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Does environmental CSR performance matter for corporate financial performance? Evidence from panel quantile regression

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Abstract

The paper re-investigates the relationship between European firms' Environmental performance and their financial performance using a robust fixed effect panel quantile regression. We used data describing 303 European firms covering the period 2005-2017. We demonstrate that the influence of corporate green investment on financial performance takes different effects along the quantiles. Green investment might affect negatively corporate financial performance only for large quantiles of financial performance (75% and 90%). However, for lower quantile, green investment is likely to increase firms' financial performance.

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Introduction:

Sustainable development goals cannot be achieved without the collaboration between government and firms' actions and practices towards a responsible behaviour. Corporate social responsibility (CSR) is defined as the association of three pillars representing the environmental responsibility, the social responsibility and the governance performance. The environmental performance at the firm level might reflect firms' green investment in the reduction of pollutant emissions, the efficient use of resource, and the environmental innovation in production. Therefore, during the last three decades, firms have moved from the classic business models to the new green business models. Increasing pressures on firms to meet international environmental treaties and regulations have caused new thinking about profound organizational changes (Xie et al., 2019). Following Fujii et al. (2013), corporate green investment is defined by practices aiming at conserving resources and reducing environmental burden. Corporate green investment represents low-carbon emissions and climate resilient firm expenditures allotted to environmental protection activities such as end-of-pipe as well as cleaner production approaches.

Firm environmental performance requires the mobilization of financial resources as well as governance capabilities to achieve a competitive advantage and increase firm financial performance (Leonidou et al., 2017). Environmental economics approaches consider firm green investment as an unnecessary investment because it generates firm financial losses. Besides, traditional view considers green investment as an additional and unrecoverable cost activities which might hamper corporate productivity and competitive positioning in a free and competitive market (Walley and Whitehead, 1994; Lahouel et al. (2020); Nishitani et al. (2014); Nishitani et al. (2012); Nishitani et al. (2011)). However, new approaches based on the Porter hypothesis (Kumar and Managi, 2009; Managi et al., 2005), show that corporate green investment induces green innovations that would improve resources productivity, creates extra revenues and generates financial performance (Ben Lahouel et al., 2020). Previous literature on the impact of the firm green investment on its financial performance discussed the aforementioned two competing views.

Most of the empirical studies examining the relationship between CGI and financial performance find their roots within the above-mentioned two competing views. The focus of these studies was to answer the longstanding question "Does it pay to be green?" while searching for the impact (positive or negative) of CGI on financial performance (Fujii et al., 2013). Empirically, the debate is still ongoing, and no common understanding has been reached yet. From the early studies of Jaggi and Freedman (1992) and Cordeiro and Sarkis (1997) to the recent ones of Misani and Pogutz (2015), Gonec and Scholtens (2017), and Xie et al. (2019), passing by the meta-analysis of Margolis and Walsh (2003), Orlitzky et al. (2003), and Albertini (2013), researchers have provided opposite arguments for and against the hypothesis "it pays to be green". For instance, the meta-analysis of Horváthová (2010) on the effect of CGI on financial performance shows that about 15%, 30%, and 55% of empirical studies find negative, neutral, and positive effects, respectively.

This paper examines the relationship between firm environmental performance and financial performance using an updated dataset describing a sample of more than three hundred European listed firm, observed from 2005 to 2017. The paper is pioneer in using the robust panel quantile regression approach to re-investigate the relationship between firm financial performance and

environmental performance. The major feature and advantage of a quantile regression, compared to static regression, is its ability to give a more comprehensive picture of the effect of the independent variable on the dependent variable. It can assess the variation of the effect with respect to different percentiles level. A quantile regression allows modeling the relationship between the independent variable and the conditional quantile of the dependent variable rather than the mean of the dependent variable like static OLS methods. The quantile regression estimates different effect of the independent variable on the dependent depending across the spectrum of the dependent variable. Unlike the mean-centered technique of estimation, which only describe the mean effect of environmental performance on the financial performance that is supposed to remain constant over the full distribution of the dependent variable, the panel quantile regression approach allows the regression parameters to vary across different quantiles of the financial performance distribution.
The rest of the paper is organized as follow: section 2 describes the used dataset. The empirical methodology is presented in section 3. In section 4, we discussed the empirical results before concluding the paper and giving some policy implications.

2. Data and their proprieties:

We used a novel data base from a sample of more than three hundred European listed firms from the euro zone countries. The panel data is covering the period 2005-2017. The data are collected from the Datastream dataset on the financial and different CSR components including social, environmental and governance scores. This data base encompasses the largest firms listed in the main stock indexes around the world. It is used by recent empirical studies on the linkage between corporate financial performance and environmental performance (see Benlemlih et al., 2018; Ben Lahouel et al., 2019, 2020; Chollet and Sandwidi, 2018). Following previous studies, we used the Tobin's Q as an indicator of listed firms' financial performance. It is likely to reflect better the listed firms' financial performance rather that other accounting measure like ROA and ROE. The environmental performance (EP) is measured by the firm environmental pillar of the ESG disclosure score collected form the Datastream dataset.

Further, Actions, practices and decisions that are taken within the three components of the E pillar (i.e., the emission reduction score, the resource use score, and the product innovation score) accurately reflect the two major approaches of corporate environmental protection performance that are the investments in pollution prevention and pollution control. Finally, consistent with prior studies (e.g., Benlemlih et al., 2018; Inoue and Lee, 2011; Moneva et al., 2020), we consider a set of four controls for other influences: the firm's perceived market value measured by the market-to-book ratio, size measured by the logarithm of market capitalization, capital structure measured by leverage, and growth opportunities measured by sales growth.

Table 1 below shows the descriptive statistics on the variables used to estimate our model. First, let's take a look at the distribution of our variables. According to Mukherjee et al. (1998), data are considered to be normally distributed if the value of skewness is 0 and kurtosis is lower than 3. We can clearly see that our variables are not symmetrically distributed as the values of skewness and kurtosis are different from 0 and 3, respectively. Additionally, we notice that in most cases the median is significantly different from the mean, which corroborates our first impression that our data are not normally distributed. Hence, the choice of using a quantile regression seems to be more relevant than mean-centered approaches. Second, Table 1 shows the presumption of the absence of multicollinearity problem in our regression as the absolute values of the Pearson coefficients between the independent variables are less than 0.5.

Table 1. Descriptive statistics of the panel data

	Mean	SD	Q1	Median	Q3	Min	Max	Skewness	Kurtosis	N
Tobin'Q	1.499	.9593	1.009	1.207	1.6137	.3823	13.442	4.463	32.264	3917
EP	71.164	28.442	53.98	86.33	92.77	8.54	97.48	-1.053	2.595	3853
MTBV	2.603	11.409	1.08	1.725	2.76	-11.95	682.5	54.153	3206.995	3,718
LnMK	15.538	1.4510	14.598	15.565	16.540	9.919	19.085	-.355	3.261	3,917
LEV	46.102	120.829	17.06	30.235	47.29	-2556	1470.34	-.0529	134.223	3,896
SGW	10.716	169.574	-1.9	4.33	11.73	-99.98	9813.49	52.046	2949.722	3,877

3. Empirical methodology:

We start by estimating the panel data model that explains the linkage between firm's financial performance and its main determinants augmented by the environmental CSR score which accounts for the firm environmental performance. The main determinants of firm financial performance are sales growth, market capitalization, leverage and market to book value. The model is specified within a classic panel data model as follows:

$$FP_{it} = \alpha_i + \alpha_1 EP_{it} + \alpha_2 MTBV_i + \alpha_3 LnMK_{it} + \alpha_4 Lev_{it} + \alpha_5 SGW_{it} + \beta_i Indus\_D_{it} + \varepsilon_{it} \quad (1)$$

$$FP_{it} = c + \alpha_1 EP_{it} + \alpha_2 MTBV_i + \alpha_3 LnMK_{it} + \alpha_4 Lev_{it} + \alpha_5 SGW_{it} + \beta_i Indus\_D_{it} + v_i + u_{it} \quad (2)$$

In model 1 and 2, the variables FP and EP represents firms' financial performance measured by Tobin'Q and environmental corporate social responsibility score ECSR, respectively. However, MTBV, LnMk, Lev and SGW are market to book value, logarithm of the firm's market capitalization, leverage and sales growth. However, to control for the industry effect, we added a set of dummy variables representing the different industrial sectors. The dummies are specified based on the Statistical Classification of Economic Activities in the European Community (NACE) because we are using a sample of more than three hundred European firms (see table A1 in the appendix for the classification of our sample and the number of firms in each sector).
In model 1, α_i is a firm fixed observed effect that characterizes each firm. In model 2, v_i is a random effect that characterizes each firm but it is not observed. ε_{it} and u_{it} are random error terms normally distributed and i=1….303 European firms observed from 2005 to 2017.
The estimation procedure consists in estimating the different models by panel static models such as random and fixed effect model then the preferred model will be selected based on the Hausman specification test. Next, the model is estimated by simultaneous quantile regression with bootstrapped standard errors and inter-quantile regression.

After the specification of the linear panel static models, we perform a linear conditional model estimation using panel quantile regression model. The quantile regression model allows the estimated coefficient conditioned by the level of the dependent variables to vary across the different quantiles. The specification of the quantile regression model, firstly introduced by Koenker and Basset (1978), was developed for panel data models. Graham et al (2018) argue

that the quantile regression model is suitable when the factors of interest have different impacts at different points of the conditional distribution of the dependent factor. More recently, interest on combining quantile regression models with panel data has been intensified and several research papers in environmental economics and management have used the quantile regression for panel data model. The QRPD can be introduced as follow:

$$Y_{it} = D'_{it}\beta_j(U_{it}) \qquad (3)$$

Where, Y_{it} is the firms' financial performance, β_j is the variable of interest (ECSR), and U_{it} is the error term encompassing fixed and time-varying disturbance terms.

The model given in Eq. (3) is linear in parameters, and $D'_{it}\beta_{(\tau)}$ is strictly increasing in τ. In general, for the τ^{th} quantile of Y_{it} the QR is based on the following condition restriction:

$$P(Y_{it} \leq D'_{it}\beta(\tau)|D_{it}) = \tau \qquad (4)$$

The estimator developed by Powell (2016) takes into account this probability as varying by individuals. Consequently, the regression panel data (RPD) relies on a conditional and unconditional restriction, letting $D_i = (D_{i1}, \ldots . D_{iT})$.

$$P(Y_{it} \leq D'_{it}\beta(\tau)|D_i) = P(Y_{it} \leq D'_{is}\beta(\tau), (Y_{it} \leq D'_{it}\beta(\tau)|D_i)) = \tau \qquad (5)$$

The panel quantile regression is an advanced estimation tool compared to the mean equation proposed by classic econometric models (i.e., fixed effect, random effect, dynamic panel data model). it allows disaggregating the coefficient of the impact of ECSR on FP by different level of financial performance. Therefore, we are able to estimate different impacts representing different quantile of firms' financial performance level.
The panel quantile regression estimates different effect of the independent variable on the dependent one depending across the spectrum of the dependent variable.

$$FP_{\tau it} = \alpha_{\tau 1}EP_{it} + \alpha_{\tau 2}MTBV_i + \alpha_{\tau 3}LnMK_{it} + \alpha_{\tau 4}Lev_{it} + \alpha_{\tau 5}SGW_{it} + \beta_{\tau i}Indus\_D_{it} + \varepsilon_{\tau it} \qquad (6)$$

The specified panel quantile model (equation (6)) is estimated for different quantile level of the dependent variables. Firms with different financial performance level are likely to react differently to investment in corporate social environmental responsibility. The estimation procedure is established to see if a threshold effect might exist in the relationship between the environmental performance and financial performance. Indeed, for different quantile level of the financial performance, we estimated the impact of corporate green investment on financial performance of European listed firms. It allows therefore the differentiation of that impact with respect to the firms' financial performance level.

4. Discussions on the empirical results:

4.1 Quantile estimation results

The empirical investigation is conducted using a strongly balanced panel data of a sample of 303 European listed firms. The sample classification of firms within the different industrial sectors is presented in the appendix in table A1. we perform a Haussmann specification test, which compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with the other explanatory variables of the model. We apply the random

effect model after the statistical test since it is more adequate than the random effect model. The panel covers the period 2005-2017. The estimation results of the random effect model supported the traditional point of view. The impact of firm investment in environmental practices affects negatively the corporate financial performance. An increase of the environmental performance by 1% might decrease the financial performance by 0.005. The estimated coefficient still robust to the change of the random effect panel data model estimation (fixed effect, random effect and between effect model estimated by maximum likelihood). The other determinants of firm financial performance approximated by the Tobin's Q are globally significant having the right signs. Indeed, market capitalisation affects positively the firm financial performance, but leverage has a negative and significant impact on firm financial performance. The firm's perceived market value affects positively firm's financial performance as expected by corporate financial performance.

Table 2. panel static models

	Random Effect
ECSR	-0.004***
	(0.00)
MTBV	0.02
	(0.23)
LnMK	0.11***
	(0.04)
Lev	-0.002**
	(0.06)
SGW	-0.002
	(0.15)
Cons	-3.56***
	(0.00)
Wald chi2 test	763.12
	(0.00)
R2	0.19
H-test	15.41
	(0.07)

Note: p-value are in parenthesis. *, **, *** denote respectively significance at 10%, 5% and 1%.

Next, we moved to the estimation of the different panel quantile regression. The pooled panel quantile regression results supported in all the traditional view. The impact of the environmental performance on financial performance is negative for 25%, 50% and 75% percentiles of the firm financial performance. The same negative impact of environmental performance on firm financial performance is also confirmed by the pooled inter-quantile regression (see table A2 in appendix). However, the determinants of the firm financial performance such as firm leverage, perceived market value and market capitalisation have the same impact and are in all significant. The market capitalisation affects positively the firm financial performance. In contrast, firm leverage has a negative and significant impact on firm financial performance. The firm's perceived market value affects positively firm's financial performance as expected by corporate financial performance.

In table 3, we reported the estimation results of the fixed effect robust panel quantile regression. The results show that for different percentiles level of firm financial performance, the corporate green investment has different impacts ranging from positive impact for the quantile 25% and the median to a negative impact for the percentile 75% and 90%. A threshold effect may exist and justify these changes of firm environmental performance on financial performance. Indeed, green investment might be beneficial especially for firms with lower financial performance that is below the median (i.e., 25% and 50%). However, for higher financial performance, any additional investment on environmental practices and actions might affect negatively the financial situation of the firm.

Table 3. Fixed effect robust panel. Quantile estimation

	Robust Panel Quantile regression			
Percentile level	*25%*	*50%*	*75%*	*90%*
ECSR	0.001*** (0.03)	-0.005** (0.06)	-0.006*** (0.01)	-0.006*** (0.00)
MTBV	0.031*** (0.00)	0.15*** (0.00)	0.19*** (0.00)	0.11*** (0.00)
LnMK	0.04*** (0.00)	0.014*** (0.00)	0.06*** (0.00)	0.038*** (0.00)
Lev	0.00005 (0.27)	0.0001 (0.23)	-0.0004*** (0.00)	-0.0004*** (0.05)
SGW	0.0003*** (0.00)	0.0006** (0.05)	-0.004 (0.91)	-0.0009*** (0.00)
Value of objective function				
Mean	-31.12	-137.18	-267.11	-241.91
Min	-36.1	-197.34	-288.22	-265.78
Max	-27.12	-116.22	-257.75	-219.22

Note: p-value are in parenthesis. *, **, *** denote respectively significance at 10%, 5% and 1%.

The positive impact of firm environmental performance for 25% and 50% percentiles are supported by previous results of the revisionist point of view (Kumar and Managi, 2009; Managi et al., 2005; Ben Lahouel et al., 2020). It means that corporate green investment induces green innovations that would improve resources productivity, creates extra revenues and generates financial performance. However, the negative impact of firm environmental performance on financial performance, for 75% and 90% percentiles, is supported by the traditional view which argue that firm green investment as an unnecessary investment because it generates firm financial losses. Besides, this traditional view considers green investment as an additional and unrecoverable cost activities which might hamper corporate productivity and competitive positioning in a free and competitive market (Hibiki and Managi, 2010; Walley and Whitehead, 1994).

The determinants of firm financial performance impact still robust to the change of the estimation methods and have the same impact suggested by the corporate financial theory. Indeed, market capitalisation affects positively the firm financial performance, but firm leverage has a negative and significant impact on firm financial performance. The firm's perceived market value affects positively firm's financial performance as expected by corporate financial performance.

The panel quantile regression appears appropriate and useful for investigating the relationship between corporate green investment and financial performance. It shows that this relationship

is nonlinear. Finally, it demonstrates that the influence of corporate green investment on financial performance takes different effects along the quantiles.

4.2 Endogeneity treatment

The firm financial performance is likely to affect indirectly the environmental performance as well performed financially firms are more engaged in CSR process and green firms are likely perform well. Hence, a bidirectional effect may create an endogeneity problem within the relationship between firm financial performance and firm environmental performance. From an econometric point of view, the GMM estimator is recognized as a useful tool to resolve the endogeneity that must occur when we model firm's financial performance-environmental performance nexus. The GMM specification corrects the linear specification that is characterized by endogeneity. The GMM uses all possible instruments in difference and in level to correct endogeneity and carry out consistent results. Equation (7) is estimated by three system GMM estimators to account for endogeneity. All estimators follow the same methodology of GMM system in two-step.

$$FP_{it} = \alpha_0 + \alpha_1 FP_{it-1} + \alpha_2 EP_{it} + \alpha_3 MTBV_i + \alpha_4 LnMK_{it} + \alpha_5 Lev_{it} + \alpha_6 SGW_{it} + \beta_i Indus\_D_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (7)$$

Where μ_i and λ_t are respectively the firm-specific effect and the time-specific effect.
Endogeneity issue is due to three problems which are the simultaneity bias, dynamic endogeneity and the unobserved heterogeneity bias. Indeed, the simultaneity bias is the endogeneity of the environmental corporate social responsibility (ECSR) which must be affected by financial performance (FP). The dynamic endogeneity is due to the lagged dependent variables among the explanatory variables. Finally, the unobserved heterogeneity bias is basically related to the firm-specific effect which must be correlated to the explanatory variables. The unobserved heterogeneity bias problem can be resolved by transforming equation (7) in first difference, as follows:

$$\Delta FP_{it} = \Delta\alpha_0 + \alpha_1 F\Delta P_{it-1} + \alpha_2 \Delta EP_{it} + \alpha_3 \Delta MTBV_i + \alpha_4 \Delta LnMK_{it} + \alpha_5 \Delta Lev_{it} + \alpha_6 \Delta SGW_{it} + \beta_i \Delta Indus\_D_{it} + \Delta\mu_i + \Delta\lambda_t + \Delta\varepsilon_{it} \quad (8)$$

Therefore, the firm-specific effect which causes the unobserved heterogeneity problem is controlled:

$$\Delta\alpha_0 = \Delta\mu_i \quad (9).$$

This transformation in equation (8) creates an additional problem which is the correlation between the lagged dependent variable in first difference and the error term in first difference. Consequently, to resolve this problem and the dynamic endogeneity and the simultaneity bias, we followed Arellano and Bond (1991) by estimating the system GMM in two steps. The endogenous explanatory variables expressed in difference are instrumented by their lagged value. However, to avoid problem of number of observations reduction and weak instruments, Blundell and Bond (1998) combined the instruments in difference and the instruments in level. The variables in difference are instrumented through their values in level and the variables are instrumented by their values in difference, as follows:

$$\begin{cases} FP_{it} = \alpha_0 + \alpha_1 FP_{it-1} + \alpha_2 EP_{it} + \alpha_3 MTBV_i + \alpha_4 LnMK_{it} + \alpha_5 Lev_{it} + \alpha_6 SGW_{it} \\ \qquad + \beta_i Indus\_D_{it} + \mu_i + \lambda_t + \varepsilon_{it} \\ \Delta FP_{it} = \Delta\alpha_0 + \alpha_1 F\Delta P_{it-1} + \alpha_2 \Delta EP_{it} + \alpha_3 \Delta MTBV_i + \\ \alpha_4 \Delta LnMK_{it} + \alpha_5 \Delta Lev_{it} + \alpha_6 \Delta SGW_{it} + \beta_i \Delta Indus\_D_{it} + \Delta\mu_i + \Delta\lambda_t + \Delta\varepsilon_{it} \end{cases} \quad (10)$$

To sum up, the main difference between the three estimators of GMM is the manner by which we used the instruments to resolve endogeneity. We choose to present the three estimator in table 4 above to show the robustness of the estimated coefficients.

Table 4: GMM estimation: accounting for endogeneity

	GMM (Arellano-Bond))	GMM (Blundel-Bond)	Dynamic 2-step PDM
FP_{it-1}	0.36*** (0.00)	0.58*** (0.00)	0.45*** (0.03)
ECSR	-0.0006** (0.06)	-0.003*** (0.00)	-0.007*** (0.00)
MTBV	0.0004 (0.69)	0.0003 (0.29)	0.0004 (0.79)
LnMK	0.20*** (0.00)	0.33*** (0.00)	0.47*** (0.00)
Lev	-0.0001*** (0.00)	-0.0001 (0.27)	0.0001 (0.34)
SGW	-0.00004 (0.27)	-0.0001 (0.79)	0.0002 (0.16)
Cst	-2.34*** (0.00)	-3.37*** (0.00)	-5.52 (0.4)
Observations	3331	3331	3331
Wald Chi2 test	968.54 (0.00)	1645.11 (0.00)	693 (0.00)
AR(2) (p-value)	0.67	0.75	0.52

Note: p-value are in parenthesis. *, **, *** denote respectively significance at 10%, 5% and 1%.

As we can clearly see from the result in Table 4, the impact of environmental CSR on firm financial performance still robust having the expected sign. It has a negative and significant impact ranging from -0.003 to -0.0006. The impact of environmental performance on firm financial performance still substantially negative. firm green investment as an unnecessary investment because it generates firm financial losses. Accounting for endogeneity in the relationship between firm environmental performance and financial performance support theoretically the traditional view, which considers green investment as an additional and unrecoverable cost activities which might hamper corporate productivity and competitive positioning in a free and competitive market (Hibiki and Managi, 2010; Walley and Whitehead, 1994). However, the rest of variables having the expected impact on firm financial performance. For instance, the firm market capitalization has a positive and significant impact on firm financial performance. Finally, as we can see the estimation results from the GMM specification are robust to the change of the GMM estimation model from the Arellano-Bond estimator to the dynamic two step panel data model.

Conclusion and policy recommendations

This paper re-investigates the relationship between firm environmental performance and financial performance for a sample of listed European firms belonging to 11 Euro area countries over the period 2005-2017. In order to test the variability of the estimated coefficient, we employed the panel quantile regression model with fixed effect.
Theoretically, the relationship between corporate green investment and financial performance is rooted within two different views: the 'traditionalist' and the 'revisionist'. Empirically, results about this relationship using traditional econometric techniques yield to mixed and inconclusive results. The contribution of our paper to the existing literature is twofold. First, methodologically, our study shows the relevance of using quantile regression estimator because it considers different impacts of the environmental performance with respect to different quantile level of the firm financial performance and shows the existence of threshold effects in the relationship between firm environmental performance and financial performance. Second, theoretically, our research gives support to previous studies claiming that the results' inconsistencies are caused by the linearity hypothesis that has been largely admitted among environmental management researchers. The more flexible and comprehensive nonlinear hypothesis should become the basis of future studies exploring the relationship between corporate green investment and financial performance.

References

Albertini, E. (2013). Does environmental management improve financial performance? A meta-analytical review. *Organization & Environment*, *26*(4), 431-457.

Antonakis, J., Bendahan, S., Jacquart, P., & Lalive, R. (2014). Causality and endogeneity: Problems and solutions. *The Oxford handbook of leadership and organizations*, *1*, 93-117.

Attig, N., Cleary, S. W., El Ghoul, S., & Guedhami, O. (2014). Corporate legitimacy and investment–cash flow sensitivity. *Journal of Business Ethics*, *121*(2), 297-314.

Attig, N., El Ghoul, S., Guedhami, O., & Suh, J. (2013). Corporate social responsibility and credit ratings. *Journal of business ethics*, *117*(4), 679-694.

Ben Lahouel, B., Bruna, M. G., & Zaied, Y. B. (2020). The Curvilinear Relationship Between Environmental Performance and Financial Performance: An Investigation of Listed French Firms Using Panel Smooth Transition Model. *Finance Research Letters*, 101455.

Ben Lahouel, B.; Gaies, B.; Ben Zaied, Y., &Jahmane, A. (2019). Accounting for endogeneity and the dynamics of corporate social-corporate financial relationship. *Journal of Cleaner Production*, *230*(1), 352-364.

Benlemlih, M., Shaukat, A., Qiu, Y., & Trojanowski, G. (2018). Environmental and social disclosures and firm risk. *Journal of Business Ethics*, *152*(3), 613-626.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics*, *87*(1), 115-143.

Busch, T., & Friede, G. (2018). The robustness of the corporate social and financial performance relation: A second-order meta-analysis. *Corporate Social Responsibility and Environmental Management*, *25*(4), 583-608.

Chernozhukov, V., & Hansen, C. (2005). An IV model of quantile treatment effects. *Econometrica*, *73*(1), 245-261.

Chollet, P., & Sandwidi, B. W. (2018). CSR engagement and financial risk: A virtuous circle? International evidence. *Global Finance Journal*, *38*, 65-81.

Cordeiro, J. J., & Sarkis, J. (1997). Environmental proactivism and firm performance: evidence from security analyst earnings forecasts. *Business strategy and the environment*, *6*(2), 104-114.

Dixon-Fowler, H. R., Slater, D. J., Johnson, J. L., Ellstrand, A. E., & Romi, A. M. (2013). Beyond ''does it pay to be green?'' A meta- analysis of moderators of the CEP–CFP relationship. *Journal of Business Ethics*, 112(2), 353–366.

Endrikat J., Guenther E., & Hoppe H., (2014). Making sense of conflicting empirical findings: A meta-analytic review of the relationship between corporate environmental and financial performance. *European Management Journal*, *32*(5), *735*-751.

Eurostat (2001) Definitions and guidelines for measurement and reporting of company environmental protection expen- diture, Eurostat Task Force, ''Environmental Protection Expenditure—Industry Data Collection, Doc. ENV/01/3.6A'', European Commission

Fujii, H., Iwata, K., Kaneko, S., & Managi, S. (2013). Corporate environmental and economic performance of Japanese manufacturing firms: Empirical study for sustainable development. *Business Strategy and the Environment*, *22*(3), 187-201.

Godfrey, P. C., & Hatch, N. W. (2007). Researching corporate social responsibility: An agenda for the 21st century. *Journal of business ethics*, *70*(1), 87-98.

Gonenc, H., & Scholtens, B. (2017). Environmental and financial performance of fossil fuel firms: A closer inspection of their interaction. *Ecological Economics*, *132*, 307-328.

Horváthová, E. (2010). Does environmental performance affect financial performance? A meta-analysis. *Ecological economics*, *70*(1), 52-59.

Inoue, Y., & Lee, S. (2011). Effects of different dimensions of corporate social responsibility on corporate financial performance in tourism-related industries. *Tourism Management*, *32*(4), 790-804.

Jaggi, B., & Freedman, M. (1992). An examination of the impact of pollution performance on economic and market performance: pulp and paper firms. *Journal of business finance & accounting*, *19*(5), 697-713.

Graham, B. S., Hahn, J., Poirier, A., & Powell, J. L. (2018). A quantile correlated random coefficients panel data model. Journal of Econometrics, 206(2), 305-335.

Kato, K., Galvao Jr, A. F., & Montes-Rojas, G. V. (2012). Asymptotics for panel quantile regression models with individual effects. *Journal of Econometrics*, *170*(1), 76-91.

Kumar, S., & Managi, S. (2009). Win–win opportunities and environmental regulation: test of the porter hypothesis. In *The Economics of Sustainable Development* (pp. 157-166). Springer, New York, NY.

Lamarche, C. (2010). Robust penalized quantile regression estimation for panel data. *Journal of Econometrics*, *157*(2), 396-408.

Lahouel, B. B., Zaied, Y. B., Song, Y., & Yang, G. L. (2020). Corporate social performance and financial performance relationship: A data envelopment analysis approach without explicit input. *Finance Research Letters*, 101656.

Lee, S., Seo, K., & Sharma, A. (2013). Corporate social responsibility and firm performance in the airline industry: The moderating role of oil prices. *Tourism management*, *38*, 20-30.

Leonidou, L. C., Christodoulides, P., Kyrgidou, L. P., & Palihawadana, D. (2017). Internal drivers and performance consequences of small firm green business strategy: The moderating role of external forces. *Journal of business ethics*, *140*(3), 585-606.

Managi, S., Opaluch, J. J., Jin, D., & Grigalunas, T. A. (2005). Environmental regulations and technological change in the offshore oil and gas industry. *Land economics*, *81*(2), 303-319.

Margolis, J. D., & Walsh, J. P. (2003). Misery loves companies: Rethinking social initiatives by business. *Administrative science quarterly*, *48*(2), 268-305.

Misani, N., & Pogutz, S. (2015). Unraveling the effects of environmental outcomes and processes on financial performance: A non-linear approach. *Ecological economics*, *109*, 150-160.

Moneva, J. M., Bonilla-Priego, M. J., & Ortas, E. (2020). Corporate social responsibility and organisational performance in the tourism sector. *Journal of Sustainable Tourism*, *28*(6), 853-872.

Mukherjee, C., White, H., & Wuyts, M. (2013). *Econometrics and data analysis for developing countries*. Routledge.

Nishitani, K., Kaneko, S., Komatsu, S., & Fujii, H. (2014). How does a firm's management of greenhouse gas emissions influence its economic performance? Analyzing effects through demand and productivity in Japanese manufacturing firms. *Journal of Productivity Analysis*, *42*(3), 355-366.

Nishitani, K., Kaneko, S., Fujii, H., & Komatsu, S. (2012). Are firms' voluntary environmental management activities beneficial for the environment and business? An empirical study focusing on Japanese manufacturing firms. *Journal of environmental management*, *105*, 121-130.

Nishitani et al. (2011). Effect of the reduction of pollution emissions on the economic performance of firms: An empirical analysis focusing on demand and productivity. *Journal of Cleaner Production*, vol.19(17-18), pp.1956-1964.

Nishitani, K., Kaneko, S., Fujii, H., & Komatsu, S. (2011). Effects of the reduction of pollution emissions on the economic performance of firms: an empirical analysis focusing on demand and productivity. *Journal of Cleaner Production*, *19*(17-18), 1956-1964.

Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta-analysis. *Organization studies*, *24*(3), 403-441.

Powell, D. (2016). Quantile regression with nonadditive fixed effects. *Quantile Treatment Effects*, 1-28.

Rhou, Y., Singal, M., & Koh, Y. (2016). CSR and financial performance: The role of CSR awareness in the restaurant industry. *International Journal of Hospitality Management*, *57*, 30-39.

Schreck, P. (2011). Reviewing the business case for corporate social responsibility: New evidence and analysis. *Journal of Business Ethics*, *103*(2), 167.

Wagner, M., Van Phu, N., Azomahou, T., & Wehrmeyer, W. (2002). The relationship between the environmental and economic performance of firms: an empirical analysis of the European paper industry. *Corporate social responsibility and Environmental Management*, *9*(3), 133-146.

Walley, N, & Whitehead B. 1994. It's Not Easy Being Green. *Harvard Business Review*, 72(3), 46–47.

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of econometrics*, *126*(1), 25-51.

Wintoki, M. B., Linck, J. S., & Netter, J. M. (2012). Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics*, *105*(3), 581-606.

Xie, J., Nozawa, W., Yagi, M., Fujii, H., & Managi, S. (2019). Do environmental, social, and governance activities improve corporate financial performance? *Business Strategy and the Environment*, *28*(2), 286-300.

Zaefarian, G., Kadile, V., Henneberg, S. C., & Leischnig, A. (2017). Endogeneity bias in marketing research: Problem, causes and remedies. *Industrial Marketing Management*, *65*, 39-46.

Appendix

Table A1: Distribution of firms between the sectors

Sector	Number of firms
AGRICULTURE, FORESTRY AND FISHING	13
MINING AND QUARRYING	16
MANUFACTURING	15
ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	19
Water Supply; SEWERAGE; Waste Management and remediation activities	12
CONSTRUCTION	10
Wholesale and retail trade; repair of motor vehicles and motorcycles	18
TRANSPORTATION AND STORAGE	17
Accommodation and Food service activities	19
INFORMATION AND COMMUNICATION	18
FINANCIAL AND INSURANCE ACTIVITIES	23
REAL ESTATE ACTIVITIES	12

PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	19
ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	12
PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	15
ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; UNDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	13
EDUCATION	14
HUMAIN HEALTH AND SOCIAL WORK ACTIVITIES	12
ARTS, ENTERTAINMENT AND RECREATION	5
OTHER SERVICE ACTIVITIES	13
ACTIVITIES OF EXTRATERRITORIAL ORGANISATIONS AND BODIES	8

Table A2. Pooled quantile estimation

	Pooled Quantile regression (Simultaneous QR)			Pooled Inter-quantile regression
Quantile level	*25%*	*50%*	*75%*	*75%-25%*
ECSR	-0.003*** (0.00)	-0.006** (0.02)	-0.008*** (0.00)	-0.045* (0.07)
MTBV	0.19 (0.31)	0.08*** (0.01)	0.17*** (0.00)	0.21*** (0.00)
LnMK	0.04*** (0.00)	0.11*** (0.00)	0.06*** (0.00)	0.09*** (0.04)
Lev	-0.00007*** (0.00)	-0.0004*** (0.00)	-0.0003*** (0.00)	0.0003 (0.51)
SGW	-0.0003 (0.63)	-0.0003 (0.78)	-0.0006 (0.91)	-0.0005 (0.06)
Pseudo R2	0.07	0.15	0.17	

Note: p-value are in parenthesis. *, **, *** denote respectively significance at 10%, 5% and 1%.