additional measures brought in by the government (which we discuss below) to monitor compliance cemented this view. These recommendations were supported by the U.K. government, with the then business Secretary, Vince Cable, adding that the government will "engage with business in considering his recommendations" and "encourage regulators, investors and executive search firms to take forward those recommendations" (Department for Business, Innovation & Skills, 2011). Thus, from 2011, FTSE 350 listed firms were pressured by external stakeholders to comply with recommendations on board gender diversity (Vinnicombe et al., 2021). The focal voluntary target was later revised to thirty-three percent in 2016[7] (Department for Business, Innovation & Skills, 2015) and most recently it was increased to forty percent in 2021 (Department for Business, Energy & Industrial Strategy, 2021).

Importantly for our study, regulation was introduced relatively rapidly at the beginning of 2011, with little warning and less than four months after a brief consultation began, allowing us to suggest this event reflects an exogenous shock and take advantage of it for the purpose of our study.

Corporate governance environment before and after the introduction of regulation. Before 2011 there was a general lack of external pressure placed on FTSE 350 firms to consider the issue of gender diversity at board level. The approach of FTSE listed boards was described as "based on voluntarism and the good will of chairmen, rather than mandatory intervention by government" (Sealy, Vinnicombe, & Singh, 2008, p.12).

The introduction of regulation meant that these boards were abruptly confronted with pressure to voluntarily comply with new external regulatory goals, expectations, and norms concerning increasing the percentage of women at board level. In fact, after the publication of Lord Davies' 2011 report, additional monitoring measures were introduced to help identify the effect of the report's recommendations. After 2011, FTSE 350 listed firms were being annually monitored, evaluated, and reviewed by external institutions, such as the annual "Women on Boards Review" published by the U.K. government (e.g., Department for Business, Innovation & Skills, 2012), the Financial Reporting Council corporate governance code adherence report (e.g., Sealy & Vinnicombe, 2012a; Sealy, Turner, Pryce, & Vinnicombe, 2014), and the annual "Female FTSE board report" published by Cranfield University (e.g., Sealy & Vinnicombe, 2012b, Vinnicombe, Doldor, & Sealy, 2018). The period after 2011 reflects a corporate governance environment in which FTSE listed firms were not only pressured by external stakeholders to comply with regulation on board gender composition, but also were continuously monitored and evaluated by external institutions.

Corporate boards vs. senior management. In the public discussions and consultations on leadership diversity, most of the attention has been focused on gender diversity at board level. This reflects a general view that "gender-diverse boards have a positive impact on [firm] performance. It is clear that [gender diverse] boards make better decisions where a range of voices, drawing on different life experiences, can be heard." (Department for Business, Innovation & Skills, 2011, p.3). An often implicit, and sometimes explicit, reason for encouraging more female representation at board level is the belief that it sets the "tone" for lower levels of the firm and will trickle-down, leading to more gender diversity in management levels below the board. This belief was shared by the U.K. government, who assumed increases in board gender diversity should cause "a ripple effect of women taking up prominent positions in different areas of the workplace" (Department for Business, Innovation & Skills, 2015, p.18). However, neither the 2011 report in the U.K., nor similar regulatory interventions introduced in other countries, specified any targets or measures to incentivize the increase of the proportion of women in senior management positions. Based on available public data, it is possible, however, to monitor whether any such trickle-down effects did occur by measuring the gender diversity of senior management. We use the U.K. FTSE 350 index as an empirical setting to investigate how regulation on board gender diversity influenced the trickle-down of female representation from the board level to senior management positions.

Data collection and sample

The U.K. regulation for gender diversity on corporate boards applied to all firms listed on the FTSE 350 index. We therefore use data from publicly listed firms that were consistently listed on the FTSE 350 index during all years of the study sample period of 2007 to 2018. Firms listed on the FTSE index were subjected to the introduction of regulation from the 24th of February 2011, the time-period after this date reflects a change in which FTSE listed firms faced pressure to increase the proportion of female directors at board level to comply with soft law regulatory recommendations. Therefore, given the regulation was introduced at the beginning of 2011, we treat the time-period from 2011 in the U.K. as our time-based treatment. We collect data from 2007 to 2018 to provide a complete picture of the transformation of the trickle-down effect stemming from U.K. listed corporate boards.

Most restrictions on our sample selection are in line with prior research. Like prior research, our data is limited to firms who are subjected to the regulation on board gender diversity (Bertrand et al., 2019), in our analyses we focus on firms listed on the FTSE 350 index. We only consider firms who have complete information on all board level, senior management level and firm level variables (Yang et al., 2019). Our prospective sample was drawn from firms listed on the FTSE 350 Index in 2011. In total, 119 firms were not considered as they were not consistently listed on the FTSE 350 index for all years in the study time-period (i.e., 2007 to 2018). Furthermore, 12 firms were removed from the analysis owing to missing data. As a result of these restrictions, we had a sample of 2628 firm-year observations from 219 FTSE listed firms between 2007 and 2018.

We use 2007 as the start of sample time-period, 4 years before the soft law regulation was introduced in 2011. Though we could use an earlier year as the start of our study time-period, doing so is costly, as we look further back in time (before 2007) the volume of data available deteriorates, 19 firms from our original sample of 219 had data missing in the years immediately before 2007. As a consequence, we used the period of 2007-to-2010 as our "pre-regulation time-period". Furthermore, we use 2018 as the end point for our sample time-period, 7 years after regulation was introduced for FTSE 350 listed firms. Whilst a later year could have been used to extend the sample time-period, more recent data on many firms was not available to us – of our sample of 219 firms, only 59 firms had data available for the years after 2018. Thus, we used 2011-to-2018 as our "post-regulation time-period".

Corporate board positions. We collect board of director information from the BoardEx database. As the U.K. has a unitary board system, BoardEx defines a FTSE board member as an individual who

[6] Whilst the voluntary twenty-five percent target was initially introduced for FTSE 100 firms in February 2011, recommendation 1 of the February 2011 Women on Boards Report stated that "all Chairmen of FTSE 350 companies should set out the percentage of women they aim to have on their boards in 2013 and 2015 […] chairmen should announce their aspirational goals within the next six months" (Department for Business, Innovation & Skills, 2011, p. 4). Furthermore, just a few months later in 2011, the first government backed "Six-month Monitoring Report" clearly evaluated and monitored all FTSE 350 firms on their progress towards achieving the twenty-five percent voluntary target by 2015 (Sealy, Doldor, Singh & Vinnicombe, 2011). Therefore, there was an expectation all FTSE 350 should comply with the twenty-five percent target, as well as other recommendations targeting all FTSE 350 firms.

[7] In our robustness checks we control for the increase in the target by eight percentage points in 2016, which is within the range of dates of our data; our results remain unchanged.

holds either a non-executive director (i.e., outsider) or an executive director (i.e., insider) position within the firm. For each board member we recorded the individual's position on the board (i.e., non-executive director, executive director, or chairperson) and gender.

Senior management positions. For our analysis, we require the distinction between board level and senior management positions. BoardEx provides this information on its online database and defines a senior manager as "an individual who holds a position below the board within a firm." Senior managers most commonly hold titles such as 'Divisional Director', 'Regional Director', or 'Head of (function)', and typically were either on the Executive Committee (one level directly below the board and reporting directly to the Chief Executive) or were reporting into the Executive Committee[8] (Sealy, Doldor & Vinnicombe, 2016) – see Table A1 in the Appendix for the most frequent senior management roles. For each senior manager we had information on both their role and gender.

Other firm indicators. Following prior research on gender and corporate governance (e.g., Adams & Ferreira, 2009; Ahern & Dittma, 2012; Post & Byron, 2015), we also collected firm-level data for each firm-year observation. To limit the number of missing values within our dataset we collected data using the following method: first, we collected firm level data from the FAME database. Second, if data was missing from the FAME database, we then searched for firm data using CompuStat databases; and finally, we searched for missing data by looking within firm annual reports.

Variables of interest

The trickle-down effect. Research has measured the trickle-down effect by modelling the relationship between the percentage of women at board level and the percentage of women in senior management. The use of a percentage value,[9] rather than raw count data or ratios, is a commonly used approach when analyzing female representation in senior leadership (e.g., Adams & Ferreira, 2009; Terjesen, Couto, & Francisco, 2016) and when investigating the trickle-down effect (e.g., Ali et al., 2020; Biswas, Chapple, Roberts, & Stainback, 2021; Biswas, Roberts, & Stainback, 2021; Gould et al., 2018; Matsa & Miller, 2011; Skaggs et al., 2012).

The outcome variable is the percentage of women within a firm's senior management team. This measure was calculated as the percentage of women in senior management within a focal year. Specifically, we took the total number of female senior managers and divided this figure by the total number of senior managers within a firm; this figure was then multiplied by one hundred to calculate the percentage of women in senior management.

The predictor variable is the percentage of women at board level. This measure is defined as the number of women at board level divided by the total number of board members then multiplied by one hundred. In our analyses, the relationship between the outcome and predictor variables indicated the strength of the trickle-down effect within a firm – that is, a positive coefficient signals that the percentage of women at board level was associated with (i.e., "trickled down" to) the percentage of women in senior management positions.

Control variables

We control for firm-year-specific variables that may be related to, or influence, the trickle-down effect.

Senior management team size. In line with prior research on trickle-down effects (e.g., Matsa & Miller, 2011), we controlled for the size of the senior management team, measured by summing the total number of individuals within a firm's senior management team.

Firm size. We also include firm size, measured as the natural logarithm of the total number of employees within a firm. Prior research has controlled for firm size when exploring the trickle-down effect (see Ali et al., 2020; Bilimoria, 2006; Biswas, Chapple, Roberts, and Stainback, 2021; Gould et al., 2018), as larger firms may face external pressure to have greater gender diversity within management positions.

Governance related controls. We accounted for several governance factors that could be related to managerial gender diversity. We include board size, calculated as the total number of board members within a firm. We also controlled for board independence, measured using the proportion of non-executive directors to overall board size, as a more independent board is better able to steer decision processes in a way that favors firm stakeholders (Linck, Netter, & Yang, 2008; Ryan & Wiggins, 2004).

Empirical approach

The period of 2007 to 2018 was chosen because the timeframe contains a sudden shock in 2011, whereby an intervention by the U.K. government set regulatory targets for board gender diversity across all firms listed on the FTSE 350 index – we believe this sudden change in regulation represents an abrupt exogenous shock.

Event study design. We employ an event study design, utilizing the introduction of regulation in 2011, to help alleviate endogeneity concerns common in this setting: that companies who choose to have more women on their board are also more likely to have more women in senior management (Antonakis et al., 2010). The implementation of the regulatory target served as an external (arguably exogenous) shock that is independent of any firm level factors, which allows us to identify changes of board diversity and senior management diversity after the introduction of regulation. That is, by leveraging the time-period after regulation is introduced (i.e., 2011 to 2018), we can study the extent to which female representation in senior management may or may not have increased as a result of (exogenously) increasing female board representation through the use of regulation.

To qualify as an event study, one needs to argue that the event was largely unanticipated and no confounding factors occurred at the same time as the event occurred (Campbell, Lo, & MacKinlay, 1997). We argue these assumptions are met in our context. First, it is unlikely that the U.K. government's announcement in February 2011 was anticipated: while the government had supported annual independent reports on the gender diversity of corporate boards, conducted regularly since 1999 (e.g., Sealy, Vinnicombe, & Singh, 2008), at no prior point had there been discussion of regulatory interventions (Sealy, Doldor, Vinnicombe, Terjesen, Anderson & Atewologun, 2017). Second, we are not aware of any other confounding factor that could otherwise explain the increase in female representation that coincided with the introduction of the regulatory target in 2011: to the best of our knowledge, there was no other regulatory intervention, normative appeal or coordinated effort to increase the representation of women on boards for all FTSE 350 firms, other than the U.K. government's announcement of the 2011 regulation on board gender diversity. As a result, and consistent with advocates in prior literature (Adams, 2016; Hoffman & Lord, 2013; Sieweke & Santoni, 2020), the use of this method allows us to suggest that any change to the trickle-down effect in the post-regulation period (i.e., 2011 to 2018) could be the result of a sudden (arguably exogenous) shock of new regulation on board gender diversity.

Estimation technique

The purpose of our event study is to investigate how regulation on board gender composition influences the trickle-down effect. Our data

[8] In the U.K., the term 'senior management' is defined as individuals who were members of the Executive Committee and also their direct reports (Department for Business, Energy & Industrial Strategy, 2016).

[9] To account for the risk of percentage values producing inaccurate parameter estimates in our regressions (Certo, Busenbark, Kalm, & LePine, 2020) we repeated our analyses using the total head count of women in board and senior management positions (see Table A3).

was collected in a panel format, meaning our data is characterized as the repeated observations of a firm over time – such data is also referred to as "longitudinal" (Bliese, Schepker, Essman, & Ployhart, 2020). The data's panel structure allowed us to use ordinary least square estimation techniques, we estimated our panel models using Stata 16.0 statistical software (StataCorp, 2019).

Event study using ordinary least squares (OLS) estimation. We first investigate the variation in the trickle-down effect before and after regulation was announced in 2011. In line with prior research using an event study design (e.g., Bøhren, & Staubo, 2014; Halbesleben, Wheeler, & Paustian-Underdahl, 2013; Hale, Ployhart, & Shepherd, 2016; McFarland, Reeves, Porr, & Ployhart, 2020; Wiersema & Zhang, 2011), we dummy coded the introduction of new regulation by assigning a value of 0 to each year prior to the new regulation and a value of 1 for the years following the implementation of regulation, such that the regulation dummy is coded 0 in the pre-regulation period (2007–2010) and coded 1 in the post-regulation period (2011–2018).

Initially, to investigate the impact of regulation on the trickle-down effect, we estimate the following empirical model using an OLS regression:

$$PWSM_{it} = \beta_1 PWB_{it} + \beta_2 Regulation_t + \beta_3 PWB_{it} \times Regulation_t + \varepsilon_{it} \quad (1)$$

where i indexes firms and t indexes time. $PWSM_{it}$ is the measure of the percentage of women in senior management in firm i at time t, PWB_{it} is the percentage of female board members for firm i in year t, $Regulation_t$ is a dummy for the years before and after the introduction of regulation. To test the relationship (i.e., the "trickle down" effect) between female representation at the board and in senior management before the introduction of regulation, we examine the sign and significance of percentage of women directors on the board ($\beta_1 PWB_{it}$). To test a change in the trickle-down effect after the introduction of regulation, we examine the sign and significance of the interaction between the percentage of women on the board and the regulation dummy ($\beta_3 PWB_{it} \times Regulation_t$). Finally, ε_{it} is the error term. In line with prior research investigating the impact of regulation (e.g., Ahern & Dittmar, 2012; Yang et al., 2019), standard errors are clustered at the firm level to avoid serial correlation (Antonakis, Bastardoz, & Rönkkö, 2021; Cameron, Gelbach, & Miller, 2011; Cameron & Miller, 2015). To further validate our results, we also run additional analyses to establish the robustness of the results.

Results

Descriptive statistics

The United Kingdom's soft law regulatory target for the percentage of women at board level was set at the beginning of 2011. The new regulation, announced in February 2011, states that twenty-five percent of board members should be women. Before regulation was introduced, nineteen firms within our sample complied with the regulatory target in 2010. After the introduction of regulation, an increased number of firms complied with the voluntary target for gender diversity on boards, with over 120 firms complying with the target in 2018 (see Fig. A1 in the Appendix). Therefore, since the introduction of the regulatory target in 2011, FTSE listed firms have responded to regulation on the representation of women at board level.

While the introduction of regulation clearly intended to increase the percentage of women at board level, it is unclear to what extent the regulatory target could also impact the percentage of women in senior management positions below board level, known as a trickle-down effect. Fig. 1 presents the mean values of the percentage of women at board level and senior management positions from 2007 to 2018, including a dashed vertical line to indicate when regulation was introduced by the U.K. government in February 2011.

Amongst our sample of FTSE 350 listed firms, the average percentage of women at board level changed markedly from 8.37% in 2007 to 26.19% in 2018. As Fig. 1 shows visually, this sharp increase in the percentage of women at board level coincides with the introduction of regulation. While the percentage of women at board level remained roughly consistent during the pre-regulation period with a modest increase being observed from 8.37% during 2007 to 9.35% during 2010, the most dramatic change occurs during the post-regulation time-period: the percentage of women at board level increased from 10.43% during 2011 to 26.19% during 2018.

In contrast, the average percentage of women in senior management increased from 18.04% during 2007 to 23.34% during 2018. Unlike the change in percentage of women at board level, the increase in the percentage of women in senior management was relatively modest both during the pre-regulation period (rising from 18.04% in 2007 to 18.75% in 2010) and the post-regulation period (from 19.17% in 2011 to 23.34% in 2018), an increase of just 4.17% as opposed to 15.76% on the boards in the same period.

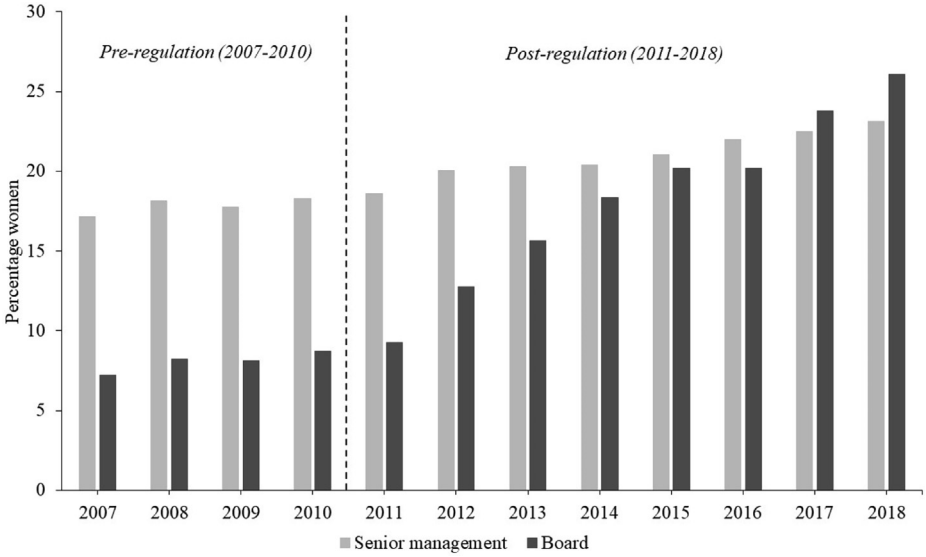

Fig. 1. The percentage of women at board level and senior management positions across the study time-period.

In sum, these descriptive results suggest several patterns. First, the (modest) percentage changes between 2007 and 2010 for women at board level and senior management roughly coincided, suggesting that they were correlated before the regulation was introduced. This is typically referred to as the trickle-down effect. Second, the regulatory target succeeded in increasing the percentage of women at board level. Third, however, the percentage of women in senior management did not increase at the same pace as the increase of female representation at board level. Put differently, the introduction of regulation could have weakened the trickle-down effect flowing from the board to senior management positions. In the next sections, we study these patterns econometrically, using OLS regressions (see Table A2 in the Appendix for summary statistics and correlation matrix of variables).

Event study of the effect of regulation on the trickle-down effect

We begin our empirical analysis using ordinary least squares (OLS) regressions to investigate the effect of the introduction of a regulation targeting female representation on boards – an exogenous shock at the beginning of 2011 – on the trickle-down effect.

First, we employ OLS regressions to investigate the relationship between the exogenous shock of regulation, the percentage women at board level, and the percentage of women in senior management positions (see Table 1).

Table 1 summarizes our results. We conduct an OLS regression for the full time-period (2007–2018) by estimating the effect of the interaction between regulation and the percentage women at board level on the outcome variable, the percentage women in senior management.

Table 1 illustrates our findings using OLS regressions. The dependent variable is the percentage of women in senior management. Table 1 presents our base model, containing only the percentage of women at board level and the regulatory target. Table 1 presents that during the pre-regulation period (2007 to 2010), the percentage of women at board level is significantly and positively associated with the percentage of women in senior management positions ($\beta = 0.352$, $p = 0.002$, SE = 0.114). While the percentage of women in senior management positions did increase between 2007 (the baseline year in the model) and 2011 (the introduction of the regulation), the interaction between the regulation dummy and women on boards is significant and negative ($\beta = -0.290$, $p = 0.006$, SE = 0.105). This negative interaction term implies that the previous (positive) association coefficient of 0.352 in the pre-regulation period is offset by the (negative) association coefficient of −0.290 in the post-regulation period, which results in a weakened relationship between women on boards and women in senior management after the (exogenous) introduction of regulation. The average marginal effects of Table 1 revealed that whilst there was a significant and positive trickle-down effect in the pre-regulation period ($\beta = 0.352$, $p = 0.002$, SE = 0.114), there was no longer a significant marginal effect of the percentage of women at board level on the percentage of women in senior management in the post-regulation period ($\beta = 0.061$, $p = 0.406$, SE = 0.073).

Table 1
OLS regressions with women in senior management (%) as the dependent variable.

	Women in Senior Management
Women on Board	.352**
	(.114)
Regulation	4.954**
	(1.535)
Regulation*Women on Board	−.290**
	(.105)
Constant	15.144**
	(1.508)
Number of firms	219
Observations	2628
R-squared	.022

Note: This table presents OLS regressions on the representation of women in senior management. Robust standard errors are clustered by firm and reported in parentheses. † p < 0.1, * p < 0.05, ** p < 0.01.

To better illustrate the implications of the interaction model presented in Table 1, we conducted another set of OLS analyses. Here, we studied the relationship between percentage of women at board level and percentage of women in senior management positions separately for each year. The year-by-year coefficients illustrate the trickle-down effect (or lack of) in every year before and after the introduction of the regulation in 2011.

As Table 2 shows, the association between women on boards and women in senior management is mostly positive and significant in the pre-regulation period (2007–2010), but then—with the introduction of regulation—the magnitude of this relationship reduces substantially and is no longer significant in any year in the post-regulation period (2011–2018). In short, Table 2 demonstrates the relationship between women on boards and women in senior management is weakened by the introduction of regulation, which suggests there is no causal link between female representation at board level and female representation in senior management.

Additional analyses

In this section, we conduct a series of additional analyses to assess the sensitivity of our results to changes in variable definitions and model specifications.

It is possible that our findings may be influenced by some forms of omitted variables, and thus the potential for omitted variable bias needs to be addressed. For instance, prior research suggests that the size of a firm is associated with women's representation in management positions (e.g., Ali et al., 2020; Bilimoria, 2006). The empirical question, therefore, is whether our results are robust to the inclusion of missing variables. Therefore, as a robustness analysis, we repeat our analyses using the following regression model in Equation (2):

$$PWSM_{it} = \beta_1 PWB_{it} + \beta_2 Regulation_t + \beta_3 PWB_{it} \times Regulation_t + \delta X_{it} + \alpha_i + \varepsilon_{it} \quad (2)$$

With δX_{it} denoting control variables that include board size, board independence, senior management size, and firm size (Ali et al., 2020; Bilimoria, 2006; Biswas et al., 2021; Gould et al., 2018; Linck et al., 2008; Matsa & Miller, 2011; Ryan & Wiggins, 2004). To further validate our results, we also hold constant firm fixed effects (α_i) to account for unobserved heterogeneity related to differences between firms. Accordingly, we go on to estimate all models with firm fixed effects and control variables.

The results presented in Table 3 show the findings are robust to the inclusion of control variables and firm fixed effects. Table 3 once again, as seen in Tables 1 and 2, exhibits that in the pre-regulation period the percentage of women at board level is significantly and positively associated with the percentage of women in senior management positions ($\beta = 0.253$, $p = 0.003$, SE = 0.085). While the interaction between the regulation dummy and women on boards is negative ($\beta = -0.146$, $p = 0.077$, SE = 0.082), meaning the trickle-down effect was weakened after the introduction of regulation. The average marginal effects of Table 3 once again show a positive trickle-down effect in the pre-regulation period ($\beta = 0.253$, $p = 0.003$, SE = 0.085) and a weaker relationship between women at board level and women in senior management in the post-regulation period ($\beta = 0.106$, $p = 0.013$, SE = 0.042). The results

Table 2
OLS regressions with women in senior management (%) as the dependent variable by year.

	Pre-regulation (2007–2010)				*Post-regulation (2011–2018)*							
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Women on Board	.373**	.458**	.372**	.192	.094	.013	−.090	−.013	−.052	.056	−.061	.117
	(.134)	(.128)	(.126)	(.121)	(.120)	(.124)	(.119)	(.136)	(.124)	(.119)	(.111)	(.140)
Constant	14.907**	13.897**	15.085**	16.942**	18.187**	20.014**	21.914**	20.840**	22.249**	20.960**	24.270**	20.255**
	(1.739)	(1.574)	(1.648)	(1.788)	(1.885)	(2.321)	(2.453)	(2.850)	(2.809)	(2.897)	(2.958)	(3.850)
Observations	219	219	219	219	219	219	219	219	219	219	219	219
R-squared	.038	.062	.043	.012	.003	.001	.002	.001	.001	.001	.002	.004

Note: This table presents OLS regressions on the representation of women in senior management for each year within our sample time-period. Robust standard errors are clustered by firm and reported in parentheses. † p < 0.1, * p < 0.05, ** p < 0.01.

Table 3
Fixed effect regressions with women in senior management (%) as the dependent variable.

	Model 1	Model 2
Women on Board	.246**	.253**
	(.085)	(.085)
Regulation	3.412**	3.336*
	(1.302)	(1.322)
Regulation*Women on Board	−.152†	−.146†
	(.082)	(.082)
Board Size		.252
		(.221)
Board Independence		3.703
		(4.513)
Senior Management Size		−.018
		(.74)
Firm Size		−2.155**
		(.904)
Constant	16.062**	18.348**
Constant	(1.046)	(4.958)
Firm fixed effect	Yes	Yes
Number of firms	219	219
Observations	2628	2628
R-squared	.032	.037

Note: This table presents fixed effect regressions on the representation of women in senior management. Robust standard errors are clustered by firm and reported in parentheses. † p < 0.1, * p < 0.05, ** p < 0.01.

of Table 3 show the trickle-down effect was weakened after the introduction of regulation, thus confirming our main results are robust to the inclusion of control variables.

Table 4 presents our findings using a time-lagged measure of the percentage of women at board level.[10] Taking advantage of the time-based structure of our dataset, we repeated our analyses using lags of one (i.e., *t*-1) and two years (i.e., *t*-2) for the percentage of women at board level – firms with data absent in lagged time-periods were removed from the analyses. The results of the regressions are consistent with our previous findings. As reported in Table 4, there was a significant and positive relationship between female board representation and women's representation in senior management when using both a one-year lag (Model 2: $\beta = 0.284$, $p = 0.001$, SE = 0.088) and a two-year lag (Model 4: $\beta = 0.288$, $p = 0.002$, SE = 0.090). The interaction between the regulation dummy and women on boards remained significant and negative, implying the relationship between women on boards and women in senior management is weakened in the post-regulation period when using a one-year lag (Model 2: $\beta = -0.193$, $p = 0.028$ SE = 0.087) and two-year lag (Model 4: $\beta = -0.186$, $p = 0.042$, SE = 0.090). Our findings therefore remain consistent when we include one-year and two-year lags between female board representation and female representation in senior management.

Table 5 presents our findings in consideration of the unitary board structures used by U.K. listed firms.[11] A unitary board structure is commonly used in most U.K. and U.S. firms, a unitary board contains a single set of directors who are either non-executive (i.e., external or outsider directors) or executive directors (i.e., management or insider directors). We replicate our analyses to consider these separate board level roles. First, we calculate the percentage of executive female directors (i.e., Women ED), we took the total number of female executive directors and divided this figure by the total number of executive directors within a board; this figure was then multiplied by one hundred. Second, we calculate the percentage of non-executive female directors (i.e., Women NED), we took the total number of female non-executive directors and divided this figure by the total number of non-executive directors within a board; this figure was then multiplied by one hundred. Initially, as reported in Table 5, there was a significant and positive trickle-down effect in the pre-regulation period when focusing on women in executive director positions (Model 2: $\beta = 0.085$, $p = 0.025$, SE = 0.037). However, the interaction between the regulation dummy and women in executive director positions is significant and negative (Model 2: $\beta = -0.111$, $p = 0.005$, SE = 0.039), meaning the trickle-down effect stemming from executive director positions was weakened after the introduction of regulation. The average marginal effects confirm that the association between women in executive director positions and women in senior management is positive and significant in the pre-regulation period ($\beta = 0.085$, p = 0.024, SE = 0.037), but then the magnitude of this relationship reduces substantially and is no longer significant in the post-regulation period ($\beta = -0.026$, $p = 0.396$, SE = 0.031). In short, there is a substantially weakened correlation between female representation in executive board level positions and female representation in senior management after the introduction of regulation in 2011.

Subsequently, when focusing on women in non-executive positions, there was a significant and positive trickle-down effect in the pre-regulation period when focusing on women in non-executive positions (Model 4: $\beta = 0.171$, $p = 0.037$, SE = 0.079). However, the interaction effect suggests the introduction of regulation had no statistically meaningful impact on the relationship between women in non-executive positions and women in senior management (Model 4: $\beta = -0.074$, p = 0.349, SE = 0.079). Taken together, the results of Table 5 suggest the introduction of regulation broke down the correlation between the representation of women in executive positions and the representation of women in senior management, whilst the relationship between women in non-executive positions and women in senior management was not weakened after the introduction of regulation.

[10] The sample used in Table 4 contains 200 firms, 19 firms from our original sample had data missing when using lags of two years (i.e., *t*-2).

[11] The sample used in Table 5 contains 195 firms, 24 firms were omitted because they had unitary boards comprising of only non-executive directors – 23 of the 24 omitted firms has a standard industrial classification description stating 'activities of investment trusts.'

Table 4
Fixed effect regressions with women in senior management (%) as the dependent variable and time lagged independent variables.

	Model 1	Model 2	Model 3	Model 4
Regulation	3.786**	3.595**	3.660**	3.496*
	(1.440)	(1.460)	(1.416)	(1.436)
Women on Board (1 year lag)	.281**	.284**		
	(.088)	(.088)		
Regulation*Women on Board (1 year lag)	−.201**	−.193**		
	(.088)	(.087)		
Women on Board (2 year lag)			.286**	.288**
			(.090)	(.090)
Regulation*Women on Board (2 year lag)			−.195*	−.186*
			(.091)	(.090)
Board Size		.171		.167
		(.211)		(.210)
Board Independence		6.932		6.831
		(4.572)		(4.577)
Senior Management Size		−.029		−.032
		(.074)		(.073)
Firm Size		−2.054*		−2.018*
		(.912)		(.937)
Constant	16.370**	17.243**	16.481**	17.391**
	(1.078)	(4.997)	(1.038)	(4.969)
Firm fixed effect	Yes	Yes	Yes	Yes
Number of firms	200	200	200	200
Observations	2400	2400	2400	2400
R-squared	.031	.036	.030	.036

Note: This table presents fixed effect regressions on the lagged representation of women in senior management. Robust standard errors are clustered by firm and reported in parentheses. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

Table 5
Fixed effect regressions with women in senior management (%) as the dependent variable, percentage of women executive directors (Women ED) and percentage of women non-executive directors (Women NED) are the independent variables.

	Model 1	Model 2	Model 3	Model 4
Regulation	4.769**	4.995**	3.999**	4.141**
	(1.027)	(1.067)	(1.346)	(1.359)
Women ED	.091*	.085*		
	(.042)	(.037)		
Regulation*Women ED	−.120**	−.111**		
	(.041)	(.039)		
Women NED			.168**	.171*
			(.081)	(.079)
Regulation*Women NED			−.089	−.074
			(.079)	(.079)
Board Size		.207		.194
		(.228)		(.229)
Board Independence		4.261		3.173
		(4.480)		(4.494)
Senior Management Size		−.069		−.091
		(.072)		(.075)
Firm Size		−1.843*		−2.467*
		(.916)		(.965)
Constant	18.133**	20.972**	16.823**	22.948**
	(.683)	(5.233)	(1.108)	(5.346)
Firm fixed effect	Yes	Yes	Yes	Yes
Number of firms	195	195	195	195
Observations	2340	2340	2340	2340
R-squared	.042	.047	.046	.054

Note: This table presents fixed effect regressions on the lagged representation of women in senior management. Robust standard errors are clustered by firm and reported in parentheses. † $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

Moreover, we conducted supplementary analyses using a different model specification and variable descriptions. Here we compute gender diversity as the total head count of women on a given board or senior management team. The count-based nature of these variables indicated that a Poisson regression may be more appropriate than OLS estimates, as regression models with count-based outcome variables are often best fit with regressions using a Poisson-like distribution assumption (Blevins, Tsang, & Spain, 2015). The results displayed in Table A3 are consistent with our prior analysis, we obtained similar results for the interaction term as above (Model 2: $\beta = -0.106$, $p = 0.001$, SE = 0.030) indicating that the trickle-down effect was weakened after the introduction of regulation.[12] The marginal effects for this interaction term reveal that the positive trickle-down effect in the pre-regulation period ($\beta = 0.159$,

[12] We would like to acknowledge that the *p* value for the interaction effect of this model is lower when the senior management size variable is excluded from the analysis, directionally the effect remains negative.

$p = 0.001$, SE = 0.031) and the trickle down-effect was weaker during the post-regulation period ($\beta = 0.053$, $p = 0.002$, SE = 0.017).

During the study time-period the voluntary target set for FTSE listed firms was revised in 2016, increasing from 25% to 33% (Department for Business, Innovation & Skills, 2015). Although our study treats the introduction of regulation in 2011, and the proceeding time-period as a post-regulation context where regulation is in effect, we check to ensure our results hold when controlling for the revision of the board gender diversity target in 2016. The results displayed in Table A4 are consistent with our main findings and show that our results remain unchanged when we control for the revision of the regulatory target in 2016.

Finally, we repeat our analyses excluding controls for board size and senior management size. Certo et al. (2020) highlight several concerns regarding the use of control variables that are related to the predictor or dependent variable. In our analyses two control variables (i.e., board size and senior management team) are also the denominator for the dependent variable (i.e., women in senior management) and predictor variable (i.e., women on board). We therefore check to ensure our results hold when excluding controls for board size and senior management size. The results displayed in Table A5 are consistent with our main findings.

Discussion

We investigate how the trickle-down effect between women on boards and women in senior management is influenced by the introduction of regulation on board gender diversity. Using an event study design, we were able to explore the trickle-down effect before and after the introduction of soft law regulation in the United Kingdom. Our findings reveal that in the pre-regulation period the representation of women at board level trickled-down and was positively related to the representation of women in senior management positions. However, the introduction of regulation on board gender composition led to a substantial weakening of that relationship. The sudden introduction of regulation on board gender composition, therefore, had the unintended consequence of weakening the relationship between the representation of women at board level and the representation of women in senior management. Thus, whilst a firm might comply with the extrinsic requirements put forward by regulation on gender diversity, this does not necessarily lead the same firm to have an intrinsic desire to also increase women's representation in senior management. We interpret this finding as suggesting the trickle-down effect observed in prior literature is *not* causal, but instead driven by endogenous factors in the non-regulated environment where the same unobserved factors (e.g., firm level policies to increase women in management positions) are at play regarding the relationship between women's representation in both board and senior management roles, which is no longer the case when regulation becomes the driving factor for women on boards.

Implications for research and practice

Our results are relevant to academics, investors, stakeholders, and policy makers. This study presents evidence on the impact of regulation on board gender diversity, introduced in the United Kingdom. Other countries have also introduced regulation on board gender diversity (e.g., Germany, France, Italy, Spain, Belgium, and the Netherlands). Our results contradict the implicit and widespread belief that regulatory interventions facilitate the trickle-down effect (e.g., Department for Business, Innovation & Skills, 2015; Matsa & Miller, 2011). Furthermore, our results hint at the possibility that the trickle-down effect may vary across different contexts and settings, matching the pattern in the prior literature that the trickle-down effect tends to be more robust in settings without regulation on board gender composition (Bertrand et al., 2019).

This study also extends prior research on the trickle-down effect by investigating the impact of the sudden (arguably exogenous) introduction of regulation. Prior research investigating the trickle-down effect provided clues regarding the impact of regulatory change. For instance, no trickle-down effect was observed during the extended period in which the Norwegian board gender diversity quota was introduced (Bertrand et al., 2019). However, the U.K. context could be considered substantively different. In the present study, we find evidence suggesting that the sudden and unprecedented change in regulation on board gender diversity substantially weakens a pre-existing trickle-down effect that occurred between the board and senior management. Our results contribute to the increasing body of research investigating the factors influencing the trickle-down effect (Ali et al., 2020; Bertrand et al., 2019; Biswas, Chapple, Roberts, and Stainback, 2021; Biswas, Roberts, & Stainback, 2021; Gould et al., 2018). Specifically, this study's contribution shows how a previously established trickle-down effect is negatively impacted by the introduction of regulation on board gender diversity – implying that the trickle-down effect observed in a non-regulated environment is endogenous, driven by unobserved factors that influence both women on boards and women in senior management.

Our results, therefore, do not support the view that regulatory interventions to increase women on boards leads to a strengthening of the trickle-down effect. This assumption is grounded in traditional theories of ingroup preference that suggest women, and men, prefer to socialize, interact, and work with same gender others (e.g., Byrne, 1971; Ibarra, 1993). Rather, our results suggest that regulation weakens the trickle-down effect, supporting the notion that regulation does not guarantee an improvement in gender diversity at board level will also extend to senior management positions (Bertrand et al., 2019; Gould et al., 2018). Hence, our results suggest that whilst firms conform with the priorities and pursuit of meeting targets (or quotas) on board gender diversity, the introduction of regulation will lead to a breakdown in the relationship between women on boards and women in senior management.

This study also contributes to literature on the impact of regulation on board gender diversity. To date, literature exploring the impact of regulation has mainly focused on the Norwegian quota (e.g., Ahern & Dittmar, 2012; Bertrand et al., 2019; Seierstad & Opsahl, 2011). Although this body of literature has done much to contribute towards our understanding of regulation, we believe the particular nature of the Norwegian governance and socio-political environment, should be given greater consideration by researchers. Specifically, listed Norwegian firms have boards comprising of supervisory (i.e., non-executive/outsider) directors and have no representation from firm management. This is distinct from the unitary board structures used in most anglophone countries across the globe. Therefore, the Norwegian gender quota was directed towards supervisory directors only. We suggest that any regulatory intervention at board level is less likely to have an impact on management structures within Norwegian firms, as executive directors (i.e., senior management) would not be present within the board nor have much contact with the newly diversified directors. This negates accepted explanations of trickle-down, such as the similarity attraction paradigm (Byrne, 1971), social identity theory (Tajfel & Turner, 1979), homosocial reproduction (Kanter, 1977), and homophily (Ibarra, 1993), as supervisory directors are not involved with the hiring or promotion of senior managers (Cohen et al., 1998). We believe the context of the Norwegian governance system, and more egalitarian socio-political environment, could have important implications for research on the impact of regulation, especially with respect to research on trickle-down effects. Our study therefore presents the United Kingdom as a contrasting empirical context. The unprecedented soft law regulation introduced in the United Kingdom's more neoliberal free-market business context arguably qualifies

as an exogenous shock, as it was abruptly introduced in 2011 with very little warning. The regulatory intervention in the United Kingdom targeted unitary boards comprising of both non-executive and executive directors, who are engaged with management on a day-to-day operational basis. Therefore, there is reason to suspect regulation affecting the composition of the board is more likely to impact on lower-level management structures within regulated firms. Thus, rather than focusing on the notable Norwegian case, our use of regulation in the United Kingdom meant we were able to investigate how the introduction of regulation impacted the trickle-down effect.

Finally, our findings also have two important implications for policy makers, investors, and other stakeholders. Our results suggest that regulation on board gender composition is associated with a disconnect between women's representation between the corporate board and senior management team. Policymakers could resolve this issue by increasing the relevance of regulation for management teams located below board level. For instance, this could be achieved through setting soft law or hard law regulation on the representation of women in the senior leadership positions below board level (also suggested by Klettner, Clarke, & Boersma, 2016). Second, the representation of women at board level has traditionally been used as an indication to establish if a firm engages in acceptable social and ethical corporate practice concerning the issue of gender diversity, in national environments where regulation on board gender diversity has been implemented (for a review, see, Terjesen et al., 2015). Our results suggest that when women's representation on a firm's board is regulated, either through the use of soft law or hard law, the representation of women on boards could reflect a less accurate measure of a firm's orientation towards the promotion of gender diversity within the workplace. This could be the result of "window dressing", where a firm complies with regulation on board gender diversity to gain recognition and praise, when in fact below board level they do not fully endorse or internalize these efforts. Therefore, investors and other stakeholders should consider the representation of women in other (non-regulated) senior positions below board level, such as the senior management team, as a more accurate measure of a firm's orientation to promote gender diversity.

Future directions and limitations

Much more remains to be explored concerning how trickle-down effects are impacted by exogenous shocks. While our findings address the consequences of regulation on board gender composition, it is possible that other exogenous shocks external to the firm could have an impact on trickle-down effects between the board and lower management levels. For example, unexpected global natural disasters, economic recessions, pandemics, or disclosures of sexual misconduct (e.g., #MeToo) could have important implications for the endogenous trickle-down effect existing between the board and lower-level management teams. Exploring the impact of exogenous shocks may be a fruitful area for future research, particularly given the existing literature on trickle-down effects has largely neglected to explore how external events can influence the trickle-down of behaviors, attitudes, perceptions, or representation of women between management levels. Thus, our findings suggest that exogenous shocks, or change events (Hoffman & Ocasio, 2001), in a firm's external environment could influence trickle-down phenomena.

In the present study we explore the impact of regulation on the trickle-down effect. This presents an opportunity for future research to further explore the mechanisms explaining why regulation has an impact on the trickle-down effect. At present, it remains unclear if individual firms who showed the trickle-down effect in the pre-regulation period continued to display the trickle-down effect after regulation is introduced. Future research could address this by performing a comparative study investigating the impact of the exogenous shock on the trickle-down effect between 'firms who have an intrinsic interest in gender diversity' versus 'firms who are merely complying with regulation'. Insights from literature on institutional decoupling (for a review see, Bromley & Powell, 2012) could provide a lens through which to investigate this comparison between firms. An investigation into the mechanisms driving the findings observed in the present study could reflect a useful and insightful area of future investigation in this field of research.

We want to acknowledge some limitations in our study which could inform future research. First, our study focuses on a very specific context, the implementation of soft law regulation in the U.K. – where listed firms are recommended to comply with voluntary targets on female representation at board level. Therefore, it remains unclear if our results are generalizable to other countries, such as Germany or Italy, where mandatory hard law regulation has been implemented (Terjesen et al., 2015). In such contexts, where firms are punished for non-compliance with regulatory quotas, boards face increased coercive pressure to comply with the demands of external regulation on board gender composition, and, consequently, this may further exacerbate the disconnect in the representation of women between the corporate board and senior management team. Thus, future research could investigate if our arguments hold in other national environments that have implemented alternative forms of regulation to those used in the United Kingdom.

Second, due to constraints accessing data on the representation of women below senior management positions, we were not able to investigate the trickle-down effect between board level and management positions further down the firm (e.g., middle management). In time, however, data on gender diversity across the corporate hierarchy may become available to researchers, allowing a deeper analysis into the trickle-down effects stemming from women's representation at board level.

Third, we acknowledge the analyses used in our study do not completely solve endogeneity issues associated with our independent variable, the representation of women on boards. Even though there might be reasons to believe our analytical approach, leveraging the argued exogenous shock, suffers from less endogeneity problems than other methods that rely purely on correlational approaches (Bun & Harrison, 2019), several variables in our analysis do correlate with the independent variable (see Table A2) and we express caution regarding the causal interpretation of our results. A similar limitation is also present in our analysis of the time-lag variables, where causality cannot be inferred directly. We therefore recommend future research in this area employs additional (quasi-) exogenous methods (see, Antonakis et al., 2010; Matsa & Miller, 2013; Yang et al., 2019) such that only a treatment group is causally affected by the exogenous variation (but not a comparable control group), to resolve endogeneity problem issues and establish causal effects.

Furthermore, as a result of explicitly leveraging the exogenous shock in the empirical context of the U.K. alone, we were unable to exclude unobserved confounds at the year level in our analyses – meaning we were unable to separate the causal impact of the impact of regulation from other macro year-level factors. Future research could alleviate this issue by using empirical methods (see, Yang et al., 2019) that would allow the inclusion of year fixed effects in regressions, thus controlling for unobserved heterogeneity across years within the study time period.

Finally, the European Commission Directive on improving the gender balance among directors of listed companies, originally proposed in 2012, reached an agreement in June 2022 such that 40% of non-executives on supervisory boards, or 33% of unitary board directors, must be of the "under-represented sex" by June 2026 (European Commission, 2022). This, then, may present more opportunities for academics to investigate and follow the changes in board composition and their trickle-down effects in multiple national contexts.

Conclusion

Our aim in this study was to explore the impact of regulation on the trickle-down effect. Specifically, our findings show that regulation weakens the trickle-down effect. Using the sudden introduction of regulation for FTSE listed firms in the United Kingdom, we provide evidence showing the trickle-down effect existed before regulation was introduced and was substantially weakened once regulation was implemented. Thus, by implementing regulation on board gender diversity, national regulators may inadvertently weaken the endogenous trickle-down effect that previously existed between the representation of women at board level and the representation of women in senior management.

Data availability

The data and code will be shared in a public repository. Data and code will also be made available on request - please follow link (https://osf.io/pktuc/?view_only=d6644c5436e44592b701e31f0ce39108).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

We thank our editors Professor Philippe Jacquart and Professor Jost Sieweke, method advisor, and two anonymous reviewers for their helpful comments on this paper. This work was supported by the UK Research and Innovation Future Leaders Fellowship (No. MR/T020253/1) awarded to O.P. Hauser and the Bateman Family Charitable Trust Studentship awarded to A.C. Page.

Appendix A

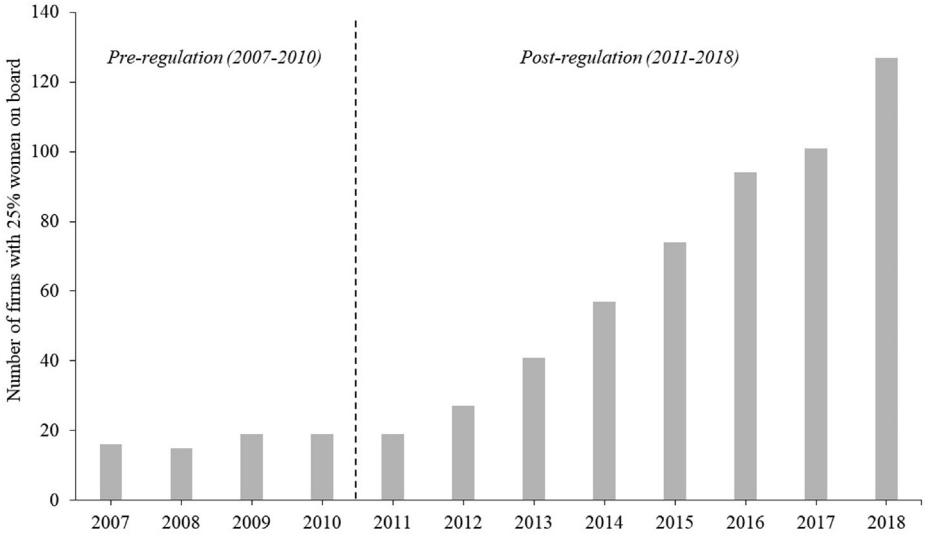

Fig. A1. The number of firms with women representing twenty-five percent of board level positions.

Table A1
Examples of most frequent senior management roles.

Senior Management Role	Frequency of Occurrence (n)
Senior Vice President	66
Vice President	60
Executive Vice President	44
General Council	37
Group Director	35
Division Chief	29
Chief Information Director	26
Investor Relations Director	23
Regional Director	15
Chief Technology Director	14
Corporate Development Director	14
Chief Marketing Director	11
Division Executive	11
Marketing Officer	11

Note: This table presents examples of the most frequent senior manager roles retrieved from the BoardEx database. A total of 1359 unique senior manager roles were identified across all firms.

Table A2
Descriptive statistics and correlations.

	Mean	SD	1	2	3	4	5	6	7
1. Women Snr. Mgmt.	20.234	16.610	–						
2. Women on Board	15.409	11.491	.117**	–					
3. Regulation	.666	.471	.086**	.413**	–				
4. Board Size	9.912	2.914	.136**	.162**	.008	–			
5. Senior Management Size	14.608	13.820	.094**	.280**	.161**	.530**	–		
6. Board Independence	.700	.147	−.092*	−.211**	.191**	−.203**	.059**	–	
7. Firm Size	3.355	1.425	.119**	.131**	.036*	.512**	.428**	−.410**	–

Note: † p < 0.1, * p < 0.05, ** p < 0.01.

Table A3
Fixed effect Poisson regressions with the number of women in senior management as the dependent variable.

	Model 1	Model 2
Women on Board	.113**	.159**
	(.035)	(.031)
Regulation	.393**	.347**
	(.088)	(.057)
Regulation*Women on Board	−.011	−.106**
	(.033)	(.030)
Board Size		.007
		(.008)
Senior Management Size		.023**
		(.003)
Board Independence		.457*
		(.191)
Firm Size		−.040
		(.46)
Firm fixed effect	Yes	Yes
Number of firms	201	201
Observations	2412	2412
Wald test	145.010**	171.650**

Note: n = 201, 18 firms dropped because of all zero outcomes. This table presents fixed effect Poisson regressions on the representation of women in senior management. Robust standard errors are reported in parentheses. † p < 0.1, * p < 0.05, ** p < 0.01.

Table A4
Fixed effect regressions with women in senior management (%) as the dependent variable, controlling for revision of voluntary targets in 2016.

	Model 1	Model 2
Women on Board	.225**	.232**
	(.087)	(.087)
Regulation	3.560**	3.569**
	(1.302)	(1.534)
Regulation*Women on Board	−.175*	−.169*
	(.081)	(.081)
Board Size		.243
		(.219)
Senior Management Size		−.029
		(.219)
Board Independence		2,528
		(.960)
Firm Size		−2.340*
		(.960)
Post 2016 Dummy	2.008**	2.147**
	(.751)	(.753)
Constant	16.245**	20.123**
	(1.048)	(5.025)
Firm fixed effect	Yes	Yes
Number of firms	219	219
Observations	2628	2628
R-squared	.036	.042

Note: This table presents fixed effect regressions on the representation of women in senior management. Robust standard errors are clustered by firm and reported in parentheses. † p < 0.1, * p < 0.05, ** p < 0.01.

Table A5
Fixed effect regressions with women in senior management (%) as the dependent variable.

	Women in Senior Management
Women on Board	.255**
	(.085)
Regulation	3.342*
	(1.309)
Regulation*Women on Board	−.149†
	(.082)
Board Independence	2.831
	(4.522)
Firm Size	−2.078*
	(.912)
Constant	20.940**
	(4.440)
Firm fixed effect	Yes
Number of firms	219
Observations	2628
R-squared	.036

Note: This table presents fixed effect regressions on the representation of women in senior management. Robust standard errors are clustered by firm and reported in parentheses. † p < 0.1, * p < 0.05, ** p < 0.01.

References

Abbott, K. W., & Snidal, D. (2000). Hard and soft law in international governance. *International Organization, 54*, 421–456.

Adams, R. B. (2016). Women on boards: The superheroes of tomorrow? *The Leadership Quarterly, 27*, 371–386.

Adams, R. B., & Ferreira, D. (2009). Women in the boardroom and their impact on governance and performance. *Journal of Financial Economics, 94*, 291–309.

Ahern, K. R., & Dittmar, A. K. (2012). The changing of the boards: The impact on firm valuation of mandated female board representation. *The Quarterly Journal of Economics, 127*, 137–197.

Ali, M., Grabarski, M. K., & Konrad, A. M. (2020). Trickle-down and bottom-up effects of women's representation in the context of industry gender composition: A panel data investigation. *Human Resource Management, 60*, 559–580.

Ambrose, M. L., Schminke, M., & Mayer, D. M. (2013). Trickle-down effects of supervisor perceptions of interactional justice: A moderated mediation approach. *Journal of Applied Psychology, 98*, 678–689.

Antonakis, J., Bastardoz, N., & Rönkkö, M. (2021). On ignoring the random effects assumption in multilevel models: Review, critique, and recommendations. *Organizational Research Methods, 24*, 443–483.

Antonakis, J., Bendahan, S., Jacquart, P., & Lalive, R. (2010). On making causal claims: A review and recommendations. *The Leadership Quarterly, 21*, 1086–1120.

Arnaboldi, F., Casu, B., Kalotychou, E., & Sarkisyan, A. (2020). Board diversity reforms: Do they matter for EU bank performance? *European Financial Management, 26*, 416–454.

Aryee, S., Chen, Z. X., Sun, L. Y., & Debrah, Y. A. (2007). Antecedents and outcomes of abusive supervision: Test of a trickle-down model. *Journal of Applied Psychology, 92*, 191–201.

Australian Institute of Company Directors. (2010). *New corporate governance recommendations on diversity*. Retrieved from http://www.companydirectors.com.au/~/media/resources/director-resource-centre/policy-on-director-issues/2010/submissions/asx-corporate-governance-recommendations-on-diversity-tips-for-getting-started.ashx.

Bass, B. M., Waldman, D. A., Avolio, B. J., & Bebb, M. (1987). Transformational leadership and the falling dominoes effect. *Group & Organization Studies, 12*, 73–87.

Bennouri, M., De Amicis, C., & Falconieri, S. (2020). Welcome on board: A note on gender quotas regulation in Europe. *Economics Letters, 190* 109055.

Bernile, G., Bhagwat, V., & Rau, P. R. (2017). What doesn't kill you will only make you more risk-loving: Early-life disasters and CEO behavior. *The Journal of Finance, 72*, 167–206.

Bertrand, M., Black, S. E., Jensen, S., & Lleras-Muney, A. (2019). Breaking the glass ceiling? The effect of board quotas on female labour market outcomes in Norway. *The Review of Economic Studies, 86*, 191–239.

Bilimoria, D. (2006). The relationship between women corporate directors and women corporate officers. *Journal of Managerial Issues, 18*, 47–61.

Biswas, P. K., Chapple, L., Roberts, H., & Stainback, K. (2021). Board gender diversity and women in senior management. *Journal of Business Ethics*. https://doi.org/10.1007/s10551-021-04979-x.

Biswas, P. K., Roberts, H., & Stainback, K. (2021). Does women's board representation affect non-managerial gender inequality? *Human Resource Management, 60*, 659–680.

Blevins, D. P., Tsang, E. W., & Spain, S. M. (2015). Count-based research in management: Suggestions for improvement. *Organizational Research Methods, 18*, 47–69.

Bliese, P. D., Schepker, D. J., Essman, S. M., & Ployhart, R. E. (2020). Bridging methodological divides between macro-and microresearch: Endogeneity and methods for panel data. *Journal of Management, 46*, 70–99.

Bøhren, Ø., & Staubo, S. (2014). Does mandatory gender balance work? Changing organizational form to avoid board upheaval. *Journal of Corporate Finance, 28*, 152–168.

Bormann, K. C., & Diebig, M. (2021). Following an uneven lead: Trickle-down effects of differentiated transformational leadership. *Journal of Management, 47*, 2105–2134.

Bozhinov, V., Joecks, J., & Scharfenkamp, K. (2021). Gender spillovers from supervisory boards to management boards. *Managerial and Decision Economics, 42*, 1317–1331.

Bromley, P., & Powell, W. W. (2012). From smoke and mirrors to walking the talk: Decoupling in the contemporary world. *Academy of Management Annals, 6*, 483–530.

Bun, M. J., & Harrison, T. D. (2019). OLS and IV estimation of regression models including endogenous interaction terms. *Econometric Reviews, 38*, 814–827.

Byrne, D. (1971). *The attraction paradigm*. New York: Academic Press.

Cameron, A. C., Gelbach, J. B., & Miller, D. L. (2011). Robust inference with multiway clustering. *Journal of Business & Economic Statistics, 29*, 238–249.

Cameron, A. C., & Miller, D. L. (2015). A practitioner's guide to cluster-robust inference. *Journal of Human Resources, 50*, 317–372.

Campbell, J. Y., Lo, A. W., & MacKinlay, A. C. (1997). Event-study analysis. In J. Y. Campbell, A. W. Lo, & A. C. MacKinlay (Eds.), *The Econometrics of Financial Markets* (pp. 149–180). Princeton: Princeton University Press.

Carbonero, F., Devicienti, F., Manello, A., & Vannoni, D. (2021). Women on board and firm export attitudes: Evidence from Italy. *Journal of Economic Behavior & Organization, 192*, 159–175.

Certo, S. T., Busenbark, J. R., Kalm, M., & LePine, J. A. (2020). Divided we fall: How ratios undermine research in strategic management. *Organizational Research Methods, 23*, 211–237.

Cohen, L. E., Broschak, J. P., & Haveman, H. A. (1998). And then there were more? The effect of organizational sex composition on the hiring and promotion of managers. *American Sociological Review, 63*, 711–727.

Cook, A., & Glass, C. (2015). Diversity begets diversity? The effects of board composition on the appointment and success of women CEOs. *Social Science Research, 53*, 137–147.

De Cabo, R. M., Terjesen, S., Escot, L., & Gimeno, R. (2019). Do 'soft law' board gender quotas work? Evidence from a natural experiment. *European Management Journal, 37*, 611–624.

Department for Business, Energy & Industrial Strategy. (2016). *Hampton-Alexander review: FTSE women leaders*. Retrieved from https://www.gov.uk/government/publications/ftse-women-leaders-hampton-alexander-review.

Department for Business, Energy & Industrial Strategy. (2021). *FTSE women leaders review 2021: achieving gender balance*. Retrieved from https://ftsewomenleaders.com/wp-content/uploads/2022/02/2021-FTSE-Women-Leaders-Review-Final-Report.pdf.

Department for Business, Innovation & Skills. (2011). *Women on boards*. Retrieved from https://www.gov.uk/government/news/women-on-boards.

Department for Business, Innovation & Skills. (2012). *Women on boards*. Retrieved from https://www.gov.uk/government/publications/women-on-ftse-company-boards.

Department for Business, Innovation & Skills. (2015). *Women on boards: 5 year summary*. Retrieved from https://www.gov.uk/government/publications/women-on-boards-5-year-summary-davies-review.

Derks, B., Van Laar, C., & Ellemers, N. (2016). The queen bee phenomenon: Why women leaders distance themselves from junior women. *The Leadership Quarterly, 27*, 456–469.

Doldor, E., Sealy, R., & Vinnicombe, S. (2016). Accidental activists: Headhunters as marginal diversity actors in institutional change towards more women on boards. *Human Resource Management Journal, 26*, 285–303.

Doldor, E., Vinnicombe, S., Gaughan, M., & Sealy, R. (2012). *Gender diversity on boards: The appointment process and the role of executive search firms. Manchester: Equality and Human Rights Commission*.

Eckbo, B. E., Nygaard, K., & Thorburn, K. S. (2022). Valuation effects of Norway's board gender-quota law revisited. *Management Science, 68*, 4112–4134.

Ellemers, N., Van den Heuvel, H., De Gilder, D., Maass, A., & Bonvini, A. (2004). The underrepresentation of women in science: Differential commitment or the queen bee syndrome? *British Journal of Social Psychology, 43*, 315–338.

European Commission. (2022). *Commission welcomes political agreement on Gender Balance on Corporate Boards*. Retrieved from https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3478.

Ferrari, G., Ferraro, V., Profeta, P., & Pronzato, P. (2021). Do board gender quotas matter? Selection, performance, and stock market effects. *Management Science*. https://doi.org/10.1287/mnsc.2021.4200.

Financial Reporting Council. (2014). *The UK Corporate Governance Code*. Retrieved from https://www.frc.org.uk/getattachment/59a5171d-4163-4fb2-9e9d-daefcd7153b5/UK-Corporate-Governance-Code-2014.pdf.

Forbes, M. (2011). *How to add more women to corporate boards*. Retrieved from https://www.forbes.com/sites/moiraforbes/2011/03/07/how-to-add-more-women-to-corporate-boards/?sh=6d1d4866692c.

Garcia-Blandon, J., Argilés-Bosch, J. M., Ravenda, D., & Castillo-Merino, D. (2022). Board gender quotas, female directors and corporate tax aggressiveness: A causal approach. *International Review of Financial Analysis, 79* 102010.

Gatti, L., Vishwanath, B., Seele, P., & Cottier, B. (2019). Are we moving beyond voluntary CSR? Exploring theoretical and managerial implications of mandatory CSR resulting from the new Indian companies act. *Journal of Business Ethics, 160*, 961–972.

Gould, J. A., Kulik, C. T., & Sardeshmukh, S. R. (2018). Trickle-down effect: The impact of female board members on executive gender diversity. *Human Resource Management, 57*, 931–945.

Grosvold, J., & Brammer, S. (2011). National institutional systems as antecedents of female board representation: An empirical study. *Corporate Governance: An International Review, 19*, 116–135.

Halbesleben, J. R., Wheeler, A. R., & Paustian-Underdahl, S. C. (2013). The impact of furloughs on emotional exhaustion, self-rated performance, and recovery experiences. *Journal of Applied Psychology, 98*, 492–503.

Hale, D., Ployhart, R. E., & Shepherd, W. (2016). A two-phase longitudinal model of a turnover event: Disruption, recovery rates, and moderators of collective performance. *Academy of Management Journal, 59*, 906–929.

Hoffman, A. J., & Ocasio, W. (2001). Not all events are attended equally: Toward a middle-range theory of industry attention to external events. *Organization Science, 12*, 414–434.

Hoffman, E. L., & Lord, R. G. (2013). A taxonomy of event-level dimensions: Implications for understanding leadership processes, behavior, and performance. *The Leadership Quarterly, 24*, 558–571.

Ibarra, H. (1993). Personal networks of women and minorities in management: A conceptual framework. *Academy of Management Review, 18*, 56–87.

Kanter, R. M. (1977). *Men and women of the corporation*. New York: Basic Books.

Kirsch, A. (2018). The gender composition of corporate boards: A review and research agenda. *The Leadership Quarterly, 29*, 346–364.

Klettner, A., Clarke, T., & Boersma, M. (2016). Strategic and regulatory approaches to increasing women in leadership: Multilevel targets and mandatory quotas as levers for cultural change. *Journal of Business Ethics, 133*, 395–419.

Lara, J. M. G., Penalva, J., & Scapin, M. (2022). Financial reporting quality effects of imposing (gender) quotas on boards of directors. *Journal of Accounting and Public Policy, 41* 106921.

Linck, J. S., Netter, J. M., & Yang, T. (2008). The determinants of board structure. *Journal of Financial Economics, 87*, 308–328.

Matsa, D. A., & Miller, A. R. (2011). Chipping away at the glass ceiling: Gender spillovers in corporate leadership. *American Economic Review, 101*, 635–669.

Matsa, D. A., & Miller, A. R. (2013). A female style in corporate leadership? Evidence from quotas. *American Economic Journal: Applied Economics, 5*, 136–169.

Mawritz, M. B., Mayer, D. M., Hoobler, J. M., Wayne, S. J., & Marinova, S. V. (2012). A trickle-down model of abusive supervision. *Personnel Psychology, 65*, 325–357.

Mayer, D. M., Kuenzi, M., Greenbaum, R., Bardes, M., & Salvador, R. B. (2009). How low does ethical leadership flow? Test of a trickle-down model. *Organizational Behavior and Human Decision Processes, 108*, 1–13.

McFarland, L. A., Reeves, S., Porr, W. B., & Ployhart, R. E. (2020). Impact of the COVID-19 pandemic on job search behavior: An event transition perspective. *Journal of Applied Psychology, 105*, 1207–1217.

Meyer, A. D. (1982). Adapting to environmental jolts. *Administrative Science Quarterly, 27*, 515–537.

Nekhili, M., Gull, A. A., Chtioui, T., & Radhouane, I. (2020). Gender-diverse boards and audit fees: What difference does gender quota legislation make? *Journal of Business Finance & Accounting, 47*, 52–99.

Peev, G. (2011). *Government quota threat to firms that fail to appoint 25% female boards*. Retrieved from https://www.dailymail.co.uk/news/article-1359983/Women-boardroom-companies-increase-face-Government-quotas.html.

Post, C., & Byron, K. (2015). Women on boards and firm financial performance: A meta-analysis. *Academy of Management Journal, 58*, 1546–1571.

Ryan, H. E., & Wiggins, R. A. (2004). Who is in whose pocket? Director compensation, board independence, and barriers to effective monitoring. *Journal of Financial Economics, 73*, 497–524.

Sealy, R., & Vinnicombe, S. (2012a). *Women on Boards: Benchmarking early adopters of the Corporate Governance Code 2012*. Cranfield: Cranfield University School of Management.

Sealy, R., & Vinnicombe, S. (2012b). *The female FTSE board report 2012: Milestone or millstone?* Cranfield: Cranfield University School of Management.

Sealy, R., Doldor, E., Singh, V., & Vinnicombe, S. (2011). *Women on boards: 6 month monitoring report*. Cranfield: Cranfield University School of Management.

Sealy, R., Doldor, E., Vinnicombe, S., Terjesen, S., Anderson, D., & Atewologun, D. (2017). Expanding the notion of dialogic trading zones for impactful research: The case of women on boards research. *British Journal of Management, 28*, 64–83.

Sealy, R., Doldor, E., & Vinnicombe, S. (2016). *The female FTSE board report 2016*. Cranfield: Cranfield University School of Management.

Sealy, R., Turner, C., Pryce, P., & Vinnicombe, S. (2014). *Women on boards: Progress following the 2012 corporate governance code*. Cranfield: Cranfield University School of Management.

Sealy, R., Vinnicombe, S., & Singh, V. (2008). *The female FTSE report 2008*. Cranfield: Cranfield University School of Management.

Sealy, R., & Vinnicombe, S., & Singh, V. (2018). The pipeline to the board finally opens: Women's progress on FTSE 100 boards in the UK. In S. Vinnicombe, V. Singh, R. Burke, D. Bilimoria, & M. Huse (Eds.), *Women on Corporate Boards of Directors: International Research and Practice* (pp. 37–46). Cheltenham: Edward Elgar.

Seierstad, C., & Opsahl, T. (2011). For the few not the many? The effects of affirmative action on presence, prominence, and social capital of women directors in Norway. *Scandinavian Journal of Management, 27*, 44–54.

Shanock, L. R., & Eisenberger, R. (2006). When supervisors feel supported: Relationships with subordinates' perceived supervisor support, perceived organizational support, and performance. *Journal of Applied Psychology, 91*, 689–695.

Sieweke, J., & Santoni, S. (2020). Natural experiments in leadership research: An introduction, review, and guidelines. *The Leadership Quarterly, 31* 101338.

Skaggs, S., Stainback, K., & Duncan, P. (2012). Shaking things up or business as usual? The influence of female corporate executives and board of directors on women's managerial representation. *Social Science Research, 41*, 936–948.

Sojo, V. E., Wood, R. E., Wood, S. A., & Wheeler, M. A. (2016). Reporting requirements, targets, and quotas for women in leadership. *The Leadership Quarterly, 27*, 519–536.

StataCorp, (2019). *Stata statistical software: Release 16*. College Station: StataCorp LLC.

Stoker, J. I., Garretsen, H., & Soudis, D. (2019). Tightening the leash after a threat: A multi-level event study on leadership behavior following the financial crisis. *The Leadership Quarterly, 30*, 199–214.

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In W. G. Austin & S. Worchel (Eds.), *The social psychology of intergroup relations* (pp. 33–48). Monterey: Brooks/Cole.

Tepper, B. J., & Taylor, E. C. (2003). Relationships among supervisors' and subordinates' procedural justice perceptions and organizational citizenship behaviors. *Academy of Management Journal, 46*, 97–105.

Terjesen, S., & Sealy, R. (2016). Board gender quotas: Exploring ethical tensions from a multi-theoretical perspective. *Business Ethics Quarterly, 26*, 23–65.

Terjesen, S., Aguilera, R. V., & Lorenz, R. (2015). Legislating a woman's seat on the board: Institutional factors driving gender quotas for boards of directors. *Journal of Business Ethics, 128*, 233–251.

Terjesen, S., Couto, E. B., & Francisco, P. M. (2016). Does the presence of independent and female directors impact firm performance? A multi-country study of board diversity. *Journal of Management & Governance, 20*, 447–483.

Terjesen, S., Sealy, R., & Singh, V. (2009). Women directors on corporate boards: A review and research agenda. *Corporate Governance: An International Review, 17*, 320–337.

Vinnicombe, S., Doldor, E., & Sealy, R. (2018). *The female board report 2018*. Cranfield: Cranfield University School of Management.

Vinnicombe, S., De Largy, C., Tessaro, M., Battista, V., & Anderson, D. (2021). *The female FTSE board report 2021: Inclusion works for everyone*. Cranfield: Cranfield University School of Management.

Wang, M., & Kelan, E. (2013). The gender quota and female leadership: Effects of the Norwegian gender quota on board chairs and CEOs. *Journal of Business Ethics, 117*, 449–466.

Wiersema, M. F., & Zhang, Y. (2011). CEO dismissal: The role of investment analysts. *Strategic Management Journal, 32*, 1161–1182.

Wo, D. X., Schminke, M., & Ambrose, M. L. (2019). Trickle-down, trickle-out, trickle-up, trickle-in, and trickle-around effects: An integrative perspective on indirect social influence phenomena. *Journal of Management, 45*, 2263–2292.

Yang, P., Riepe, J., Moser, K., Pull, K., & Terjesen, S. (2019). Women directors, firm performance, and firm risk: A causal perspective. *The Leadership Quarterly, 30* 101297.