1 Introduction

Over the past decades, humanity has progressively become aware of the finiteness of earth's resources and its impact on the current global warming. The club of Rome, with their book *"The limits to growth"*, concluded that *"if the present growth trends in world population, industrialization, pollution, food production, resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years"* (Meadows et al., 1972: p23). In the nineties, Houghton and Change (1996) also pleaded that *"in the absence of mitigation policies, greenhouse gas emissions will continue to rise during the next century"* (p9). This will *"increase the global mean surface air temperature relative to 1990 of about 2°C by 2100... leading to harsh climatic repercussions"* (p23).

Over the last 30 years, these predictions have come true. For the first time in 400 000 years, atmospheric carbon dioxide crossed, in 1950, the level of 300 Parts Per Million[1] (i.e. PPM) (Pieter Tans et al., 2018). According to the NOAA's Annual Greenhouse Gas Index, the atmospheric abundance of CO_2 increased by an average of 1.80 PPM per year from 1979 to 2016 (Butler and Montzka, 2016). In May 2018, the global level of carbon dioxide has reached 410 PPM (Pieter Tans et al., 2018). This increase led to direct effects.

Since the 19^{th} century, the average temperature of the planet increased (+ 1.1°C). Most of the warming occurred in the past 35 years, with 16 of the 17 warmest years on record occurring since 2001 (Gistemp Team, 2018; Hansen et al., 2010). Data from NASA's Gravity Recovery and Climate Experiment show Greenland lost 150 to 250 cubic kilometers of ice per year between 2002 and 2006, while Antarctica lost about 152 cubic kilometers of ice between 2002 and 2005 (Gistemp Team, 2018). Church and White (2006) showed that, in the last century, the global sea level rose (+ 8 inches). Due to a high carbon dioxide absorption level (Sabine et al., 2004), the acidity of surface ocean waters also increased (+ 30%) (NOAA's Pacific Marine Environmental Laboratory, n.d.) leading, *inter alia*, to harsh repercussions to corals.

Ecosystem degradation and resources depletion engender a threat to firm's longevity (Dowell et al., 2000). Mark Carney, Governor of the Bank of England and Chair of the Financial Stability Board, identifies climate change as one of the most material

[1] A concentration of 300 PPM means that for every million air particles, 300 of them are carbon dioxide molecules, namely a carbon concentration of 0.03%.

threats to financial stability (Elliott, 2015). The Business and Sustainable Development Commission (2017) (p12) report states: *"... businesses need to pursue social and environmental sustainability as avidly as they pursue market share and shareholder value... If they don't, the costs and uncertainty of unsustainable development could swell until there is no viable world in which to do business."* In other words, adopting environmental strategies ensure companies' competitiveness and survival in the near future.

Testa et al. (2018) show that, due to institutional pressure or the influence of stakeholders, a majority of companies have integrated, either substantially or symbolically (i.e. greenwashing), proactive environmental practices. However, according to Scarpellini et al. (2016), green projects are still not common in companies of many countries because of significant barriers and a negligible culture of excluding sustainable development from an organization's strategy.

People's actions reflect a variable mix of altruistic motivation, material self-interest, and social or self-image concerns (Bénabou and Tirole, 2006). Hence, for more than 40 years, scholars have analyzed the Corporate Environmental Performance (i.e. CEP) and Corporate Financial Performance (i.e. CFP) nexus to provide evidence that it does pay to be green and to convince companies to incorporate environmental sustainability into their core values and strategies (Lu et al., 2014).

The International Organization for Standardization (ISO, 2013) defines CEP as *"measurable results of an organization's management of its environmental aspects"*. The CFP construct assesses the outcomes of business strategy (Bansal and DesJardine, 2014) and is a primary, fundamental indicator of organizational performance and long-term survival of an organization (Hamann et al., 2013).

The relationship between CEP and CFP is broadly discussed in the literature and is characterized by inconsistent empirical findings (Endrikat et al., 2014). Two major opposite trends have emerged. Some scholars (Chen et al., 2018; Manrique and Martí-Ballester, 2017; Miroshnychenko et al., 2017) provide evidence of a positive link between CEP and CFP while others (Busch and Hoffmann, 2011; Fernando et al., 2010; Fisher-Vanden and Thorburn, 2008) demonstrate a negative relationship. This inconclusiveness may come from the multidimensionality of both focal constructs (Albertini, 2013; Endrikat et al., 2014; Griffin and Mahon, 1997) given that commonly shared understanding or conceptualization of CEP and CFP has not been established so far (Etzion, 2007; Hamann et al., 2013).

Indeed, Endrikat et al. (2014) argue that a two-group classification of CEP can be deduced from the literature. (i) Process-based CEP which refers to *"a strategic level and focuses on managerial principles and processes such as environmental objectives, environmental policies, or environmental management structures"*. (ii) Outcome-based CEP which reflects *"the observable and quantifiable results of these efforts (*Delmas et al.*, 2011) and refers to measures such as the number of released pollutants or the ratio of recycled waste to total waste"*.

Regarding CFP, scholars have adopted three broad subdivisions: market-based (i.e. investor returns), accounting-based (i.e. accounting returns), and perceptual (i.e. survey) measures (Lu et al., 2014). Furthermore, the multidimensionality of CFP includes a wide array of estimations that may capture a firm's ability to generate value in the short-term and company's future growth prospects assessed by the external stakeholders (Opler and Titman, 1994).

Endrikat et al. (2014) highlight the need for a better understanding of the multidimensionality of both CEP and CFP constructs. Furthermore, King and Lenox (2002) suggest that *"When does it pay to be green?"* may be a more important question than *"Does it pay to be green?"*. Griffin and Mahon (1997) is the first to call for studies that look at the CEP-CFP relationship over time. To that extent, Busch and Friede (2018) demonstrate that, at a meta-research level, evidence of a time dependency on the CEP-CFP link are not significant and that the call of Griffin and Mahon (1997) remains, to date, unanswered. Therefore, using a panel data of 393 US publicly traded companies for the period 2012-2014, this study first investigates the impact of process-based CEP on outcome-based CEP. Then, it explores whether the combined effect of process-based and outcome-based CEP influences CFP. Finally, it observes the time influence (i.e. short-term vs long-term) of the relationship.

This study provides evidence that process-based CEP positively influences outcome-based CEP and support the idea that it does pay to be green. More precisely, it demonstrates that both process and outcome-based CEP have a positive impact on CFP, no matter the time horizon, and is stronger with a long-term perspective than a short-term perspective. This study emphasizes strong incentives for companies to invest in environmental strategies.

The rest of the paper is organized as follows: the next section reviews the literature regarding the CEP-CFP nexus. Then, I describe the database and methodology. Next, the results are presented. Finally, I discuss the main contributions to the literature and

highlight potential future research.

Albertini, E., 2013. Does environmental management improve financial performance? A meta-analytical review. Organization & Environment 26, 431–457. doi:10.1177/1086026613510301

Bansal, P., DesJardine, M.R., 2014. Business sustainability: It is about time. Strategic Organization 12, 70–78. doi:10.1177/1476127013520265

Bénabou, R., Tirole, J., 2006. Incentives and Prosocial Behavior. The American Economic Review 96, 1652–1678. doi:10.1257/000282806779396283

Busch, T., Friede, G., 2018. The Robustness of the Corporate Social and Financial Performance Relation: A Second-Order Meta-Analysis: Corporate social and financial performance. Corporate Social Responsibility and Environmental Management. doi:10.1002/csr.1480

Busch, T., Hoffmann, V.H., 2011. How Hot Is Your Bottom Line? Linking Carbon and Financial Performance. Business & Society 50, 233–265. doi:10.1177/0007650311398780

Business and Sustainable Development Commission, 2017. Better business, better world - The report of the Business & Sustainable Development Commission.

Butler, J.H., Montzka, S., 2016. The NOAA annual greenhouse gas index. Noaa earth system research laboratory technical report.

Chen, F., Ngniatedema, T., Li, S., 2018. A cross-country comparison of green initiatives, green performance and financial performance. Management Decision. doi:10.1108/MD-08-2017-0761

Church, J.A., White, N.J., 2006. A 20th century acceleration in global sea-level rise. Geophysical research letters 33. doi:10.1029/2005gl024826

Dahl, D.B., 2016. Xtable: Export Tables to LaTeX or HTML.

Dancho, M., Vaughan, D., 2018. Tidyquant: Tidy Quantitative Financial Analysis.

Delmas, M., Hoffmann, V.H., Kuss, M., 2011. Under the Tip of the Iceberg: Absorptive Capacity, Environmental Strategy, and Competitive Advantage. Business & Society 50, 116–154. doi:10.1177/0007650310394400

Dowell, G., Hart, S., Yeung, B., 2000. Do corporate global environmental standards create or destroy market value? Management science 46, 1059–1074. doi:10.1287/mnsc.46.8.1059.12030

Dowle, M., Srinivasan, A., 2017. Data.Table: Extension of ‘data.Frame‘.

Elliott, L., 2015. Carney warns of risks from climate change ’tragedy of the horizon’

[WWW Document]. the Guardian. URL http://www.theguardian.com/environment/2015/sep/29/carney-warns-of-risks-from-climate-change-tragedy-of-the-horizon (accessed 3.30.18).

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, 735–751. doi:10.1016/j.emj.2013.12.004

Etzion, D., 2007. Research on Organizations and the Natural Environment, 1992-Present: A Review. Journal of Management 33, 637–664. doi:10.1177/0149206307302553

Fernando, C.S., Sharfman, M., Uysal, V.B., 2010. Does Greenness Matter? Environmental Performance, Ownership Structure and Analyst Coverage. SSRN Electronic Journal. doi:http://dx.doi.org/10.2139/ssrn.1571596

Fisher-Vanden, K., Thorburn, K.S., 2008. Voluntary Corporate Environmental Initiatives and Shareholder Wealth. doi:10.2139/ssrn.1324983

Fox, J., Weisberg, S., 2011. An R Companion to Applied Regression, Second. ed. Sage, Thousand Oaks CA.

Gistemp Team, 2018. GISS Surface Temperature Analysis (GISTEMP). NASA Goddard Institute for Space Studies. [WWW Document]. URL https://data.giss.nasa.gov/gistemp/. (accessed 4.15.18).

Griffin, J.J., Mahon, J.F., 1997. The corporate social performance and corporate financial performance debate: Twenty-five years of incomparable research. Business & society 36, 5–31. doi:10.1177/000765039703600102

Grolemund, G., Wickham, H., 2011. Dates and Times Made Easy with lubridate. Journal of Statistical Software 40, 1–25.

Hamann, P.M., Schiemann, F., Bellora, L., Guenther, T.W., 2013. Exploring the Dimensions of Organizational Performance: A Construct Validity Study. Organizational Research Methods 16, 67–87. doi:10.1177/1094428112470007

Hansen, J., Ruedy, R., Sato, M., Lo, K., 2010. Global surface temperature change. Reviews of Geophysics 48. doi:10.1029/2010RG000345

Harrell Jr, F.E., with contributions from Charles Dupont, many others., 2018. Hmisc: Harrell Miscellaneous.

Henry, L., Wickham, H., 2017. Purrr: Functional Programming Tools.

Hlavac, M., 2018. Stargazer: Well-formatted regression and summary statistics

tables. R package version 5.2.1.

Houghton, J.T., Change, I.P. on C., 1996. Climate Change 1995: The Science of Climate Change: Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

ISO, 2013. Environmental management. Environmental performance evaluation. Guidelines. doi:10.3403/30241113

King, A.A., Lenox, M.J., 2002. Does It Really Pay to Be Green? An Empirical Study of Firm Environmental and Financial Performance: An Empirical Study of Firm Environmental and Financial Performance. Journal of Industrial Ecology 5, 105–116. doi:10.1162/108819801753358526

Lang, D.T., the CRAN team, 2018. RCurl: General Network (HTTP/FTP/...) Client Interface for R.

Lu, W., Chau, K.W., Wang, H., Pan, W., 2014. A decade's debate on the nexus between corporate social and corporate financial performance: A critical review of empirical studies 20022011. Journal of Cleaner Production 79, 195–206. doi:10.1016/j.jclepro.2014.04.072

Manrique, S., Martí-Ballester, C.-P., 2017. Analyzing the Effect of Corporate Environmental Performance on Corporate Financial Performance in Developed and Developing Countries. Sustainability 9, 1957. doi:10.3390/su9111957

Meadows, D.H., Meadows, D.L., Randers, J., Behrens, W.W., 1972. The limits to growth. New York 102, 27.

Miroshnychenko, I., Barontini, R., Testa, F., 2017. Green practices and financial performance: A global outlook. Journal of Cleaner Production 147, 340–351. doi:10.1016/j.jclepro.2017.01.058

Müller, K., Wickham, H., 2017. Tibble: Simple Data Frames.

NOAA's Pacific Marine Environmental Laboratory, n.d. Ocean Acidification [WWW Document]. URL https://www.pmel.noaa.gov/co2/story/Ocean+Acidification (accessed 5.14.18).

Opler, T.C., Titman, S., 1994. Financial Distress and Corporate Performance. The Journal of Finance 49, 1015–1040. doi:10.1111/j.1540-6261.1994.tb00086.x

Peterson, B.G., Carl, P., 2018. PerformanceAnalytics: Econometric Tools for Performance and Risk Analysis.

Pieter Tans, NOAA/ESRL, Ralph Keeling, 2018. ESRL Global Monitoring Division - Global Greenhouse Gas Reference Network - Mauna Loa CO2 records [WWW

Document]. URL https://www.esrl.noaa.gov/gmd/ccgg/trends/data.html (accessed 5.15.18).

Ren, K., 2016. Rlist: A Toolbox for Non-Tabular Data Manipulation.

Ryan, J.A., Ulrich, J.M., 2018. Xts: eXtensible Time Series.

Sabine, C.L., Feely, R.A., Gruber, N., Key, R.M., Lee, K., Bullister, J.L., Wanninkhof, R., Wong, C.S.L., Wallace, D.W., Tilbrook, B., 2004. The oceanic sink for anthropogenic CO2. science 305, 367–371. doi:10.1126/science.1097403

Sarkar, D., 2008. Lattice: Multivariate Data Visualization with R. Springer, New York.

Scarpellini, S., Valero-Gil, J., Portillo-Tarragona, P., 2016. The "economicfinance interface" for eco-innovation projects. International Journal of Project Management 34, 1012–1025. doi:10.1016/j.ijproman.2016.04.005

Terry Therneau, Patricia Mia Grambsch, 2000. Modeling Survival Data: Extending the Cox Model. New-York.

Testa, F., Boiral, O., Iraldo, F., 2018. Internalization of Environmental Practices and Institutional Complexity: Can Stakeholders Pressures Encourage Greenwashing? J Bus Ethics 147, 287–307. doi:10.1007/s10551-015-2960-2

Wickham, H., 2017. Tidyverse: Easily Install and Load the 'Tidyverse'.

Wickham, H., 2016. Rvest: Easily Harvest (Scrape) Web Pages.

Wickham, H., 2011. The Split-Apply-Combine Strategy for Data Analysis. Journal of Statistical Software 40, 1–29.

Wickham, H., 2009. Ggplot2: Elegant Graphics for Data Analysis. Springer-Verlag New York.

Wickham, H., Francois, R., Henry, L., Müller, K., 2017. Dplyr: A Grammar of Data Manipulation.

Wickham, H., Henry, L., 2018. Tidyr: Easily Tidy Data with 'spread()' and 'gather()' Functions.

Yihui Xie, 2018. Knitr: A General-Purpose Package for Dynamic Report Generation in R. R package version 1.20.

Zhu, H., 2018. kableExtra: Construct Complex Table with 'kable' and Pipe Syntax.