Board gender quotas, female directors and corporate tax aggressiveness: A causal approach

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Abstract

As a result of a mandatory board gender quota regulation, the percentage of female directors in Norway increased from around 5% in 2001 to over 40% in 2007, while it remained stable in neighbouring Denmark. Taking advantage of this unique research setting, this study implements a difference-in-differences approach to investigate the effects of the gender composition of the board of directors on corporate tax aggressiveness. Results indicate that the likelihood of corporate tax aggressive strategies increased in Norway after the appointment of many female directors, compared to the situation in Denmark. This finding is robust to a battery of sensitivity analyses and, in particular, to how corporate tax aggressiveness is measured. We interpret this result as caused by the way in which the incorporation of women to the boards was achieved, that is, through a mandatory board gender quota regulation. Possible implications of the findings are discussed.

Key-words: female directors; gender quotas; tax aggressiveness; difference-in-differences.

JEL: G30; M14.

1. Introduction

Lack of gender diversity in senior management is one of the main challenges facing corporations today. For example, achieving gender equality in leadership figures prominently in the United Nations' Agenda for Sustainable Development as well as in the European Union's Gender Equality Strategy 2020-2025. Many countries have adopted different types of regulations with the aim of increasing the presence of women on boards of directors (hereinafter "BoDs") (Aguilera & Cuervo-Cazurra, 2004). As the most controversial of these regulations, the

enactment of mandatory board gender quotas is surrounded by heated and polarized debate (Teigen, 2016). Encouraged by the real-life relevance of this topic, there is increased research interest to studying the possible implications of board gender diversity and board gender quotas on firm performance (e.g., Ahern & Dittmar, 2012; Matsa & Miller, 2013; Yang et al., 2019). However, as we discuss in the next section of the article, board gender diversity and gender quotas can also affect the likelihood of corporate tax aggressive strategies.

The very concept of tax aggressiveness is controversial, and terms such as tax avoidance and tax aggressiveness are often used in the literature as substitutes for each other (Frank et al., 2009). Hanlon & Heitzman (2010) note the absence of universally accepted definitions of, or constructs for these concepts, and that they mean different things to different people. As the main references of our study (Chen et al., 2019; Deslandes et al., 2021; Lanis et al., 2017; Richardson et al., 2016) we refer to tax aggressiveness, and adopt Hanlon & Heitzman's (2010) broad definition as the reduction in explicit taxes paid by the firm. By this definition, tax aggressiveness represents a range of tax planning strategies along the continuum between activities that are perfectly legal and illegal activities, with the entire grey area in the middle. Therefore, while our definition of tax aggressiveness does not necessarily imply any illegal behaviour by the firm (as the reduction of tax expenses could simply indicate that the firm has an efficient and competent tax department), it definitely includes such possibility. Furthermore, as usual in the related literature, the study focuses on income tax aggressiveness, and consequently, more specific forms of corporate tax aggressiveness, such as labour tax aggressiveness, are not addressed.

This study takes advantage of the unique research framework provided by Norway during the first decade of the century to investigate the effects of the appointment of female directors on tax aggressiveness, when these appointments are the results of a gender quota regulation. The enactment of a mandatory board gender quota in 2003 led to an unprecedented increase in the number of female directors on the boards of Norwegian firms over a short period of time. Undoubtedly, a main reason of the great success of the Norwegian regulation was that firms that did not comply with the quota by January 2008 were forced to dissolve. Requirements to comply were issue to 77 non-compliant firms in January 2008, and by April of this same year, all public limited firms were following the law (Ahern & Dittmar, 2012).[1] Hence, whereas by the

[1] According to Ahern & Dittmar (2010), the fact that the average size of boards did not change suggests that firms replace rather than add directors to comply with the law. Furthermore, because neither the percentage of executive directors nor the percentage of women chairpersons changed after the enactment of the quota, in most cases the new female directors were appointed as non-executive directors in substitution of male non-executive directors

year 2001, women hold just 5% of the board seats, this percentage jumped to 41% in 2007 (Ahern & Dittmar, 2012). Thus, Norway during the first decade of this century somehow provides a laboratory environment for investigating the effects of the appointment of female directors on different corporate outcomes. Regarding tax aggressiveness, gender differences in risk aversion (Abou-El-Sood, 2021; Charness & Gneezy, 2012; Hardies et al., 2013), independence (Carter et al., 2003) and ethical standards (Bernardi & Arnold, 1997; Ruegger & King, 1992) can justify that firms with more female directors are less likely to undertake tax aggressive strategies. However, when the increase in the number of female directors is the result of a mandatory gender quota, under the so-called limited supply view of qualified female directors (Sultana et al., 2020), this could lead to less competent boards, and thus, facilitate corporate tax aggressive strategies.

The motivation is twofold. First, as discussed above, the research topic has an obvious interest that, due to its relevance in real-life, transcends the confines of academia. Second, previous studies have focused on countries with a common-law legal tradition (La Porta et al., 1998). Hence, Chen et al. (2019) and Lanis et al. (2017) examine the effects of female directors on tax aggressiveness in the US, Deslandes et al. (2021) investigate the Canadian setting and Richardson et al. (2016) studies the issue with a sample of Australian firms. Because the research question covers corporate governance, tax and gender issues and, given the significant differences between countries on each of these topics, the results reported for common-law countries cannot be generalized and, therefore, new evidence for other contexts is welcome.

This interdisciplinary study aims to contribute to the literature in several ways. First, it extends the available evidence on the relationship between female directors and tax aggressiveness beyond common-law countries. Due to differences in the effective role of BoDs in common-law and civil-law countries (La Porta et al., 1998), the presence of women on boards may not produce the same effects in both types of countries. Second, it proposes a novel research design to address the impact of female directors on tax aggressiveness. This design takes advantage of the unique setting provided by the mandatory board gender quota passed in Norway in late 2003, which led to an enormous increase in the number of female directors over a short period of time, and implements a difference-in-differences (hereinafter “diff-in-diff”) methodology. While focusing on the Norwegian case allows overcoming one of the main

limitations of prior related studies, whose samples include very few female directors,[2] diff-in-diff models are particularly robust to endogeneity problems (Abadie, 2005) and provide a truly causal approach to the relationship between female directors and tax aggressiveness. Last, but not least, because for the first time the relationship between female directors and tax aggressiveness is investigated in a context of mandatory board gender quota, this study also contributes to the literature and informs the debate on the assessment of gender quotas.

The results show that corporate tax aggressiveness did not decrease in Norway after the accelerated incorporation of women into the boardroom during the first half of the century. As a matter of fact, we observe the opposite situation, as the effective tax rate of Norwegian companies, regardless of whether tax rates are calculated based on tax expenses or tax payments, are significantly lower in the post-quota period than before the quota, compared to the behaviour of the control group, which did not experience significant changes in the gender composition of their boards. This result is sound, as it holds practically without exception throughout a battery of sensitivity analyses, and contradicts most previous evidence that shows a negative relationship between female directors and tax aggressiveness (Chen et al., 2019; Lanis et al., 2017; Richardson et al., 2016). On the other hand, results support prior studies that have concluded that mandatory board gender quotas lead to less effective BoDs (Ahern & Dittmar, 2012; Matsa & Miller, 2013; Yang et al., 2019).

The paper continues as follows. The next section summarizes the related literature and develops the hypothesis to be addressed in the empirical analysis. Then, section 3 develops the research design and describes the sample, while sections 4 and 5, respectively, present and discuss the results of the study. Finally, the last section concludes the paper.

2. Review of the literature and hypothesis development

This section begins with the review of the literature on the relationship between female directors and tax aggressiveness, and afterwards discusses the possible implications of mandatory board gender quotas on the research topic.

2.1. Female directors and tax aggressiveness

The discussion of the possible effects of a greater participation of women in boards on tax aggressiveness requires, as a preliminary stage, understanding the very role of the BoD in the

[2] Deslandes et al. (2021) point out the low number of female directors in their sample as a limitation of the study.

corporate governance scheme and, in particular, regarding the tax strategy of the firm. The monitoring function of the board in managers' decision-making (Fama & Jensen, 1983) includes the decisions on the amount of corporate taxes to be paid. According to Erle (2008), the board has ultimate responsibility for the tax policy and is accountable for it to shareholders. More specifically, Landolf (2006) points out that as the risks associated with tax policies have become more diverse, the BoD is more directly involved with the tax strategy of the firm. The monitoring function of the BoD has become particularly important following the enactment of the Sarbanes-Oxley Act in the US and of similar regulations worldwide.[3]

Because the presence of female directors on corporate boards is generally associated with good corporate governance structures and practices (Ely & Thomas, 2001) and, considering that there exists a negative relationship between good corporate governance practices and tax aggressiveness (Ortas & Gallego-Álvarez, 2020), female directors should contribute to reduce corporate tax aggressiveness. There is theoretical background to support a negative relationship between female directors and tax aggressiveness. For example, according to the psychology and behavioural economics literatures, men and women tend to behave differently (e.g., Costa et al., 2001; Feingold, 1994; Schmitt et al., 2008). More specifically, gender differences have been found in relation to risk aversion (Abou-El-Sood, 2021; Charness & Gneezy, 2012; Hardies et al., 2013), independence (Carter et al., 2003), and ethical and moral behaviour (Bernardi & Arnold, 1997; Ruegger & King, 1992). In the specific case of the BoD, female directors are considered more risk averse (Betz et al., 1989; Carter et al., 2017), independent (Adams & Ferreira, 2009; Carter et al., 2003), and with stronger moral and ethical standards than their male counterparts (Betz et al., 1989; Sun et al., 2021). All the above gender differences suggest that firms with more female directors should be less willing to adopt tax aggressive strategies. Given the fiduciary responsibility of board members over managers' accounting and financial decisions, more risk-averse boards (for example, due to a greater presence of female directors) may be more willing to oppose tax aggressive strategies. Likewise, BoDs with more female directors would be more independent from the managers and, consequently, less compliant with the adoption of tax aggressive policies. Furthermore, due to the obvious ethical implications of tax aggressiveness, a board with more (female) directors strongly committed to business ethics and corporate social responsibility is likely to take their monitoring role over corporate behaviour more seriously

[3] In our research setting, the main examples of this regulation are the Norwegian Corporate Governance Code, the Accounting Act and the Public Companies Act, in Norway, and the Danish Governance Code and the Danish Companies Act, in Denmark.

(Shafer et al., 2016) and, consequently, less willing to accept the implementation of tax aggressive strategies (Ortas & Gallego-Álvarez, 2020).

Based on the theoretical framework developed above that justifies an association between the presence of female directors on the board and corporate tax aggressiveness, a few studies have empirically investigated whether or not this association actually existed. Lanis et al. (2017) investigate the relationship between the percentage of female directors on the board and corporate tax aggressiveness, measured by effective tax rates and book-tax gap differences. The sample consists of large US firms included in the Standard & Poor's 500 index for the years 2006-2009. The estimations are based on Heckman two-stage regressions (Heckman, 1979) since self-selection bias was detected in the research design. The study finds a negative association between female directors and tax aggressiveness. Whereas this result holds for most of the estimations, in the analysis based on a matched sample of firms results are insignificant, and marginally significant in some of the estimations. Subsequently, Chen et al. (2019) examine the association of female directors with tax aggressiveness and financial risk. As Lanis et al. (2017), they also investigate the US context, although in this case the research period runs from 1997 to 2013. The authors conclude that female directors are negatively associated with tax aggressiveness, although positively related to financial risk. However, the evidence is stronger for financial risk than for tax aggressiveness, as in the latter case some of the sensitivity analyses do not report significant results. Unlike the above studies, Deslandes et al. (2021) do no focus on the women participation on BoDs but on the audit committee. The study is based on a sample of Canadian listed companies from 2011 to 2015. If, according to the behavioural literature and the results of Lanis et al. (2017) and Chen et al. (2019), firms with more female directors were less tax aggressive, this gender effect should be particularly strong in the board committee with specific responsibility for accounting and tax policies. However, Deslandes et al. (2021) report insignificant results. Outside the North American region, Richardson et al. (2016) find a negative relationship between the number of female directors and tax aggressiveness in Australia over the 2006-2010 period. Finally, although neither Francis et al. (2014) nor Zirgulis et al. (2021) focus on the gender composition of the BoD, they find that female CEOs (Zirgulis et al., 2021) and female CFOs (Francis et al., 2014) are associated with less corporate tax aggressiveness.

The contradictory results reported for the BoD (Lanis et al., 2017 and Chen et al., 2019) and for the audit committee (Deslandes et al., 2021) are somewhat surprising, since these studies are conducted with samples of North American listed companies and use relatively similar methodologies. Furthermore, after the evidence provided by Lanis et al. (2017) and Chen et al. (2019), the gender effect on tax aggressiveness would be expected particularly strong in the

audit committee. It should be noted, however, that the negative relationship between female directors and corporate tax aggressiveness observed by Lanis et al. (2017) and Chen et al. (2019) cannot be considered too strong, as it did not hold in some of the sensitivity analyses performed in these studies. Additionally, the opposite effects female directors have on tax aggressiveness and financial risk observed in Chen et al. (2019) seem difficult to reconcile with each other. If, as already discussed in this section, one of the main explanations for a negative effect of female directors on tax aggressiveness is that women are more risk-averse than men, it is difficult to explain why these more risk-averse female directors are willing to take on higher financial risks than their comparatively less risk-averse male counterparts. Finally, it needs to be considered that a shared limitation of these previous studies is the very few female directors in their samples. In Lanis et al. (2017), female directors hold, on average, 16% of the board seats, and this percentage is even lower in Chen et al. (2019) (10%) and Deslandes et al. (2021) (11%). Although Post et al. (2011) do not address tax aggressiveness but instead investigate environmental reporting, they conclude that a critical mass of at least three women on the board is necessary to observe significant gender differences in corporate decisions. The very low percentages of female directors in Lanis et al. (2017), Chen et al. (2019) and Deslandes et al. (2021) imply very few female directors in most firms, clearly below the minimum critical mass suggested by Post et al. (2011). Conversely, the present study takes advantage of the enormous increase in the number of female directors over a short period of time occurred in Norway. This type of laboratory setting is particularly suitable for examining the impact of female directors on tax aggressiveness.

Therefore, based on the theoretical studies examined in this section and after reviewing the empirical evidence, the first hypothesis of this study states:

Hypothesis #1 (H1)*:* Female directors reduce corporate tax aggressiveness.

2.2. Board gender quotas, board effectiveness and tax aggressiveness

The discussion in the previous subsection should be complemented by the analysis of how the enormous increase in the presence of women on the boards of Norwegian companies was achieved. Sun (2021) maintains that changes in corporate governance have different effects depending on whether they are adopted voluntarily or imposed externally. By December 2003, Norway passed a regulation that mandated a minimum representation of 40% for men and women on the boards of public limited companies. The new regulation, initially based on voluntary compliance, established that if the 40% threshold was not reached by July 2005, the gender quota would be mandatory. As by this date women accounted for only 13% of board

seats, the quota became mandatory in 2006 (Dale-Olsen et al., 2013). Not surprisingly, the regulatory process that eventuated in the mandatory board gender quota generated intense and heated debate (Teigen, 2016). Supporters of the quota (politicians, senior civil servants and gender equality activists) based their view mainly on ethical and justice arguments (the huge underrepresentation of women in leadership positions was difficult to reconcile with the principle of gender non-discrimination, as it suggested unfair treatment of women). On the other hand, opponents of the quota (mainly corporate managers and owners and representatives of employers' organizations) argued that the regulation was illegitimate (since the owners of the firm should have the right to decide who sits on the board) and discriminatory for men (since men and women were not treated equally). They also claimed that the new regulation would lead to less competent boards.

From a theoretical perspective, the position that the quota would reduce the effectiveness of BoDs can be articulated through the limited supply view of female directors (Sultana et al., 2020). Fairchild & Li (2005) point out that the effectiveness of the board in the role of monitoring firm managers depends on the quality of its members, and Faleye et al. (2013) find that the experience of these members is associated with enhanced board effectiveness. Under the limited supply view, due to the quota the demand for high-quality female directors (for example, directors with more years of experience) would exceed the number of available candidates. Consequently, firms should be forced to appoint low quality (female) candidates as directors, and the new boards would be less able to perform the monitoring function.[4]

Regarding the empirical evidence, Ahern & Dittmar (2012), Matsa & Miller (2013) and Yang et al. (2019) investigate a related issue to the one addressed here, such as the impact of the Norwegian quota on firm's financial performance, and all of them conclude that the quota reduced the level of performance of Norwegian firms.[5] The usual interpretation of this result is in terms of the less effective boards of Norwegian firms due the quota compared to their peers from neighbouring countries not affected by any gender quota and, therefore, free to appoint the most suitable candidates as directors, regardless of their gender. Managers have incentives to implement corporate tax aggressive strategies in order to minimize tax expenses and payments (Armstrong et al., 2015; Black et al., 2017; Chyz, 2013; Gaertner, 2014; Graham et al.,

[4] It should be noted that Sultana et al. (2020) also refer to the discrimination perspective, according to which the low number of female directors would be the consequence of discriminatory hiring practices that favour the hiring of less qualified men instead of more qualified women. If this were the case, the gender quota could lead to more competent boards. However, the empirical results provide support for the limited supply view.

[5] Like ours, most of these studies implement diff-in-diff research designs.

2014; Halioui et al., 2016), for example, with the aim of overstating earnings. Therefore, if as a result of the gender quota, the boards of Norwegian firms are less capable to perform the monitoring function over managers, they would also be less able to limit the implementation of tax aggressive strategies. Consequently, the second hypothesis of this study opposes H1 and states:

Hypothesis #2 (H2): Female directors increase corporate tax aggressiveness.

Summing up, there are two opposite effects associated with the increased presence of women on the boards of Norwegian firms as a result of the gender quota. On the one hand, because female directors are generally considered more independent, risk-averse, and also appear to have stronger ethical standards than male directors, their appointment in large numbers should reduce the likelihood of tax aggressive strategies. However, on the other hand, if the level of competence of Norwegian boards (and, consequently, the ability to monitor managers) decreased as a result of the implementation of the gender quota, corporate tax aggressiveness may have increased in the post-quota period. Obviously, the sign of the final effect will depend on which of these two opposite effects empirically prevails. The above discussion is summarized in Figure 1.

Insert Figure 1 around here

3. Research design, sample and descriptive statistics

In the research design, the treated group consists of Norwegian listed companies which, after the enactment of the gender quota had to show a minimum participation in the board of 40% for both genders. For the control group, we choose Danish listed companies, due, on the one hand, to the similarities in the institutional corporate environment between Norway and Denmark (e.g. Gregorič & Hansen, 2017) and, on the other hand, because the percentage of women on Danish boards remained very stable until 2011 (Ferreira, 2015). The pre-treatment period covers the years from 2001 to 2003 (before the increase in the number of female directors in the treated group), whereas the post-treatment period runs from 2007 to 2010 (once the effects off the gender quota became fully effective).

$$TAG_{it} = \alpha + \beta * POST03_{t} + \lambda * TREATxPOST03_{it} + \\ + \delta * CONTROLS_{it} + \pi * INDFE + \sum * YEARFE + £ * FIRMFE + \varepsilon_{it} \qquad (1)$$

The analysis is based on panel data estimation of Eq. *(1)*. Like previous studies, we measure tax aggressiveness (*TAG*) by tax expenses and tax payment variables. The effective tax rate (*ETR*)

is defined as total tax expenses divided by pre-tax accounting income, while the cash-effective tax rate (*CASHETR*) is computed as income tax payments on pre-tax accounting income. As usual in the related literature, we truncate both variables to the 0-1 range and, to control for yearly differences in the official tax rate between Norway and Denmark, the dependent variables finally included in the model are adjusted by the official tax rate of the firm's home country. Hence, *ETRAD* (*CASHETRAD*) is defined as *ETR* (*CASHETR*) minus the firm's country official tax rate in the corresponding year. Finally, as larger *ETRAD* or *CASHETRAD* indicate lower tax aggressiveness, similar to Chen et al. (2019), Deslandes et al. (2021) and Lanis et al. (2017), we transform both variables by multiplying them by -1 to obtain increasing measures of tax aggressiveness. *TREAT* is a dummy variable that indicates whether the firm belongs to the treated group (with value of 1) or the control group (with value of 0). *POST03* is another dummy variable, taking the value of 1 if the observation belongs to the post-treatment period (2007-2010) and 0 otherwise. *TREATxPOST03* is the variable resulting from the interaction of *TREAT* and *POST03,* and it is the main variable of interest in diff-in-diff designs. Eq. *(1)* also includes the standard control variables used in previous studies (Chen et al., 2019; Deslandes et al., 2021; Lanis et al., 2017), and also industry fixed effects (*INDFE*), year fixed effects (*YEARFE*) and firm fixed effects (*FIRMFE*). Finally, to avoid the effects of outlier observations on the estimates, all the continuous variables in Eq. *(1)* are winsorized at the top and bottom 1% level.

According to H1 (H2), a negative (positive) and significant coefficient for the interaction variable *TREATxPOST03* is anticipated. In the case of H1 (H2), this would indicate that the likelihood of tax aggressive strategies decreased (increased) in Norway after the large increase in the percentage of female directors, compared to the situation in Denmark, where this percentage remained stable.

Insert Table 1 around here

The control variables in Eq. *(1)* are chosen based on Lanis et al. (2017) and include: firm size (*SIZE*), financial leverage (*LEV*), capital intensity (*CINT*), research and development intensity (*RDINT*), inventory intensity (*INVINT*), foreign subsidiaries (*FGNOPS*), market-to-book ratio (*MKTBK*), return on assets (*ROA*) and Big 4 audit firm (*BIG4AUD*). Table 1 provides detailed definitions for these variables.[6]

[6] Lanis et al. (2017) also include some corporate governance variables. Unfortunately, we cannot include these variables in Eq. *(1)* because our database provides no historical information for them. Like our study, neither Chen et al. (2019) nor Deslandes et al. (2021) include any corporate governance variables in their respective analyses. Besides, most of these variables present insignificant coefficients in Lanis et al. (2017).

Insert Figure 2 around here

A fundamental issue for the correct implementation of diff-in-diff estimations is that both the treated and the control groups share a parallel trend in the dependent variable during the pre-treatment period. Under the assumption that the control group (Danish firms) has not been affected by the new gender quota regulation, any behaviour by the treated group (Norwegian firms) deviating from the parallel trend after the change in regulation is interpreted as caused by the treatment (the gender quota). To check for the existence of a parallel trend, Figure 2 shows the behaviour of the change in *ETRAD* and *CASHETRAD* during the pre-treatment period for the treated and the control groups. The graphs suggest a parallel trend for both variables, thus, validating the implementation of the diff-in-diff methodology.

Insert Table 2 around here

The sample consists of the firms listed in the stock markets of Norway and Denmark during the period of investigation with information available from Capital IQ. There are 137 firms (63 from Denmark and 74 from Norway), and given the seven-year research period (from 2001 to 2003 and from 2007 to 2010), a maximum of 959 firm-year observations. However, in the analysis based on tax expenses, *ETRAD* could not be calculated in 296 observations due to lack of data about tax expenses or because negative earnings before taxes, and besides, we lose 165 observations due to lack of data on the control variables, leading to a final sample of 498 firm-year observations. On the other hand, in the analysis based on cash payments, *CASHETRAD* could not be computed in 601 cases (in most of them, because the information about tax payments was not available), and we lose 45 additional observations because lack of data on the control variables, resulting in a final sample of 313 firm-year observations. Table 2 provides the usual descriptive statistics for the sample, showing a balanced distribution of firms between treated and control groups. Next, Table 3 presents Pearson pairwise correlation coefficients. We observe the expected high and positive correlations between the two measures of tax aggressiveness (*ETRAD* and *CASHETRAD*) and between the interaction variable *POST03xTREAT* and its two components (*POST03* and *TREAT*). However, the most interesting result in the Table is the positive and significant correlation of *POST03xTREAT* with both *ETRAD* and *CASHETRAD,* although the statistical significance is stronger with the latter. This suggests that tax aggressiveness appears to increase in Norway during the post-treatment period, providing preliminary support to H2. Furthermore, the generally low correlations observed for the control variables do not anticipate serious multicollinearity problems in the estimations.

Insert Table 3 around here

4. Results of the study

Table 4 shows the estimates of Eq. *(1)*. Estimations are performed with panel data models, and significance tests are conducted with robust standard errors clustered by firm. The Hausman test provides support for estimations with random effects (*p*-value = 0.1079 in the estimation with *ETRAD* as the dependent variable and *p*-value = 0.4822 in the estimation based on *CASHETRAD*). Accordingly, the main estimations are performed with random effects and thus, year and industry fixed-effects are included in the estimations but not firm fixed-effects. Columns (1) and (2) respectively show the estimates of the models with *ETRAD* and *CASHETRAD.* In both cases, the explanatory power of the models, as measured by the *R-squared* statistic, is similar to that of Lanis et al. (2017) and higher than in Chen et al. (2019).[7] The main result in Table 4 (Columns (1) and (2)) is the positive and significant coefficient for the variable of interest *POST03xTREAT* in both estimations. According to the diff-in-diff approach, we interpret this result as caused by the treatment, which in our study is the increase in the number of female directors in Norway after the enactment of the gender quota. Thus, compared to neighbouring Denmark where the women presence on boards remained fairly constant throughout the research period, the accelerated incorporation of women into the boards of Norwegian firms did not increase either corporate tax expenses or tax payments, but rather the opposite. These results were anticipated by Table 3, which shows positive and significant correlations of *POST03xTREAT* with both *ETRAD* and *CASHETRAD,* and provides support for H2. Finally, although the correlations in Table 3 do not suggest serious multicollinearity problems in the estimations, we have computed the variance inflation factors (VIFs). The only variables with VIFs greater than 2 are those inherent to the diff-in-diff methodology: *POST03, TREAT* and *POST03xTREAT.*

Insert Table 4 around here

We conduct several sensitivity analyses with the aim of evaluating the robustness of the above results. The first one addresses the influence of the estimation method. Even though the Hausman test suggested using random effects estimations, Table 4 (Columns (3) and (4)) also provides the results of the estimations with fixed effects. According to this estimation method, year and firm fixed-effects are included in the model but not industry fixed-effects or *TREAT,* given the invariant nature of these variables across firms. As in the estimations with random

[7] Unfortunately, we cannot compare this result with Deslandes et al. (2021) as these authors do not provide the *R-squared* of the estimations.

effects, *POST03xTREAT* presents positive and significant coefficients in both estimations, therefore, supporting the results in Columns (1) and (2).

Insert Table 5 around here

The second analysis examines the sensitivity of the results to alternative definitions of the post-treatment period, as the election of this period is sometimes problematic in the implementation of diff-in-diff models. For example, while Dale-Olsen et al. (2013), Matsa & Miller (2013) and Yang, et al. (2019) apply the same diff-in-diff approach to the study of the effects of the Norwegian gender quota on financial performance, they define different post-treatment periods. In that regard, our choice of the years between 2007 and 2010 may be considered arbitrary. As a matter of fact, the presence of female directors on the boards of Norwegian firms began to increase immediately after the enactment of the gender quota in late 2003. Accordingly, we re-estimate Eq. *(1),* maintaining the pre-treatment period but for the alternative post-treatment period 2004-10. An advantage of the new post-treatment period is that it allows the sample size to be significantly increased and, on that regard, to report sounder results. Here the Hausman test provides support for estimations with fixed effects in the model with *ETRAD* as the dependent variable, and with random effects in the model based on *CASHETRAD*. Table 5 summarizes the new estimates for *ETRAD* with fixed effects and for *CASHETRAD* with random effects in Columns (1) and (2), respectively. Results for *POST03xTREAT* are consistent with those reported in Table 4. Next, as a sensitivity check, Columns (3) and (4) show the estimates with random effects (fixed effects) for the model with *ETRAD* (*CASHETRAD*) as the dependent variable, which reinforce the findings in Columns (1) and (2). Furthermore, the possibility of confounding effects in the research design also justifies defining additional post-treatment periods. An important assumption for interpreting causality in diff-in-diff estimations is the absence of unmeasured relevant confounders. During the former research period (2001-2010) we identify two potential confounding effects. The first refers to the enactment of tax reforms in the treated and/or control groups. Although some tax reforms were carried out in Norway (2006) and Denmark (2004) during that period, only in the case of Norway did they affect the corporate tax burden. Hence, in 2006 Norway adopted the exemption method as a measure to realign dividend and wage income taxation. Albeit these new provisions may reduce ETRs, the effects, if any, should be marginal. Nevertheless, to further assess this issue, we re-estimate Eq. *(1)* after removing from the sample the observations affected by the tax reform (from 2007 to 2010). Whereas in the estimation of the model with *CASHETRAD* the Hausman test recommends the use of fixed effects (p-value < 0.01), in the estimations with *ETRAD*, it cannot be conducted because the data failed to meet the asymptotic assumptions of

the test. Nevertheless, as in the previous analyses Table 6 shows the estimates with both fixed effects (Columns (1) and (2)) and random effects (Columns (3) and (4). Like the results in Tables 4 and 5, *POST03xTREAT* shows positive and significant coefficients in all the estimations. A second potential confounding effect is the international financial crisis occurred in 2008 and 2009. This event caused a dramatic drop in corporate earnings and, consequently, may have produced some level of noise in tax expenses and tax payments variables, affecting the results of the estimations. Therefore, we re-estimate Eq. *(1)* for the post-treatment period 2004-2007. The results of the new estimations (untabulated) are qualitative the same as those presented in Table 6.

Insert Table 6 around here

The next analysis is intended to control for the potential impact that differences in the type of firms included in the control and treated groups may have on the results. To conduct this analysis, we apply the propensity score procedure to obtain a one-to-one matched sample of the treated and control groups with homogenous characteristics in terms of size and industry. Afterwards, we re-estimate Eq. *(1)* with the matched subsample for the original pre-treatment (2001-03) and post-treatment (2007-10) periods. Whereas the Hausman test provides support for estimations with random effects (in Columns (1) and (2)), estimations with fixed effects are also provided (in Columns (3) and (4)) as a sensitivity check. The results of the new estimations, presented in Table 7, show positive and significant coefficients for *POST03xTREAT* in all four estimations.

Insert Table 7 around here

The fourth analysis is aimed by the difficulties associated with the measurement of tax aggressiveness (Hanlon & Heitzman, 2010; Lanis & Richardson, 2015). As prior related studies, we assume that higher values of the dependent variables (*ETRAD* or *CASHETRAD*) indicate more tax aggressiveness. However, according to Garcia-Blandon et al. (2021), to a certain extent, higher *ETRAD* or *CASHETRAD* may not necessarily mean more tax aggressive strategies, but simply that the firm has a more efficient tax department. Nevertheless, the leading companies in terms of *ETRAD* or *CASHETRAD* may be reasonably viewed as tax aggressive. To conduct this analysis, we define the new variables: *ETRTAG* (1 if *ETRAD* is in the highest quartile of the distribution of *ETRAD* and 0 otherwise) and *CASHETRTAG* (1 if *CASHETRAD* is in the highest quartile of the distribution of *CASHETRAD* and 0 otherwise); and afterwards, conduct panel data logistic estimations of Eq. *(1)* with robust errors clustered by firm, with the new dependent variables. The results of the new estimations in Table 8 show a positive and significant coefficient

for *POST03xTREAT* in the estimation of the model based on tax expenses (Column (1)), which is consistent with the findings reported so far in this study. However, in the model based on tax payments (Column (2)), *POST03xTREAT* presents an insignificant coefficient.

Insert Table 8 around here

Dyreng et al. (2008) highlight the limitations associated with measuring tax aggressiveness using annual data, due to the significant year-to-year variations in the annual ETR. To conduct the last analysis of this study, we have calculated 2-year moving averages for all the variables included in Eq. *(1),* and afterwards have re-estimated the model with the new moving average variables in substitution of the original annual variables. For this specific analysis, because moving average variables lead to an important reduction in the number of observations, we use the longest post-treatment period defined by the years between 2004 and 2010. The estimations with the new variables are presented in Table 9. Even though the Hausman test suggests using random effects in both estimations (Columns (1) and (2)), estimations with fixed effects are also tabulated (Columns (3) and (4)). Consistent with the main results reported so far, *POST03xTREAT* presents positive and significant coefficients in all four estimations.

Insert Table 9 around here

5. Discussion

Most previous related studies have reported that female directors are associated with less corporate tax aggressiveness. This is the main result in Lanis et al. (2017) and Chen et al. (2019) for the US and Richardson et al. (2016) for Australia. On the other hand, Deslandes et al. (2021) report insignificant results for Canada. The present study, the first conducted in a civil-law environment, finds that corporate tax aggressiveness did not decrease in Norway after the enormous increase in the number of female directors, compared to the situation in Denmark during the same period, where the number of female directors did not change substantially. In fact, the results point to the opposite situation, as we observe significantly lower tax expenses and tax payments in Norway during the post-treatment period. This result seems sound as it holds with almost no exception across a battery of sensitivity analysis. Consequently, we reject the first hypothesis of this study that the larger presence of female directors would lead to less tax aggressive strategies.

Several factors may explain the differences between the results of this study and previous research, generally reporting a negative association between female directors and tax aggressiveness. First, because the topic investigated includes corporate governance and gender

issues, the generalization of the results obtained in a specific setting becomes problematic. Regarding corporate governance, La Porta et al. (1998), among others, point out that BoDs play different roles in countries with different legal traditions. It should be noted that the evidences reported by Chen et al. (2019), Deslandes et al. (2021), Lanis et al. (2017) and Richardson et al. (2106) refer, in all the cases, to the common-law region, while the present study investigates a civil-law environment. If the function as well as the functioning of the board is different in both types of environments, one should not expect the same effects of the gender composition of the BoD. Similarly, with respect to gender issues, there is evidence that gender differences in values have an important country component (Schwartz & Rubel-Lifschitz, 2009), and this could explain that the presence of women on BoDs may have different effects across countries. Second, while previous studies share a relatively similar methodology based on standard regression and with samples of firms where the presence of female directors is rather small, our research design combines a unique research setting, where the percentage of female directors multiplied by eight (from 5% to 41%) over a short period of time, with the use of diff-in-diff models, a particularly robust procedure to establish causal relationships (Abadie, 2005). A meaningful example of the advantages of this approach over standard regression is that most of the research on a related topic to that addressed in this study, such as the impact of female directors on firm performance, examines the Norwegian case and builds on diff-in-diff research designs (Dale-Olsen et al., 2013; Matsa & Miller, 2013; Yang et al., 2019). Last but not least, a third possible explanation is that while in previous studies the appointment of female directors is the result of a voluntary decision of the owners of the firm, in the institutional context investigated in this study, most of these appointments are mandated by the law. Next, we further elaborate on this issue.

Given that there is no theoretical background supporting that the appointment of female directors should increase corporate tax aggressiveness, according to H2, we interpret our findings as a direct effect of the board gender quota. The limited supply view of female directors (Sultana et al., 2020) anticipates that gender quotas increases the demand for qualified female directors without a similar increase in the supply of these directors. This view was also shared by the opponents to the Norwegian quota who argued that it would lead to more competent men to be substituted by less competent female (Teigen, 2016), and supported by some studies that have shown a negative impact of the gender quota on firm performance (Ahern & Dittmar, 2012; Matsa & Miller, 2013; Yang et al., 2019). The results of these studies suggest that the effectiveness of Norwegian BoDs decreased due to the gender quota. Similarly, the evidence reported by Sultana et al. (2020) that the positive association between the presence of female

directors on the audit committee and audit quality weakened after the introduction of gender diversity guidelines also supports the limited supply view. Therefore, if the effectiveness of the BoDs decreased as a result of the Norwegian quota, managers could more easily implement tax aggressive strategies.

6. Conclusions

A side effect of the accelerated incorporation of women to boards of directors in many countries could be a reduction in the implementation of corporate tax aggressive strategies by corporations. Although there is no complete agreement in the literature, several studies point in this direction. However, taking advantage of the unique research setting provided by the Norwegian mandatory board gender quota, this study shows evidences against this view. We regard the results as robust, first, because the presence of female directors in our research setting increased from 5% in the pre-treatment period to more than 40% in the post-treatment period. Such a context is particularly suitable for investigating the impact of the appointment of female directors on corporate tax aggressiveness. Second, the methodology is based on difference-in-differences models, which are considered particularly suitable for investigating causal relationships and are robust to endogeneity problems. Finally, the results are consistent across a battery of sensitivity analyses.

The interpretation of the positive impact of female directors on corporate tax aggressiveness reported here cannot ignore the fact that the increase in the number of female directors in our sample was the result of the implementation of a mandatory board gender quota. Therefore, we understand that the effects of the appointment of female directors on tax aggressiveness were driven by the less effective boards as a result of the implementation of the gender quota. There are several interesting implications of the results of this study. For scholars interested in the impact of gender on corporate taxes, this study contributes to fostering academic debate as it contradicts the evidence reported by most previous studies and calls for further studies. Second, for the academic debate on how best to increase women's participation in leadership, this study suggests that gender quotas may lead to less effective boards of directors. From a different perspective, this evidence supports previous studies that have shown a negative impact of board gender quotas on firm performance, attributing this effect to the less competent boards resulting from the application of the quota. Finally, at a more practical level, we should not expect increased tax collection by national governments as a result of the recent incorporation of women to boards of directors in large numbers.

We identify at least two potential limitation of the study. The first is inherent in the difference-in-differences methodology. Despite several sensitivity analyses that aimed to guarantee the comparability of the treated and control groups, and to control for possible confounding effects, according to Ferreira (2015), we cannot rule out that differences in the legal and macroeconomic environments of Norway and Denmark may have affected the results. The second limitation refers to the possibility of extending the findings reported here for Norway to other countries. Hence, the specificities of Norway in relation to taxes (i.e., higher willingness of their citizens to pay high level of taxes compared to other countries) and the accelerated appointment of female directors due to the gender quota (that may generate a lack of supply of qualified female directors) make the generalization of the findings for Norway even more difficult. The analysis of these issues, as well as the interaction between gender and other characteristics of directors, such as industry expertise, provide interesting research opportunities for further study.

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Table 1. Variable definitions

Variable	Definition
ETRAD	Total tax expense over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1.
CASHETRAD	Total tax payments over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1.
ETRTAG	1 if *ETRAD* is in the highest quartile of the distribution of *ETRAD* and 0 otherwise.
CASHETRTAG	1 if CASHETRAD is in the highest quartile of the distribution of *CASHETRAD* and 0 otherwise.
POST03	1 if the observation corresponds to a year after 2003 and 0 otherwise.
TREAT	1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise.
POST03xTREAT	The interaction variable resulting of multiplying *POST03* and *TREAT*.
SIZE	The total assets of the firm in logs.
LEV	The long-term debt over total assets.
CINT	Net property, plant and equipment over total assets.
RDINT	Research and development expenses over total assets.
INVINT	Inventories over total assets.
FGNOPS	1 if the firm has a subsidiary in a foreign country and 0 otherwise.
MKTBK	The market value of equity over the book value of equity.
ROA	Earnings before taxes over total assets.
BIG4AUD	1 if the firm is audited by a Big4 firm and 0 otherwise.

Table 2. Descriptive statistics

	Mean	St. Dev.	p25	Median	p75
ETRAD	-0.014	0.125	-0.045	-0.003	0.044
CASHETRAD	0.011	0.217	-0.074	0.045	0.169
POST03	0.637	0.481	0	1	1
TREAT	0.507	0.5	0	1	1
POST03xTREAT	0.335	0.472	0	0	1
SIZE	8.6	1.933	7.264	8.702	10.05
LEV	0.19	0.164	0.045	0.167	0.283
CINT	0.244	0.252	0.014	0.182	0.385
RDINT	0.012	0.041	0	0	0
INVINT	0.084	0.108	0	0.017	0.158
FGNOPS	0.466	0.499	0	0	1
MKTBK	3.779	7.685	0.915	1.557	3.046
ROA	0.055	0.059	0.012	0.037	0.073
BIG4AUD	0.911	0.285	1	1	1

Variables:

ETRAD: Total tax expense over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *CASHETRAD*: Total tax payments over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *POST03*: 1 if the observation corresponds to a year after 2003 and 0 otherwise; *TREAT*: 1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise; *POST03xTREAT*: The interaction variable resulting of multiplying *POST03* and *TREAT*; *SIZE*: The total assets of the firm in logs; *LEV*: Long-term debt over total assets; *CINT*: Net property, plant and equipment over total assets; *RDINT*: Research and development expenses over total assets; *INVINT*: Inventories over total assets; *FGNOPS*: 1 if the firm has a subsidiary in a foreign country and 0 otherwise; *MKTBK*: The market value of equity over the book value of equity; *ROA*: Earnings before taxes over total assets; and *BIG4AUD*:1 if the firm is audited by a Big4 firm and 0 otherwise.

Table 3. Pearson pairwise correlations with significance values

Variables	*ETRAD*	*CASHETRAD*	*POST03*	*TREAT*	*POST03xTREAT*	*SIZE*	*LEV*
ETRAD	1.000						
CASHETRAD	0.546***	1.000					
POST03	0.032	0.088*	1.000				
TREAT	0.005	0.111**	0.051	1.000			
POST03xTREAT	0.062*	0.181***	0.536***	0.700***	1.000		
SIZE	-0.060	-0.055	0.020	0.060	0.052	1.000	
LEV	-0.003	0.088*	-0.070*	0.297***	0.157***	0.218***	1.000
CINT	-0.124***	-0.005	-0.144***	-0.094**	-0.132***	-0.062	0.340***
RDINT	-0.080**	-0.063	0.001	-0.281***	-0.196***	-0.067*	-0.180***
INVINT	-0.009	-0.039	-0.037	-0.081**	-0.024	-0.344***	-0.258***
FGNOPS	-0.068*	-0.052	0.429***	-0.046	0.183***	0.172***	-0.011
MKTBK	-0.008	0.034	0.073*	-0.140***	-0.074*	-0.318***	-0.151***
ROA	-0.044	0.065	0.070*	-0.172***	-0.104***	-0.340***	-0.251***
BIG4AUD	-0.086**	-0.041	-0.104***	0.063*	0.053	0.106***	0.075*

Variables	*CINT*	*RDINT*	*INVINT*	*FGNOPS*	*MKTBK*	*ROA*
ETRAD						
CASHETRAD						
POST03						
TREAT						
POST03xTREAT						
SIZE						
LEV						
CINT	1.000					
RDINT	0.008	1.000				
INVINT	0.011	0.105***	1.000			
FGNOPS	-0.023	0.092**	-0.039	1.000		
MKTBK	-0.058	0.330***	0.202***	0.043	1.000	
ROA	0.100**	0.336***	0.264***	0.020	0.550***	1.000
BIG4AUD	0.131***	0.097**	0.050	-0.101***	0.064	0.030

**** p<0.01, ** p<0.05, * p<0.1*

Variables:

ETRAD: Total tax expense over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *CASHETRAD*: Total tax payments over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *POST03*: 1 if the observation corresponds to a year after 2003 and 0 otherwise; *TREAT*: 1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise; *POST03xTREAT*: The interaction variable resulting of multiplying *POST03* and *TREAT*; *SIZE*: The total assets of the firm in logs; *LEV*: Long-term debt over total assets; *CINT*: Net property, plant and equipment over total assets; *RDINT*: Research and development expenses over total assets; *INVINT*: Inventories over total assets; *FGNOPS*: 1 if the firm has a subsidiary in a foreign country and 0 otherwise; *MKTBK*: The market value of equity over the book value of equity; *ROA*: Earnings before taxes over total assets; and *BIG4AUD*:1 if the firm is audited by a Big4 firm and 0 otherwise.

Table 4. Results of the diff-in-diff estimations. Pre-treatment period: 2001-03; post-treatment period: 2007-10

	Random Effects		Fixed Effects	
	(1)	(2)	(3)	(4)
VARIABLES	*ETRAD*	*CASHETRAD*	*ETRAD*	*CASHETRAD*
POST03	-0.0109	0.0140	-0.00521	-0.000571
	(0.0162)	(0.0450)	(0.0201)	(0.0711)
TREAT	-0.0432*	-0.138**		
	(0.0235)	(0.0613)		
POST03xTREAT	**0.0539****	**0.172*****	**0.0507****	**0.135****
	(0.0250)	**(0.0539)**	**(0.0248)**	**(0.0633)**
SIZE	-0.0192***	-0.0181	-0.0293*	0.00167
	(0.00684)	(0.0121)	(0.0160)	(0.0503)
LEV	-0.0297	0.150	-0.0121	-0.132
	(0.0584)	(0.120)	(0.0667)	(0.232)
CINT	-0.0476	-0.0741	-0.111	-0.390
	(0.0348)	(0.0672)	(0.0871)	(0.269)
RDINT	-0.186	-0.210	0.0431	-2.394
	(0.212)	(0.377)	(0.901)	(3.239)
INVINT	0.0838	0.226	0.00317	-0.414
	(0.0827)	(0.226)	(0.0929)	(0.480)
FGNOPS	-0.0146	-0.0366	-0.00761	-0.0507**
	(0.0108)	(0.0270)	(0.0109)	(0.0245)
MKTBK	-0.000790	-0.00425**	-0.000857	-0.00709*
	(0.00119)	(0.00199)	(0.00131)	(0.00415)
ROA	0.298*	1.408***	0.498***	2.155***
	(0.157)	(0.363)	(0.182)	(0.621)
BIG4AUD	0.00975	0.0387	-0.0105	0.107**
	(0.0168)	(0.0480)	(0.0203)	(0.0439)
Constant	0.306***	0.173	0.266*	0.0375
	(0.0867)	(0.156)	(0.134)	(0.429)
Industry FE	YES	YES	NO	NO
Year FE	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES
R-squared	0.161	0.184	0.086	0.184
Observations	498	313	498	313

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Variables:

ETRAD: Total tax expense over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *CASHETRAD*: Total tax payments over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *POST03*: 1 if the observation corresponds to a year after 2003 and 0 otherwise; *TREAT*: 1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise; *POST03xTREAT*: The interaction variable resulting of multiplying *POST03* and *TREAT*; *SIZE*: The total assets of the firm in logs; *LEV*: Long-term debt over total assets; *CINT*: Net property, plant and equipment over total assets; *RDINT*: Research and development expenses over total assets; *INVINT*: Inventories over total assets; *FGNOPS*: 1 if the firm has a subsidiary in a foreign country and 0 otherwise; *MKTBK*: The market value of equity over the book value of equity; *ROA*: Earnings before taxes over total assets; and *BIG4AUD*:1 if the firm is audited by a Big4 firm and 0 otherwise.

Table 5. Results of the diff-in-diff estimations. Pre-treatment period: 2001-03; post-treatment period: 2004-10

VARIABLES	(1) Fixed effects *ETRAD*	(2) Random effects *CASHETRAD*	(3) Random effects *ETRAD*	(4) Fixed effects *CASHETRAD*
POST03	-0.00535	0.0248	-0.00925	0.0397
	(0.0193)	(0.0480)	(0.0149)	(0.0706)
TREAT		-0.120**	-0.0367	
		(0.0561)	(0.0235)	
POST03xTREAT	**0.0355***	**0.152*****	**0.0395****	**0.120****
	(0.0185)	**(0.0471)**	**(0.0192)**	**(0.0485)**
SIZE	-0.0244	-0.0204*	-0.0164**	-0.0281
	(0.0176)	(0.0107)	(0.00694)	(0.0489)
LEV	-0.0356	0.111	-0.0448	0.0144
	(0.0601)	(0.0961)	(0.0527)	(0.161)
CINT	-0.197*	-0.108	-0.0743*	-0.397
	(0.108)	(0.0746)	(0.0414)	(0.287)
RDINT	-0.465	-0.164	-0.208	-2.363
	(0.754)	(0.314)	(0.185)	(2.379)
INVINT	-0.00789	0.190	0.0769	-0.342
	(0.0863)	(0.184)	(0.0721)	(0.263)
FGNOPS	0.00223	-0.0438**	-0.00407	-0.0517***
	(0.00797)	(0.0188)	(0.00786)	(0.0189)
MKTBK	-0.000708	-0.00486***	-0.000524	-0.00668**
	(0.00117)	(0.00175)	(0.00105)	(0.00308)
ROA	0.425***	1.320***	0.282*	1.794***
	(0.160)	(0.350)	(0.145)	(0.495)
BIG4AUD	-0.00140	0.0426	0.0116	0.0919
	(0.0190)	(0.0460)	(0.0138)	(0.0575)
Constant	0.256*	0.195	0.287***	0.284
	(0.151)	(0.145)	(0.0891)	(0.417)
Industry FE	NO	YES	YES	NO
Year FE	YES	YES	YES	YES
Firm FE	YES	NO	NO	YES
R-squared	0.099	0.185	0.146	0.196
Observations	721	464	721	464

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Variables:

ETRAD: Total tax expense over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *CASHETRAD*: Total tax payments over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *POST03*: 1 if the observation corresponds to a year after 2003 and 0 otherwise; *TREAT*: 1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise; *POST03xTREAT*: The interaction variable resulting of multiplying *POST03* and *TREAT*; *SIZE*: The total assets of the firm in logs; *LEV*: Long-term debt over total assets; *CINT*: Net property, plant and equipment over total assets; *RDINT*: Research and development expenses over total assets; *INVINT*: Inventories over total assets; *FGNOPS*: 1 if the firm has a subsidiary in a foreign country and 0 otherwise; *MKTBK*: The market value of equity over the book value of equity; *ROA*: Earnings before taxes over total assets; and *BIG4AUD*:1 if the firm is audited by a Big4 firm and 0 otherwise.

Table 6. Results of the diff-in-diff estimations. Pre-treatment period: 2001-03; post-treatment period: 2004-06

	Fixed effects		Random effects	
	(1)	(2)	(3)	(4)
VARIABLES	*ETRAD*	*CASHETRAD*	*ETRAD*	*CASHETRAD*
POST03	0.0110	0.0592	-0.00723	0.00101
	(0.0139)	(0.0612)	(0.0122)	(0.0534)
TREAT			-0.0480**	-0.126*
			(0.0237)	(0.0702)
POST03xTREAT	**0.0289***	**0.154*****	**0.0310***	**0.171*****
	(0.0164)	**(0.0573)**	**(0.0166)**	**(0.0615)**
SIZE	-0.0312*	-0.0974	-0.0170**	-0.0242*
	(0.0164)	(0.101)	(0.00798)	(0.0140)
LEV	-0.0316	-0.0301	-0.0333	0.0139
	(0.0597)	(0.204)	(0.0554)	(0.137)
CINT	-0.230	-0.582**	-0.0530	-0.114
	(0.147)	(0.241)	(0.0427)	(0.0914)
RDINT	-0.410	-4.766	-0.114	0.131
	(1.020)	(3.303)	(0.251)	(0.408)
INVINT	-0.0112	0.330	0.133	0.544
	(0.106)	(0.537)	(0.0853)	(0.345)
FGNOPS	-0.00423	-0.0489*	0.0107	-0.0598**
	(0.00989)	(0.0259)	(0.00955)	(0.0236)
MKTBK	0.000375	-0.00489*	0.00204**	-0.00267
	(0.000981)	(0.00281)	(0.00102)	(0.00168)
ROA	0.409*	-0.0286	-0.121	0.213
	(0.224)	(0.509)	(0.218)	(0.503)
BIG4AUD	-0.0104	0.225***	0.0167	0.0454
	(0.0577)	(0.0185)	(0.0189)	(0.0592)
Constant	0.335**	0.929	0.284***	0.239
	(0.165)	(0.872)	(0.101)	(0.201)
Industry FE	NO	NO	YES	YES
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	NO	NO
R-squared	0.155	0.336	0.255	0.337
Observations	408	196	408	196

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Variables:

ETRAD: Total tax expense over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *CASHETRAD*: Total tax payments over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *POST03*: 1 if the observation corresponds to a year after 2003 and 0 otherwise; *TREAT*: 1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise; *POST03xTREAT*: The interaction variable resulting of multiplying *POST03* and *TREAT*; *SIZE*: The total assets of the firm in logs; *LEV*: Long-term debt over total assets; *CINT*: Net property, plant and equipment over total assets; *RDINT*: Research and development expenses over total assets; *INVINT*: Inventories over total assets; *FGNOPS*: 1 if the firm has a subsidiary in a foreign country and 0 otherwise; *MKTBK*: The market value of equity over the book value of equity; *ROA*: Earnings before taxes over total assets; and *BIG4AUD*:1 if the firm is audited by a Big4 firm and 0 otherwise.

Table 7. Results of the diff-in-diff estimations with a matched sample. Pre-treatment period: 2001-03; post-treatment period: 2004-07

	Random effects		Fixed effects	
	(1)	(2)	(3)	(4)
VARIABLES	*ETRAD*	*CASHETRAD*	*ETRAD*	*CASHETRAD*
POST03	-0.0109	0.0281	-0.00923	0.0148
	(0.0163)	(0.0390)	(0.0210)	(0.0716)
TREAT	-0.0454*	-0.138**		
	(0.0246)	(0.0626)		
POST03xTREAT	**0.0525***	**0.184*****	**0.0533***	**0.153****
	(0.0289)	**(0.0550)**	**(0.0296)**	**(0.0622)**
SIZE	-0.0189***	-0.0200	-0.0256	-0.0104
	(0.00684)	(0.0122)	(0.0171)	(0.0554)
LEV	-0.0100	0.179	-0.00716	-0.215
	(0.0607)	(0.109)	(0.0705)	(0.228)
CINT	-0.0555	-0.0697	-0.127	-0.362
	(0.0346)	(0.0636)	(0.0917)	(0.272)
RDINT	-0.184	-0.0283	0.265	-0.771
	(0.215)	(0.343)	(0.849)	(3.022)
INVINT	0.0156	0.229	-0.203	-0.383
	(0.112)	(0.269)	(0.154)	(0.534)
FGNOPS	-0.0176	-0.0573*	-0.00678	-0.0532**
	(0.0111)	(0.0293)	(0.0109)	(0.0265)
MKTBK	-0.000612	-0.00339**	0.00104	-0.00730*
	(0.00123)	(0.00172)	(0.00143)	(0.00439)
ROA	0.245	1.113***	0.593***	2.222***
	(0.188)	(0.344)	(0.223)	(0.691)
BIG4AUD	0.00694	0.0310	-0.0163	0.133***
	(0.0179)	(0.0509)	(0.0236)	(0.0405)
Constant	0.282***	0.150	0.254*	0.0852
	(0.0890)	(0.153)	(0.144)	(0.469)
Industry FE	YES	YES	NO	NO
Year FE	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES
R-squared	0.168	0.211	0.088	0.183
Observations	474	289	474	289

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Variables:

ETRAD: Total tax expense over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *CASHETRAD*: Total tax payments over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *POST03*: 1 if the observation corresponds to a year after 2003 and 0 otherwise; *TREAT*: 1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise; *POST03xTREAT*: The interaction variable resulting of multiplying *POST03* and *TREAT*; *SIZE*: The total assets of the firm in logs; *LEV*: Long-term debt over total assets; *CINT*: Net property, plant and equipment over total assets; *RDINT*: Research and development expenses over total assets; *INVINT*: Inventories over total assets; *FGNOPS*: 1 if the firm has a subsidiary in a foreign country and 0 otherwise; *MKTBK*: The market value of equity over the book value of equity; *ROA*: Earnings before taxes over total assets; and *BIG4AUD*:1 if the firm is audited by a Big4 firm and 0 otherwise.

Table 8. Logistic estimations. Dependent variable: *ETRTAG* in Column (1) and *CASHETRTAG* in Column (2). Pre-treatment period: 2001-03; post-treatment period: 2004-07

VARIABLES	(1) *ETRTAG*	(2) *CASHETRTAG*
POST03	-0.275	0.405
	(0.596)	(1.615)
TREAT	-1.278*	0.331
	(0.722)	(1.747)
POST03xTREAT	**2.396*** **	**0.742**
	(0.783)	**(1.677)**
SIZE	-0.168	-0.398**
	(0.139)	(0.164)
LEV	-1.083	2.483
	(1.629)	(2.102)
CINT	-0.0951	-0.331
	(0.791)	(1.365)
RDINT	-23.17***	-6.329
	(8.638)	(8.227)
INVINT	-1.123	0.376
	(2.863)	(3.027)
FGNOPS	-1.356***	-0.807*
	(0.384)	(0.454)
MKTBK	-0.0278	-0.0495
	(0.0375)	(0.0426)
ROA	-2.765	8.764*
	(4.204)	(5.315)
BIG4AUD	-0.254	0.799
	(0.674)	(1.025)
Constant	2.628	0.587
	(1.629)	(2.287)
Industry FE	YES	YES
Year FE	YES	YES
Firm FE	NO	NO
Pseudo R-squared	0.159	0.135
Observations	498	314

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Variables:

ETRTAG: 1 if *ETRAD* is in the highest quartile of the distribution of *ETRAD* and 0 otherwise; *CASHETRTAG*: 1 if *CASHETRAD* is in the highest quartile of the distribution of *CASHETRAD* and 0 otherwise; *POST03*: 1 if the observation corresponds to a year after 2003 and 0 otherwise; *TREAT*: 1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise; *POST03xTREAT*: The interaction variable resulting of multiplying *POST03* and *TREAT*; *SIZE*: The total assets of the firm in logs; *LEV*: Long-term debt over total assets; *CINT*: Net property, plant and equipment over total assets; *RDINT*: Research and development expenses over total assets; *INVINT*: Inventories over total assets; *FGNOPS*: 1 if the firm has a subsidiary in a foreign country and 0 otherwise; *MKTBK*: The market value of equity over the book value of equity; *ROA*: Earnings before taxes over total assets; and *BIG4AUD*:1 if the firm is audited by a Big4 firm and 0 otherwise.

Table 9. Results of the diff-in-diff estimations with moving averages. Pre-treatment period: 2001-03; post-treatment period: 2004-10. Dependent variable: two-year moving average of *ETRAD* in Columns (1) and (3) and two-year moving average of *CASHETRAD* in Columns (2) and (4)

	Random effects		Fixed effects	
	(1)	(2)	(3)	(4)
VARIABLES	*ETRAD*	*CASHETRAD*	*ETRAD*	*CASHETRAD*
POST03	-0.00716	-0.0413	-0.00704	-0.0639
	(0.0169)	(0.0580)	(0.0240)	(0.0963)
TREAT	-0.0536**	-0.151**		
	(0.0237)	(0.0689)		
POST03xTREAT	**0.0652****	**0.221*****	**0.0626****	**0.190****
	(0.0265)	**(0.0630)**	**(0.0266)**	**(0.0930)**
SIZE	-0.0180**	-0.0119	-0.0229	0.0626
	(0.00747)	(0.0120)	(0.0192)	(0.0635)
LEV	-0.0270	-0.0171	-0.0715	-0.142
	(0.0589)	(0.123)	(0.0728)	(0.286)
CINT	-0.0633*	-0.0647	-0.164	-0.823***
	(0.0377)	(0.0850)	(0.109)	(0.262)
RDINT	-0.201	0.170	-0.127	-2.876
	(0.228)	(0.289)	(1.063)	(4.139)
INVINT	0.105	0.135	0.0544	-0.739*
	(0.0915)	(0.263)	(0.103)	(0.433)
FGNOPS	-0.00920	-0.0431*	-0.00358	-0.0284
	(0.0108)	(0.0224)	(0.0106)	(0.0181)
MKTBK	0.00122	-0.00369**	0.00124	-0.00415*
	(0.00109)	(0.00149)	(0.00135)	(0.00214)
ROA	0.0130	0.783**	0.141	0.969**
	(0.129)	(0.316)	(0.136)	(0.402)
BIG4AUD	0.0144	0.0401	0.00294	0.105*
	(0.0203)	(0.0492)	(0.0222)	(0.0560)
Constant	0.281***	0.138	0.216	-0.309
	(0.0936)	(0.175)	(0.169)	(0.563)
Industry FE	YES	YES	NO	NO
Year FE	YES	YES	YES	YES
Firm FE	NO	NO	YES	YES
R-squared	0.225	0.226	0.160	0.299
Observations	372	244	372	244

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Variables:

ETRAD: Total tax expense over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *CASHETRAD*: Total tax payments over earnings before taxes minus the official tax rate of the firm home country in the corresponding year multiplied by -1; *POST03*: 1 if the observation corresponds to a year after 2003 and 0 otherwise; *TREAT*: 1 if the observation corresponds to a Norwegian firm (treated group) and 0 otherwise; *POST03xTREAT*: The interaction variable resulting of multiplying *POST03* and *TREAT*; *SIZE*: The total assets of the firm in logs; *LEV*: Long-term debt over total assets; *CINT*: Net property, plant and equipment over total assets; *RDINT*: Research and development expenses over total assets; *INVINT*: Inventories over total assets; *FGNOPS*: 1 if the firm has a subsidiary in a foreign country and 0 otherwise; *MKTBK*: The market value of equity over the book

value of equity; *ROA*: Earnings before taxes over total assets; and *BIG4AUD*:1 if the firm is audited by a Big4 firm and 0 otherwise.

Figure 1. Summary of hypotheses development

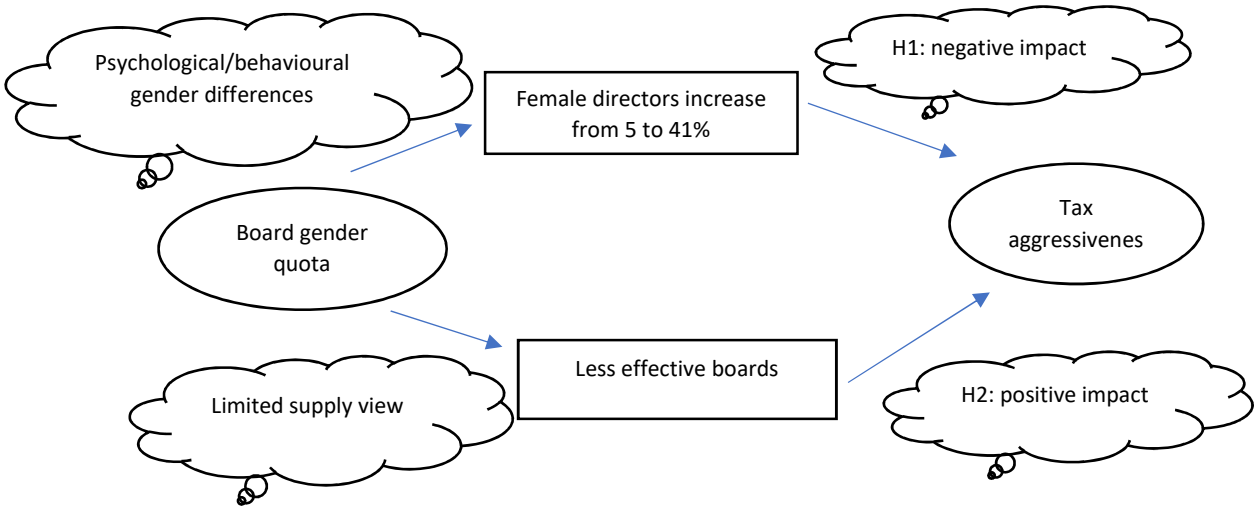
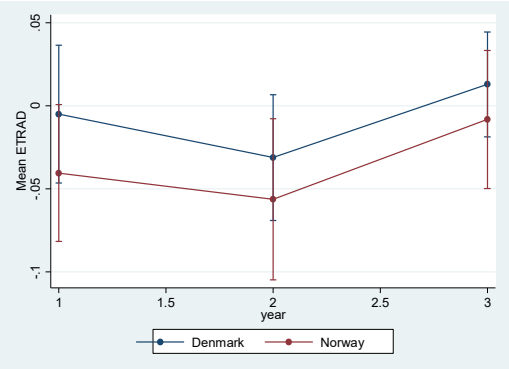


Figure 2. The parallel trend in *ETRAD* and *CASHETRAD* in the pre-treatment period (2001-03)

2a. *ETRAD*



2b. *CASHETRAD*