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► To cite this version:

Kirsten Burkhardt, Pascal Nguyen, Evelyne Poincelot. Agents of change: Women in top management and corporate environmental performance. *Corporate Social Responsibility and Environmental Management*, 2020, 27 (4), pp.1591-1604. 10.1002/csr.1907 . hal-02897389

HAL Id: hal-02897389

<https://hal.umontpellier.fr/hal-02897389>

Submitted on 12 Jul 2020

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Published as:
Burkhardt, K., Nguyen, P, & Poincelot, E. (2020).
Corporate Social Responsibility and Environmental Management, 27(4), 1591-1604.

AGENTS OF CHANGE: WOMEN IN TOP MANAGEMENT
AND CORPORATE ENVIRONMENTAL PERFORMANCE

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AGENTS OF CHANGE: WOMEN IN TOP MANAGEMENT AND CORPORATE ENVIRONMENTAL PERFORMANCE

Abstract

We analyze the influence of gender diversity in top management on the environmental performance of French firms. Consistent with gender socialization theory, which posits that women are raised from childhood to be more nurturing and compassionate for others, we find that firms with more women in top management exhibit higher environmental performance. This result extends those already reported in the literature regarding the effect of gender diversity at board level. We also show that women in top management are associated with several key indicators such as development of eco-friendly products and commitment to resource reduction. Furthermore, we find that the influence of women is weaker in firms with a lower environmental performance and in firms with high growth opportunities since these firms are likely to prioritize their own development. This suggests, in line with social role theory, that women also adapt into the role that organizations expect from them.

Keywords: gender diversity; top management; CSR; performance; sustainable development

1. INTRODUCTION

Concerns over environmental sustainability have intensified to the extent that climate change has become a key issue in EU elections. The Eurobarometer survey conducted in 2017 by the European Commission reveals that 92% of EU citizens see climate change as a serious problem. Furthermore, 89% of respondents consider critical for governments to set targets to increase renewable energy use by 2030. According to IPSOS, a global market research firm, a large majority of potential voters would like political parties to prioritize environmental issues. More specifically, 4 in 5 potential voters declare imperative to protect the environment, to make agriculture sustainable, and to reduce air pollution.

There is good cause for concern as the effect of climate change is projected to be devastating. Spinoni et al. (2018) predict that droughts will become more frequent and increasingly severe, causing extensive damage. Paroissien et al. (2015) estimate that climate change could strongly affect soil erosion and the capability of soils to sustain agriculture. According to Dellink et al. (2019) the damages due to global warming are likely to rise twice as fast as global economic activity, and to specifically affect labor and crop productivity. In any case, local extinctions of plants and animals are already widespread and are expected to be more prevalent as global temperatures continue to soar (Wiens, 2016).

These warnings have compelled governments to take action. Recognizing that human activities, and specifically CO₂ emissions, are responsible for global warming, the Kyoto Protocol (1997) commits participating countries to meet strict emission reduction targets. A key mechanism has been the introduction of emission trading schemes which financially reward firms that cut their emissions and penalize those that exceed their emission allowances. The following Paris Agreement (2016) confirms the objective of capping the rise in global average temperatures below 2°C but offers participating countries the flexibility to implement their own policies. Given the urgency to tackle climate change and due to the voluntary nature of the framework, local administrations in countries not signatory to the Paris Agreement have pledged to pursue efforts to cut carbon emissions and to promote the use of renewable energy.

Firms are also increasingly adopting sustainable practices and placing environmental concerns at the core of their strategies despite the cost involved. The reason is that CSR is associated with significant long-term benefits. Donaldson and Preston (1995) argue that CSR prompts greater stakeholder commitment, which enables firms to use their resources more efficiently. It stimulates innovation (Porter and Van der Linde, 1995) and helps firms to attract high-quality employees who play a critical role in competitive industries (Greening and Turban, 2000). Fauver et al. (2018) explain that CSR leads to higher firm performance because employees are motivated to exert greater effort. Furthermore, social and environmental business practices contribute to strengthen a firm's resilience to external shocks (DesJardine et al., 2019).

But which factors contribute to a firm's greater inclination to be environmentally responsible? Berrone et al. (2010) show that family firms achieve a higher environmental performance that can be explained by the family's need to protect its socioemotional wealth. Walls et al. (2012) suggest that environmental performance is jointly determined by the firm's ownership, board, and management characteristics. For instance, board independence interacts with CEO pay to

moderate its negative influence on a firm's environmental performance. More recent studies highlight the positive influence of female directors. Seto-Pamies (2015) indicates that the presence of women on the board of directors positively affects a firm's environmental reputation. Likewise, Valls Martinez et al. (2019) find that firms with a higher proportion of female directors are more likely to be included in the Dow Jones Sustainability Index. Furthermore, Liao et al. (2019) find that environmental innovation is linked to the proportion of female directors. To the best of our knowledge, no study has yet investigated the effect of women in top management on a firm's environmental performance.

There are reasons to believe that women care about the environment more than men do (De Silva and Pownall, 2014; Xiao and McCright, 2015). Provided the right conditions are in place, women are expected to make a positive impact. According to gender socialization theory (Chodorow, 1978), women are raised from childhood to be more nurturing and compassionate for others. This makes them more sensitive to the detrimental effects that some business decisions can have on the environment. Women also tend to be more conservative and thus more concerned about the risks that could arise as a result of climate change. We therefore hypothesize that women in top management positions are more likely to promote policies that have a beneficial effect on the environment and to reject those that may do harm.

To test this hypothesis, we use a sample of French firms over the period from 2006 to 2017. France is an interesting case. It was the first EU country to require listed firms to expand their financial reporting to include the social and environmental impacts of their activities under Section 116 of the "Nouvelles Régulations Economiques" Act of 15 May 2001. Section 225 of the "Grenelle 2" Act of 12 July 2012 broadened the scope of the law to cover all companies with over 500 employees, increased the amount of information firms were expected to provide, and made verification by an independent third-party mandatory. With Order No 2017-1180 of 19 July 2017 transposing European Directive 2014/95/UE on the disclosure of non-financial information firms must now assess the real impact of their activities and describe mitigation plans and progress towards their stated goals.

In contrast to previous studies, we do not focus on gender diversity within the board of directors because the "Copé-Zimmermann" Act of 27 January 2011 requires that 40% of board positions should be filled by women by 2017. This legal requirement has artificially inflated the number of female directors ahead of the deadline and induced clustering around the threshold. In comparison, firms are free to decide on the composition of their executive committees. As a result, the latter exhibit substantial cross-sectional variations that should facilitate the detection of a link with the firm's environment performance.

Our results show that firms with a higher proportion of women in top management are associated with greater environmental performance. In addition, we find a positive association between the proportion of women in top management and several environmental indicators, such as environmental product and process innovation, and commitment to resource reduction targets. We also find that the effect is stronger in firms with a strong environmental record suggesting that greater responsiveness to the distinctive role of women helps them to express and implement their greater inclination to protect the environment. On the other hand, the

influence of women is weaker in high-growth firms possibly because these firms prioritize their development and constrain women to focus on working toward that goal.

The positive influence of women in top management on a firm's environmental performance is consistent with their more caring inclination (Chodorow, 1978). This result extends those achieved through the analysis of board gender diversity (Bear et al., 2010; Post et al., 2011; Zhang et al., 2013; Seto-Pamies, 2015; Kassinis et al., 2016; Liao et al., 2019; Valls Martinez et al., 2019) and supports the view that women attach greater importance to environmental issues (De Silva and Pownall, 2014; Xiao and McCright, 2015). This result also resonates with the observation made by Nielsen and Huse (2010) that women bring a distinct flavor to the top management team. By expressing greater concerns regarding the impact of corporate policies, women help firms to make better and more informed decisions that do not overlook the negative externalities that firms produce. While not necessarily inducing greater firm performance, women certainly contribute to the development of a more sustainable economy.

The rest of the paper is organized as follows. In section 2, we review the literature and formulate our central hypothesis. In section 3, we describe the data and methodology. The results are presented and discussed in section 4. We finally summarize and close the study with some remarks in section 5.

2. BACKGROUND AND HYPOTHESIS

Women in top management have the opportunity to weigh on issues that are of greater significance to them. Protection of the environment is likely to be well placed among the issues about which women are expected to express a different opinion compared to men. As a matter of fact, gender socialization theory (Chodorow, 1978; Dawson, 1997) argues that women have distinct traits, interests, and values as the result of the sex roles and personalities they develop in childhood. This bifurcation explains that women are more ethical than men, that they care more about others, that they view themselves as belonging to a group, and that they are more cautious. We review these arguments in sections 2.1 to 2.3 and give reasons for each of them to imply that women pay greater attention to the environment. In section 2.4 we present results regarding women in board positions before stating the hypothesis that greater gender diversity in top management is associated with greater environmental performance.

2.1. Women and ethics

Studies suggest that women are more ethical than men. For example, Deshpande et al. (2006) show that female hospital employees are more likely to behave ethically whereas male employees are more likely to behave unethically or view questionable acts as acceptable. Valentine and Rittenburg (2008) show that businesswomen display greater intentions to act ethically. Using meta-analyses, Franke et al. (1997) confirm the hypothesis that women are more inclined than men to believe that questionable acts -- such as breaking rules, taking bribes, failing to disclose critical information, misusing private information, or issuing misleading information -- are unethical.

Furthermore, Tibbetts (1999) reveals that male students are more likely to cheat while Shawver et al. (2006) find that female students are more likely to reject bribes. In practice, firms with a higher proportion of female directors are less likely to commit securities fraud (Cumming et al., 2016). Besides, the instances of fraud appear to be less serious as they lead to a less significant drop in the firm's share price. Another interesting observation is that women are less inclined to overstate earnings. Indeed, Srinidhi et al. (2011) show that firms with greater board gender diversity are associated with greater earnings quality. Likewise, Barua et al. (2010) note that firms with female CFOs have lower performance-matched absolute discretionary accruals and lower absolute accrual estimation errors, which also suggests lower levels of earnings management.

Because of their greater ethical sensitivity, women are expected to express greater concerns about policies that create damage to the environment. Endorsing such policies are likely to be viewed by women as unacceptable and comparable to committing fraud. In addition, women are unlikely to support attempts to infringe on environmental regulation since they tend to be more respectful of the spirit of the law and exhibit a stronger belief in the power of regulation. Accordingly, firms with more women in top management are expected to display a greater environmental performance.

2.2. Women and compassion

Social role theory (Eagly, 1987; Eagly and Wood, 1991) suggests that women are more communal and concerned with others as a result of their specific responsibility in raising children and caring to the household, whereas men are more assertive and independent due to their role as breadwinners. As a matter of fact, women are supposed to care for the personal and emotional needs of others and to help others progress toward their goals (Gilligan, 1993). Moreover, beliefs in gender stereotypes put considerable pressure on women to act in a caring way, so as not to conflict with their expected gender role (Guttek and Morasch, 1982).

Consistent with these arguments, Thomas (1991) find that women in US states with the highest percentages of female representatives introduce and pass more priority bills dealing with issues of women, children, and families than men in their states. Likewise, Swiss et al. (2012) show that an increase in the number of female legislators leads to a prioritization in health care, an increase in social policy spending, and a decrease in poverty, which is more significant in socially and economically disadvantaged countries. However, Clots-Figueras (2011) observes that, in India, high caste female legislators oppose land reforms and reduce social expenditure whereas low caste female legislators invest more in health and education, and favor redistributive policies, such as land reforms.

Furthermore, women display greater inequality-aversion. Dickinson and Tiefenthaler (2002) run an experiment in which a disinterested third party decides the resource allocation to two parties who have different marginal valuations for the resources. Their results indicate that male allocators are more likely to maximize efficiency (which implies greater inequality in the allocation) while female allocators are more likely to equalize what the two parties receive. Dufwenberg and Muren (2006) propose that groups of three divide money between themselves

and a fourth recipient. Money kept for the group is divided equally amongst its members. Their main finding is that the groups consisting mostly of women give the fourth party significantly more compared to the other groups.

Because of their more inclusive personality, women are more likely to consider the interest of all stakeholders instead of narrowly focusing on the interest of shareholders. Besides greater concern for the welfare of employees, women are expected to display greater concern for the environment which is a common good. Accordingly, firms with a greater proportion of women in top management are less likely to be involved in environmental controversies and more likely to adopt initiatives that are friendly to the environment.

2.3. Women and cautiousness

Research indicates that women are more risk averse than men and tend to focus on strategies that avoid the worst outcomes. Sunden and Surette (1998) observe that women select less risky assets in their defined contribution plans. Likewise, Jianakoplos and Bernasek (1998) note that women hold a smaller proportion of their wealth in the form of risky investments than men of equal economic status. Barber and Odean (2001) explain that women are less overconfident and have a greater perception of risk, which may explain their more conservative investment strategies. Based on a survey of consumer finances, Fisher and Yao (2017) confirm that women have lower financial risk tolerance, especially when income uncertainty is high.

In many experimental studies, male participants appear more eager to take risks than female participants. Byrnes et al. (1999) underscore that the difference in risk taking is significant and that almost half of the results exceed the conventional cutoff for small effects. For example, Powell and Ansic (1997) show that women prefer broader insurance coverage than men and avoid the currency market to prevent the potential loss from exchange rate fluctuations.

Greater cautiousness explains that women avoid turbo-charged growth which is associated with a high risk of failure. Cliff (1998) shows that female small business owners purposely strive to achieve steady growth because of the risk of expanding too quickly. Adhikari et al. (2019) point out that firms where women have greater influence make decisions that are less contentious, and thus face a lower risk of lawsuits, because they pay more attention to the interests of other stakeholders and not just to the interests of shareholders. Likewise, Koellinger et al. (2013) show that women are less likely to start a business than men because of higher fear of failure.

This suggest that women avoid aggressive policies and prefer a more sustainable path forward. Women are also less likely to underestimate the effects of their decisions on the environment or to overestimate their ability to find remedial actions. In fact, surveys find that women are significantly less confident that human progress will provide technological means to address environmental challenges, which explains that they are more concerned about changing their daily habits in order to minimize their impact on the environment (Wicker and Becken, 2013). It follows again that firms with more women in top management should exhibit a greater environmental performance.

2.4. Women and the environment

The beneficial effects of gender diversity at board level have already been recognized in the literature. Hafsi and Turgut (2013) argue that board gender diversity has a positive effect on the firm's social performance because it helps improve the effectiveness of the firm's linkages with stakeholders and encourages greater sympathy to the wider society's concerns. Female directors are likely to show greater consideration to stakeholders since they are characterized by high universalism and low power-orientation (Adams and Funk, 2012). This explains that firms with more gender diverse boards take greater care of the environment, and thus avoid environmental lawsuits, particularly in the context of a male CEO (Liu, 2018). They are also more likely to be proactive in addressing environmental concerns than men directors (Glass et al., 2016). This aspiration to make a positive contribution to society is attested by the fact that firms with gender diverse boards produce more environmental innovation (Liao et al., 2019).

Kassinis et al. (2016) posit that firms with a larger proportion of female directors are more environmentally conscious because women bring environmental sensitivity to the debate and offer different perspectives in relation to managing environmental exposure. Women are also less overconfident and more receptive to expert advice. As a result, gender diverse boards are able to consider a broader range of options that may be more friendly to the environment (Liu, 2018). Additionally, female directors are more effective monitors (Adams et Ferreira, 2009), which ensures a more stringent enforcement of ethical codes of conduct. Firms with gender diverse boards are therefore less likely to be involved in environmental violations. These results are consistent with prior findings that board gender diversity reduces unethical conduct such as securities violations (Cumming et al., 2015). It follows that the presence of women on the board of directors has a positive impact on a firm's environmental reputation (Seto-Pamies, 2015). The latter is thus more likely to be included in a stock index consisting of sustainable and socially responsible firms (Valls Martinez et al., 2019).

While female directors have been shown to have a positive influence on a firm's environmental and social performance, there is no research regarding the role that women in top management can play in enhancing a firm's environmental performance. In principle, the board of directors is in charge of setting the firm's strategy that the top management team is then simply called to execute. This suggests that gender diversity in top management might not have any influence. However, the reality is that top managers have wide discretion in selecting the best way to meet the firm's strategic objectives. As a result, if their sensitivity leans towards providing greater protection to the environment, the firm is likely to display greater environmental performance. As argued in sections 2.1 to 2.3, women present this inclination. A more gender diverse top management team is thus better equipped to deal with environmental threats and opportunities and can rely on a broader repertoire of skills to come up with innovative solutions (Hambrick et al., 1996). Accordingly, it is possible to conceive the following hypothesis.

Hypothesis: The proportion of women in the top management team is associated with greater environmental performance.

3. DATA AND METHODOLOGY

3.1. Data and key variables

Our data are from Thomson Reuters Asset4. This database provides environmental, social and governance (ESG) information on listed firms using public sources such as company annual reports and stock exchange filings. The different environmental indicators reflect the impact of a firm on living and non-living natural systems, and include among others, the firm's energy and water use, CO₂ emissions, and efforts in cutting waste. Most of the indicators are binary variables that denote, for example, if the firm has a policy to reduce emissions, to improve energy efficiency, or to develop eco-friendly products.

The continuous indicators are grouped in three categories: emission reduction; product innovation; and resources reduction. For example, the emission reduction category provides information on whether the firm has a policy for reducing emissions; whether it has a policy for reducing its impacts on biodiversity; whether it uses indicators to monitor emission reduction; whether it has set targets to achieve in this respect; and whether it is making proactive environmental investments.

For each of these categories, Thomson Reuters computes a score for each firm. For that, the constituting variables are standardized by ranking the firm relative to its industry peers. The best performing firm receives a score of 100 and the worst performing one receives a score of 0, provided there are no ties. These scores are then averaged across the constituting variables to provide a category-specific score. The top-level environmental score is obtained by combining the binary indicators with the three category scores. A more detailed presentation can be found in Garcia Martin and Herrero (2019).

The percentage of women in the top management team also comes from the Asset4 database. Since the size of the team is not provided, it is not possible to calculate the number of women in the top management team to test whether a critical mass is needed before women can make a meaningful impact. However, it is possible to calculate another indicator of gender diversity. With x the proportion of women, $1 - x$ is the proportion of men, implying that the Blau index is $1 - (x^2 + (1 - x)^2)$. This indicator varies from 0, when there is no gender diversity, to 0.5 when the proportion of men and women is exactly the same. We also use a dummy variable to indicate that the proportion of women in top management is above 10%.

Since our focus is on French firms, we retrieve all firm-year observations with non-missing environmental, governance, and financial information of companies whose headquarters are located in France. This screening returned 878 firm-year datapoints for 86 firms over the period from 2006 to 2017. However, due to the application of a lag to mitigate endogeneity concerns, a total of 817 observations are actually used in the analysis. Thomson Reuters tracks those firms because they are constituents of a major stock index, such as the all-French CAC 40 and SBF 120 indices, and the pan-European STOXX 600 index. As a result, the sample is fairly representative of (large) French listed firms.

3.2. Control variables and model specification

Several firm-level characteristics are associated with a firm's environmental performance and must therefore be included as control variables. Firm size is measured by the log of total assets. Cuadrado-Ballesteros et al. (2017) and Garcia Martin and Herrero (2019) find that large firms achieve a higher environmental score, in line with Kassinis et al. (2016) who show that large firms are more environmentally conscious. We include two measures of financial performance: log of Tobin's Q and return on assets (ROA). Kassinis et al. (2016) report a positive correlation between environmental consciousness and Tobin's Q. Hussein et al. (2018) indicate a positive association between environmental performance and ROA. Finally, the firm's investment intensity is reflected by the ratio of capital expenditures to total assets and the ratio of R&D expenditures to total assets. To mitigate the high level of skewness in the R&D intensity variable, we follow standard practice and take the log of after adding an increment of one unit.

Since environmental performance can also be explained by a firm's governance (Zhang et al., 2013), we include the following control variables. Board type is a dummy variable indicating whether the firm operates with a unitary board or with a two-tiered board structure. Board size is the number of directors. Board independence is the proportion of independent directors. CEO chair is a dummy indicating that the CEO is also chairman of the board.

To analyze the effect of women in top management on a firm's environmental performance, we run cross-sectional regressions. Firm and governance characteristics are included so that barring simultaneity and reverse causality, differences in environmental performance can be linked to differences in women representation in top management. However, all the right-hand side variables, and particularly women representation in top management, are lagged one year in order to mitigate endogeneity concerns. The baseline model is as follows:

$$\begin{aligned} \text{Environmental score}_{t+1} = & \\ & \beta_1 \text{women managers}_t + \beta_2 \text{board type}_t + \beta_3 \text{board size}_t + \beta_4 \text{board independence}_t \\ & + \beta_5 \text{CEO chair}_t + \beta_6 \text{firm size}_t + \beta_7 \text{Ln Tobin's } Q_t + \beta_8 \text{ROA}_t \\ & + \beta_9 \text{Capex/TA}_t + \beta_{10} \text{Ln R\&D}_t + \gamma \text{ Industry} + \vartheta \text{ Year} + \varepsilon \end{aligned}$$

This model is estimated using OLS regression with standard errors adjusted for clustering at the firm level. Besides the environmental score, other dependent variables include an environmental innovation score, an environmental controversies score, and indicators of that the firm develops environmental products, has received environmental awards, has a resource reduction target, and has an eco-design policy for the provision of its services. When the dependent variable is an indicator, the model's coefficients are estimated using logit regressions. On the right-hand side, women managers are measured either by the percentage of women in the top management team, the associated Blau index, or a dummy indicating that the percentage of women in the team is higher than 10%.

We also analyze whether the effect of women managers depends on the firm's environmental performance. Because the conditioning variable is the dependent, we use quantile regressions. Another contingent analysis involves investigating the role of the firm's growth opportunities

which are proxied by Tobin's Q. This analysis is performed by adding the interaction term between the log of Tobin's Q and the variables measuring the influence of women in the top management committee.

$$\begin{aligned} \text{Environmental score}_{t+1} = & \\ & \beta_1 \text{ women managers}_t + \beta_2 (\text{women managers}_t \times \text{Ln Tobin's } Q_t) + \beta_3 \text{ board type}_t \\ & + \beta_4 \text{ board size}_t + \beta_5 \text{ board independence}_t + \beta_6 \text{ CEO chair}_t + \beta_7 \text{ firm size}_t \\ & + \beta_8 \text{ Ln Tobin's } Q_t + \beta_9 \text{ ROA}_t + \beta_{10} \text{ Capex/TA}_t + \beta_{11} \text{ Ln R\&D}_t \\ & + \gamma \text{ Industry} + \vartheta \text{ Year} + \varepsilon \end{aligned}$$

4. RESULTS

4.1. Description of the sample

Table 1 presents descriptive statistics for the sample. The environmental variables indicate that water and energy conservation are high priorities. As a matter of fact, 3 firms out of 4 have water conservation targets, while over 90% of firms have set targets in relation to energy conservation. Women form on average 10.5% of top management teams, which suggests that the latter remain overwhelmingly dominated by men. The situation is however improving. At the end of 2006, more than 70% of top management teams were exclusively composed of male executives, while the average proportion of women in top management was less than 4.2%. By the end of 2017, 79% of top management teams included at least one woman in their ranks, and the average proportion of women has reach 14%.

--- Table 1 about here ---

Board of directors typically consist of 13 members. Most boards are unitary. Only 22% of boards are two-tiered with a distinct management board and supervisory board. With a proportion of independent directors standing at 47.75%, French boards appear to be much less independent compared to US or UK boards. For instance, Walls et al. (2012), Liu (2018), and Adhikari et al. (2019) report that board independence is over 70% on average in the US. Haque and Ntim (2018) indicate that the average is 53.8% for UK boards. Moreover, only 4% of UK boards are chaired by the CEO. In contrast, 68.2% of boards in our sample are chaired by the CEO, which raises questions regarding the effective control that boards have over the CEO's decisions in France.

Table 2 shows the correlation between the variables. A first remark is that all the environmental variables are positively correlated with one another. Interestingly, environmental innovation is strongly associated with the development of environmental products. Likewise, water conservation policy is strongly correlated with energy savings policy. Both variables are related to the implementation of a resource conservation policy. In addition, awards for CSR activities and performance are more likely if firms have introduced such policies.

--- Table 2 about here ---

Consistent with Harjoto et al. (2015), larger firms tend to exhibit higher environmental scores. However, in contrast to their finding, we observe that ROA and Tobin's Q are negatively correlated with all the environmental variables, and particularly with the aggregate score. This might be due to the fact that firms with high growth opportunities choose to focus on achieving their growth potential at the expense of their environmental record. The negative correlation between capital expenditures and environmental performance appears to support this argument.

Among the remaining variables, board size and board independence are also positively correlated with environmental performance. However, the reason is that firms with larger and more independence boards tend to be larger, which is a marker of environmental performance. Finally, the correlation between the proportion of women in top management and the environmental variables is positive and generally significant. However, gender diversity does not appear to be strongly correlated with the firm's characteristics, except Tobin's Q.

4.2. Effect on the environmental score

Table 3 shows the OLS regressions of the environmental score on female representation in the top management team. Year dummies are included to control for any time variation and more specifically to control for the steady increase of women in top management. Industry dummies are also included. Accordingly, the regressions attempt to compare firms in the same industry and with the same characteristics in order to check whether gender diversity in top management is associated with higher environmental performance. The results suggest that the answer is positive. While the coefficients are not highly significant in statistical terms, their magnitude is economically large. For example, the result in column 1 indicates that a 10% increase in female representation which may arise from having an additional woman in a 10-person top management team is associated with a 2.3 point increase in the environmental score, which is about twice the average increase that firms have achieved each year over the sample period.

--- Table 3 about here ---

The result using the Blau index and displayed in column 2 confirms that greater gender diversity in top management is associated with greater environmental performance. The result in column 3 shows that firms in which the proportion of women in the management committee is higher than 10% outperform firms where the proportion is less than 10% by 3.34 points. Overall, the results are consistent with the view that women are more environmentally conscious (Kassinis et al., 2016). Leveraging the opportunity conferred by their positions in top management, women work to enhance the firm's environmental performance. This finding confirms unambiguously the more ethical posture of women and their greater care for the environment, which is to the benefit of all.

Consistent with the literature (Kassinis et al., 2016; Cuadrado-Ballesteros et al., 2017; Garcia Martin and Herrero, 2019), we find that larger firms are associated with a higher environmental score. This may be explained by the fact that large firms have more resources to commit to environmental protection and for tracking their own progress in this matter. It is also likely that large firms are more closely covered in the media and feel therefore under greater pressure to

paint themselves as good corporate citizens (Udayasankar, 2007). Yet, although women representation in top management is strongly correlated with firm size, the inclusion of the latter among the regressors does not soak up the positive influence that women have on a firm's environmental performance.

The proportion of independent directors is also associated with a higher environmental score, which underline the fact that good governance is not only beneficial to shareholders but is also positive for the environment (Post et al., 2011; Zhang et al., 2013). Interestingly, strong firm growth, as indicated by higher capital expenditures, is associated with a lower environmental score, which appears to suggest that firms face a trade-off between growth and environmental protection. When their growth rate is strong, firms are unlikely to prioritize the environment, perhaps due to resources constraints, which need to be focused almost exclusively towards developing and expanding their business.

Finally, none of the other variables appears to be associated with environmental performance. In particular, board size becomes insignificant in the concomitant presence of firm size among the regressors.

4.3. Effect on selected environmental indicators

Since the environmental score is constructed by aggregating a large array of items, it is likely that not all of them have the same importance. In Table 4 we select five environmental variables from the Asset4 database. The objective is to examine the effect of gender diversity for different facets of a firm's environment performance. The first column explores the effect on product innovation. The latter is also an aggregate indicator that reflects the firm's commitment and effectiveness towards supporting the development of eco-efficient products or services as well as its capacity to reduce waste by developing new technologies and products with extended durability. One key component is the amount that the firm spends on environmental R&D. The regression result shows that the effect of gender diversity is significant with an estimated coefficient about twice as large as the coefficient fitted on the environmental score.

--- Table 4 about here ---

The other dependent variables are dummy variables. Accordingly, the model is fit using logit regressions. Columns 2 and 3 reveal that firms are less likely to be involved in environmental controversies and more likely to receive environmental awards the higher the proportion of women in top management. These results are consistent with the fact that women display greater awareness towards potential risks and are more sensitive to the interests of stakeholders. This explains that they are less likely to endorse decisions that create negative externalities.

More significantly, columns 4 and 5 show that firms with a higher proportion of women top managers are more likely to develop environmental products and to have resources reduction targets. The highly significant coefficients on gender diversity underline the strongly positive impact that women can have on a firm's environmental performance which does not appear as clearly using the aggregate environmental score because some items aggregated into the score are weakly discriminant.

One reason for the lack of effectiveness of some ESG items reported in the Asset4 database is that they are not applicable across firms. For example, commitment not to use GMO applies essentially to firms in the food industry such as Danone. Likewise, development of hybrid vehicles applies to automakers such as Renault and Peugeot, and to their suppliers such as Valeo and Faurecia, but not to other firms. The specificity of these items is made worse by the aggregation process which implicitly assumes that reporting a zero value is indicative of a bad environmental performance whereas in fact the item is simply irrelevant to the firm. This is almost certainly the reason why larger firms, which tend to be more diversified, exhibit a higher environmental score.

Indeed, we find that the effect of firm size is highly significant in all the regressions. This might have been expected given that larger firms have more resources to spend on developing environmental products and are more likely to be in the spotlight, which ensures that they display greater commitment towards reducing their environmental footprint (Udayasankar, 2007). Interestingly, this also prompts them to be more careful not to be embroiled in environmental controversies although their larger size makes them more susceptible to be involved in such controversies and more likely, as a result, to be targeted in the media.

Finally, board independence retains a positive effect on the environmental innovation score and on the likelihood of developing environmental products. It also decreases the risk that the firm is involved in environmental controversies which might be explained by the fact that independent directors have more to lose in case the firm is hit by a scandal.

4.4. Effect conditional on environmental performance

The influence of women in top management is likely to depend on the firm's characteristics. One of them is the importance of environmental matters to the firm. In Table 5, we investigate the effect of female representation in top management. Since this conditioning variable is also the dependent variable, OLS regression cannot be used. We thus turn to quantile regressions. The results across the three columns show that the effect of gender diversity is more significant in the higher quantile of environmental performance, which appears to indicate that women have a stronger influence on a firm's environmental performance when the firm exhibit a greater sensitivity to environmental matters (as indicated by its high environmental score).

--- Table 5 about here ---

In contrast, firm size appears to have a stronger effect in the lower quantile. This suggests the presence of a size-induced constraint. As a matter of fact, small firms have fewer resources to dedicate to environmental issues. Hence, their weaker environmental performance. However, positive variations in firm size help to relax the constraint and lead to higher environmental performance. Large firms do not suffer from this constraint. Accordingly, the positive effect of firm size in the higher quantile appears to reflect a deliberate (rather than a forced) choice of doing more for the environment as size firm increases.

Interestingly, capital expenditures have a strong negative effect in the lower quantile but not in the higher quantile of environmental performance. This result is consistent with the idea that there is a trade-off between growth and environmental protection. When firms have a lot of

projects, their priority is to allocate resources to their internal development. It follows that their environmental record is poor. Hence, the higher their investment requirements, the lower their environmental performance, which explains the negative effect found in the lower quantile.

Another notable finding is that the effect of board independence is strongly positive in the lower quantile but not in the higher quantile. A plausible reason is that independent directors are more concerned about the negative impact on their reputation when firms have a poor environmental record. For instance, they may be held responsible for environmental damages caused by the firm. The likelihood of joining the board of other firms may also suffer as a result.

4.5. Effect conditional on growth opportunities

In Table 6, we examine the contingent effect of female representation in top management using Tobin's Q as the conditioning variable to reflect the firm's growth opportunities. One reason to expect a differential effect is that firms with a strong growth profile are likely to prioritize their development. They may also lack the resources to pursue both their growth opportunities and the protection of the environment. Accordingly, we expect the coefficient on the interaction term between Tobin's Q and the variables measuring executive gender diversity to be negative.

--- Table 6 about here ---

The results clearly support this conjecture. As a matter of fact, gender diversity is found to have a weak effect on the environmental score when firms are characterized by strong growth opportunities, while the effect is highly significant when firms have few growth opportunities. This confirms the contingent effect of gender diversity underlined in some studies. For instance, Francoeur et al. (2008) indicate that women officers contribute to positive risk-adjusted returns in firms with a high market-to-book ratio, but not in firms with a low market-to-book ratio. Likewise, Lucas-Pérez et al. (2015) show that women directors have a stronger impact on executive compensation in firms where the CEO is also the chair of the board of directors.

While women in top management have the opportunity to promote their distinctive values, and particularly their greater concern for the environment, they appear unable or unwilling to push for greater environmental commitment when their firms have profitable growth opportunities that need to be turned into real value. The pressure to meet expectations and not to disappoint compels women managers to put environmental issues on the backburner. In addition, the lack of financial and human resources is likely to make it difficult for growth firms to find the means to improve their environmental performance. In any case, diverting internal resources to protect the environment is likely to be more costly.

5. SUMMARY AND CONCLUSION

In this paper, the question is whether women in top management induce greater environmental performance. We find that firms with a higher proportion of women in top management are associated with a higher environmental score. In addition, these firms exhibit a higher product innovation score, reflecting large amounts of investment in green technologies and a greater capacity to reduce waste and develop new products with extended durability. Firms with more women in top management are also more committed to reducing their consumption of natural resources and are less likely to be involved in environmental controversies. These results extend those already reported in the literature regarding the effect of female directors (e.g., Seto-Pamies, 2015; Glass et al., 2016; Kassinis et al., 2016; Liu, 2018; Liao et al., 2019; Valls Martinez et al., 2019).

Accordingly, the first contribution in this paper is to underscore the impact of gender diversity in top management on the firm's environmental performance. Moreover, this variable is less likely to be manipulated in order to meet regulatory targets such as the need to have 40% of female directors. We also find that female representation in top management is significant at any level of a firm's environmental performance. However, women appear to have a stronger effect in firms that have a strong environmental record. Hence, favorable conditions seem to be required for women to express their distinctive views and promote their personal values. Another interesting result is that women appear to have a lower impact in high-growth firms which suggests that women's concerns are superseded by the firm's priorities towards accelerating its development and materializing its potential value.

Taken as a whole, our results support gender socialization theory (Chodorow, 1978). Indeed, we find that women are associated with greater care for the environment. The higher environmental score displayed by firms with more female top managers is likely to reflect the greater sense of ethics and sensitivity for the welfare of others that gender socialization theory attributes to women as a result of their distinctive childhood development. It may also reflect greater concerns regarding the risk presented by global warming that many surveys have highlighted (Wicker and Becken, 2013).

Our results are also consistent with social role theory (Eagly, 1987; Eagly and Wood, 1991) since we find that female top managers have a lower influence in high-growth firms because these firms are likely to prioritize their rapid development and focus their efforts into achieving the potential implicit in their high valuation ratios. Women are thus guided toward meeting this goal with little or insufficient opportunity to express their personal sensitivity. The fact that the influence of women is weaker in firms with a low environmental performance also suggests that female top managers adjust their behavior or self-select into the role that organizations expect from them (Eagly & Johnson, 1990). When environmental performance is not a priority because of other more pressing concerns, there is not much that women can do.

Nevertheless, as they increase in size and as their growth opportunities are eventually exhausted, firms are likely to pay more attention to their environmental record. These are precisely the conditions under which women executives appear to have the greatest impact. Hence, the second contribution of this study is to underline that women executives are not only

associated with a greater environmental performance, but that the material expression of their specific qualities requires favorable conditions and that women can be constrained by organizational objectives such as the need to achieve the growth potential signaled through their firm's high valuation ratio.

The work presented in this paper may be extended in several directions. A first step would be to extend the analysis to other countries. Since we have shown that the influence of women requires favorable conditions for their distinctive values and behaviors to fully express themselves, an idea would be to evaluate whether national culture plays a role in moderating the relationship between the representation of women in top management and the firm's environmental performance. The influence of the firm's governance quality may be evaluated in much the same way. Another extension would be to analyze the role of women's age, training, and past experience given that these characteristics affect their sensitivity to environmental issues (Alonso-Almeida et al., 2015). One last suggestion would be to test whether women in top management are associated with less frequent, as well as less severe, environmental incidents; and to investigate whether investors react with greater restraint to the announcement of these incidents. This research could mirror the work of Cummins et al. (2015) by focusing on environmental breaches instead of securities fraud.

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Table 1. Descriptive statistics

	Mean	Std Dev	Q1	Median	Q3
Panel A: Dependent variables					
Environmental score	74.970	16.281	66.849	77.302	87.093
Env. innovation score	67.782	25.549	44.363	73.810	90.933
Env. controversies score	45.177	23.025	19.149	57.551	61.478
Env. product	0.6071	0.4887	0	1	1
Env. award	0.5190	0.4999	0	1	1
Resource reduction	0.5496	0.4978	0	1	1
Eco-design	0.4419	0.4969	0	0	1
Water conservation	0.7625	0.4258	1	1	1
Energy conservation	0.9058	0.2924	1	1	1
Panel B: Independent variables					
Women managers	10.511	10.240	0	9.0909	15.385
Blau index	0.1803	0.1422	0	0.1800	0.2778
Fraction > 10%	0.4516	0.4979	0	0	1
Firm size	23.150	1.2985	22.215	23.102	24.069
Ln Tobin's Q	0.3322	0.4234	0.0331	0.2394	0.5399
ROA	4.3051	4.9980	1.7051	4.0219	6.4974
Capex/TA	4.7830	3.9499	2.3335	3.8137	5.9993
Ln RD	0.5204	0.8326	0	0	0.9856
Board type	1.2209	0.4148	1	1	1
Board size	13.229	3.6793	11	13	16
Board independence	47.751	20.202	35.714	46.154	60
CEO chair	0.6818	0.4661	0	1	1

Environmental score measures the firm's global impact on the environment. Env. innovation score measures the firm's commitment and effectiveness in developing eco-efficient products. Env. controversies score measures the firm's negative impact on the environment. Env. product indicates that the firm has at least one product line or service that is designed to have positive effects on the environment. Env. award indicates that the firm has received product awards with respect to environmental responsibility. Resource reduction indicates that the firm has a policy for reducing the use of natural resources. Water (/Energy) conservation indicates that the firm has a policy to improve its water (/energy) efficiency. Eco-design indicates that the firm's products are designed for reuse and recycling. Women managers is the percentage of women in top management. Firm size is the log of total assets. Tobin's Q is proxied by total assets plus market value of equity less book value of equity; scaled by total assets. ROA is operating return over total assets. Capex represents capital expenditures. Ln RD is the log of R&D to total assets incremented by one unit. Board type equals 1 if the board is two-tiered; and 0 otherwise. Board size is the number of directors. Board independence is the percentage of independent directors. CEO chair equals 1 if the CEO is chairman of the board of directors.

Table 2. Correlation between the variables

		[1]	[2]	[3]	[4]	[5]	[6]
Env. score	[1]	1.0000					
Env. innovation	[2]	0.7344*	1.0000				
Env. product	[3]	0.4827*	0.6836*	1.0000			
Env. Award	[4]	0.3459*	0.2440*	0.1685*	1.0000		
Resource red.	[5]	0.4543*	0.2519*	0.1582*	0.3052*	1.0000	
Water cons.	[6]	0.4336*	0.1340*	0.1106*	0.0960*	0.2579*	1.0000
Energy cons.	[7]	0.5361*	0.2556*	0.1608*	0.1841*	0.2721*	0.3713*
Eco-design	[8]	0.2899*	0.3971*	0.4786*	0.1561*	0.1070*	0.0737
Firm size	[9]	0.3886*	0.2600*	0.2439*	0.2248*	0.3901*	0.2578*
Ln Tobin's Q	[10]	-0.1086*	-0.1353*	-0.1219*	-0.1049*	-0.1111*	-0.0554
ROA	[11]	-0.1359*	-0.1728*	-0.1731*	-0.0303	-0.0746	-0.0612
Capex/TA	[12]	-0.2215*	-0.0613	-0.0981*	-0.0769	-0.0729	-0.0868
Ln RD	[13]	0.0563	0.1069*	0.1861*	-0.0309	-0.0273	0.0823
Board type	[14]	0.0014	-0.0003	-0.1305*	0.0137	-0.0190	-0.0842
Board size	[15]	0.1792*	0.1010*	0.1373*	0.1199*	0.2611*	0.1497*
Board indep.	[16]	0.1805*	0.2217*	0.1540*	0.0184	-0.0305	-0.0048
CEO chair	[17]	0.0271	0.0356	0.1713*	0.0312	-0.0006	0.0819
Women managers	[18]	0.1923*	0.1832*	0.1073*	0.0398	0.0597	0.1083*

		[7]	[8]	[9]	[10]	[11]	[12]
Energy cons.	[7]	1.0000					
Eco-design	[8]	0.1014*	1.0000				
Firm size	[9]	0.2706*	0.1822*	1.0000			
Ln Tobin's Q	[10]	-0.0708	-0.0142	-0.4096*	1.0000		
ROA	[11]	-0.0707	-0.0604	-0.2666*	0.6513*	1.0000	
Capex/TA	[12]	-0.1772*	-0.0611	-0.1780*	0.0905*	0.1053*	1.0000
Ln RD	[13]	-0.0241	0.2158*	-0.1225*	0.1831*	0.0455	-0.1032*
Board type	[14]	0.0557	0.0193	0.0034	-0.0651	0.0206	-0.0719
Board size	[15]	0.1044*	0.0063	0.5643*	-0.2395*	-0.1500*	-0.1032*
Board indep.	[16]	0.0690	0.1730*	0.0804	-0.0692	-0.0781	0.0293
CEO chair	[17]	-0.0405	0.1105*	0.0975*	-0.0774	-0.1134*	-0.0623
Women managers	[18]	0.1298*	0.0186	0.0167	0.1547*	0.0381	-0.0049

		[13]	[14]	[15]	[16]	[17]	[18]
Ln RD	[13]	1.0000					
Board type	[14]	-0.1439*	1.0000				
Board size	[15]	-0.1418*	-0.1805*	1.0000			
Board indep.	[16]	0.1387*	0.1682*	-0.1983*	1.0000		
CEO chair	[17]	0.1310*	-0.6216*	0.1097*	-0.0871	1.0000	
Women managers	[18]	0.0168	0.0544	0.0670	0.0029	-0.1192*	1.0000

For the definition of the variables, see the footnote under Table 1. * indicates statistical significance at the 1% level.

Table 3. OLS regression of environmental score on gender diversity in top management

	1	2	3
Women managers	0.2292 ** (2.23)		
Blau index		0.1715 ** (2.19)	
Fraction > 10%			4.1516 ** (2.03)
Firm size	4.5016 *** (4.03)	4.4661 *** (3.98)	4.6096 *** (4.13)
Ln Tobin's Q	1.9433 (0.57)	1.7587 (0.52)	2.4037 (0.71)
ROA	-0.0017 (-0.72)	-0.1613 (-0.69)	-0.1722 (-0.73)
Capex/TA	-0.6458 ** (-2.28)	-0.6429 ** (-2.28)	-0.6229 ** (-2.26)
Ln RD	1.1280 (0.67)	0.9881 (0.59)	0.8987 (0.53)
Board type	-1.1681 (-0.35)	-1.2376 (-0.37)	-1.0736 (-0.32)
Board size	-0.0261 (-0.07)	-0.0358 (-0.10)	-0.0265 (-0.07)
Board independence	0.1207 ** (2.27)	0.1199 ** (2.27)	0.1208 ** (2.30)
CEO chair	-1.7617 (-0.90)	-1.8119 (-0.93)	-1.9368 (-0.98)
Year effects	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
F value	8.95 ***	8.01 ***	7.91 ***
R ²	0.3187	0.3194	0.3170
N observations	817	817	817

The table presents OLS regressions of the environmental score extracted from Asset4 on three measures of gender diversity in top management. Women managers is the proportion of women in top management. The Blau index is defined in the text. Fraction > 10% is a dummy indicating that the proportion of women in the top management team is above 10%. The other variables are defined in the footnote under Table 1. Standard errors are corrected for clustering at the firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels.

Table 4. Effect on selected environmental indicators

	Env. innovation	Env. controversy	Env. awards	Env. products	Resource reduction
Women managers	0.4653 ** (2.51)	-0.1990 ** (-2.39)	0.0143 ** (2.49)	0.0186 *** (3.04)	0.0162 *** (2.62)
Firm size	4.3097 ** (2.38)	-8.7395 *** (-7.77)	0.1766 *** (3.42)	0.2997 *** (5.22)	0.4043 *** (7.24)
Ln Tobin's Q	0.3214 (0.06)	-3.2959 (-0.92)	-0.2817 (-1.55)	-0.3692 * (-1.86)	0.0432 (0.23)
ROA	-0.5267 (-1.48)	-0.0916 (-0.48)	0.0068 (0.50)	0.0025 (0.17)	-0.0095 (-0.68)
Capex/TA	0.0611 (0.15)	-0.0123 (-0.06)	0.0100 (0.71)	0.0262 * (1.71)	0.0111 (0.75)
Board type	-0.5864 (-0.10)	1.9932 (0.67)	0.1472 (0.91)	0.0038 (0.02)	0.0998 (0.58)
Board size	-0.2179 (-0.33)	0.0367 (0.09)	0.0046 (0.26)	-0.0345 * (-1.81)	0.0289 (1.57)
Board independence	0.2318 *** (3.01)	-0.1112 ** (-2.64)	0.0041 (1.53)	0.0067 ** (2.18)	-0.0036 (-1.31)
CEO chair	0.1511 (0.04)	-3.8208 * (-1.86)	-0.0028 (-0.02)	0.0591 (0.39)	-0.3437 ** (-2.36)
Year effects	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes
F value LR chi ²	4.38 ***	12.46 ***	152.14 ***	311.15 ***	257.32 ***
R ² Pseudo R ²	0.2010	0.3142	0.1345	0.2842	0.2288
N observations	817	817	817	817	817

The table presents OLS and logit regressions of selected environmental indicators provided in Asset4. Women managers is the proportion of women in top management. The other variables are defined in the footnote under Table 1. Standard errors are corrected for clustering at the firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels.

Table 5. Quantile regression of environmental score on women in top management

	Quantile		
	0.25	0.50	0.75
Women managers	0.1662 ** (1.98)	0.1907 *** (3.15)	0.2849 *** (5.47)
Firm size	5.2249 *** (6.06)	4.3040 *** (6.19)	3.3632 *** (4.77)
Ln Tobin's Q	3.0091 (0.85)	1.0456 (0.47)	0.1033 (0.04)
ROA	-0.3368 (-1.46)	-0.1544 (-0.96)	-0.3032 * (-1.90)
Capex/TA	-0.8211 *** (-2.94)	-0.3842 * (-1.88)	-0.3864 (-1.58)
Ln RD	2.3860 (1.62)	0.8032 (0.88)	0.4059 (0.34)
Board type	-2.8867 * (-1.67)	-3.0791 * (-1.68)	1.9537 (0.91)
Board size	0.1715 (0.54)	-0.1472 (-0.67)	-0.5351 ** (-2.56)
Board independence	0.1184 ** (2.59)	0.1311 *** (4.16)	0.0372 (1.16)
CEO chair	-3.1510 (-1.20)	-2.0896 (-1.01)	1.9382 (1.08)
Year effects	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
Pseudo R ²	0.2145	0.1665	0.1382
N observations	817	817	817

The table presents quantile regressions of the environmental score provided in Asset4 in three different quantiles. Women managers is the proportion of women in top management. The other variables are defined in the footnote under Table 1. Standard errors are bootstrapped. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels.

Table 6. Moderating effect of growth opportunities

	1	2	3
Women managers	0.3260 *** (2.81)		
Women managers × ln Q	-0.2549 * (-1.83)		
Blau index		0.2506 *** (2.90)	
Blau index × ln Q		-0.2166 * (-1.98)	
Fraction > 10%			6.5935 *** (2.85)
(Fraction > 10%) × ln Q			-7.6069 * (-1.95)
Firm size	4.6147 *** (4.14)	4.5806 *** (4.11)	4.6694 *** (4.20)
Ln Tobin's Q	5.4056 (1.43)	6.3088 (1.63)	7.3818 * (1.90)
ROA	-0.1607 (-0.71)	-0.1494 (-0.66)	-0.1608 (-0.69)
Capex/TA	-0.6104 ** (-2.16)	-0.6050 ** (-2.17)	-0.5936 ** (-2.21)
Ln RD	1.0469 (0.62)	0.8978 (0.53)	0.8865 (0.52)
Board type	-0.8211 (-0.25)	-0.9402 (-0.29)	-0.8919 (-0.27)
Board size	-0.0586 (-0.16)	-0.0727 (-0.20)	-0.0570 (-0.15)
Board independence	0.1137 ** (2.17)	0.1125 ** (2.16)	0.1138 ** (2.20)
CEO chair	-1.8220 (-0.92)	-1.8740 (-0.95)	-1.9626 (-0.99)
Year effects	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes
F value	8.31 ***	8.78 ***	9.04 ***
R ²	0.3231	0.3254	0.3247
N observations	817	817	817

The table presents OLS regressions of the environmental score provided in Asset4 on three measures of gender diversity interacted with the firm's level of growth opportunities proxied by Tobin's Q. Women managers is the proportion of women in top management. The other variables are defined in the footnote under Table 1. Standard errors are corrected for clustering at the firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels.