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Shareholder response to voluntary environmental initiatives

Does committing to voluntary environmental initiatives improve company value?

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Master thesis, Business & Administration, Finance

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Abstract

This thesis seeks to expand the knowledge of how environmental performance effect financial performance. More specifically, we examine shareholders' reaction on announcement when companies commit to the RE100-initiative, an initiative committing companies to use 100% renewable electricity within a targeted year. We believe that an examination of this initiative gives a deeper understanding of how shareholders perceive an engagement in a voluntary environmental commitment. Currently, there is no consensus reached in the academic community regarding this topic. We aim to contribute to the research by performing an event study on stock price followed by a cross-sectional OLS. We test the hypothesis; whether a commitment to the RE100-engagement decreases or increases the stock price at announcement. Empirically, we use a sample of 67 public companies committed to RE100. Our sample consists of large global companies based in the United States and Europe. Every company has unique announcement dates and the data set is therefore customized to each company.

Our results suggest that committing to RE100 does neither increase nor decrease the stock price on the announcement date of the commitment on average. However, when we examine firm fixed effects, we identify two factors affecting the reaction among shareholders. We find that a consolidated ownership structure have a positive effect on share price. Put differently, it seems like when the shareholders' and CEO's incentives are aligned, the engagement is perceived to have a more positive effect on company value. Further, American companies experience a more positive effect on announcement compared to European companies. We observe that European companies are more focused on environmental issues and the transformation towards increased use of renewable energy. A possible interpretation of our finding is related to the first mover advantage where the benefit of being a first mover might have been played out in Europe, while US companies can still be able to gain from this advantage.

Keywords: Voluntary commitments, renewable energy, environment, sustainability, electricity, non-financial activities

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Preface

This master thesis concludes our Master of Science in Finance at the Norwegian School of Business and Economics, Department of Finance.

With the perspective of two finance students, we both wanted to expand our knowledge on climate challenges and renewable energy. Therefore, a study on voluntary environmental initiatives' impact on financial performance suited us perfectly. With help from our supervisor we identified the RE100-initiative appropriate for using financial theory and econometric methodology while focusing on environmental issues.

The work with this thesis has been challenging, yet highly educational. Our main focus while producing the final product has been to learn and gain experience on applied financial theory and renewable energy. The task has been highly rewarding both related to team work and problem solving. We have gathered financial data on 67 companies for our event study. Further, we have collected data on a large number of control variables over a time period of four years. In the final product eight of these variables are applied. Moreover, all data gathered is customized to the announcement date of the RE100-initiative for each individual company. Combining the data and constructing the data set was challenging and required experience in Excel and Stata.

We would like to express our sincere gratitude to our supervisor Professor Karin Thorburn for valuable discussions and constructive feedback. Your willingness to review and engage in our work has been an important contribution to the final result.

Additionally, we are greatful for the input received from Storebrand, KLP and Statnett. Sunniva Slette, sustainability analyst in Storebrand, and Annine Bersagel, responsible for responsible investing in KLP, have provided us with valuable insight on the subject and motivated us in our work with the thesis.

Bergen, 2017-19-12

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Abbreviations

CSR   =   Corporate social responsibilities

CFP   =   Corporate financial performance

ECP   =   Environmental corporate performance

ES   =   Environmental and social

AR   =   Abnormal return

CAR   =   Cumulative abnormal return

CAAR   =   Cumulative average abnormal return

FMA   =   First mover advantage

Chapter 1

Introduction

In 2016, voluntary environmental[1] and social responsible[2] (ES) investments reached an all-time high of $23 trillion globally, up from $18 trillion in 2014. This accounts for more than 25 percent of total managed assets (Douglas, 2017). Given this enormous size and growth, it is natural that there is extensive interest in the question: Does environmental performance improve financial performance?

Scientists have been engaged in social and environmental investments and its effect on financial performance for over 40 years. However, no consensus has been reached. Traditionally, environmental performance has been viewed as a non value-creating activity. However, more recent studies find evidence that acting responsible can increase company value through gaining positive reputation (Orlitzky, 2008), reducing input factors (Porter and Kramer, 2011), and decrease regulatory risk (Reinhardt, 1999).

We perform an event study on the voluntary global initiative RE100. The initiative is aiming to commit influential companies to 100% use of renewable electricity. We apply the event study methodology due to its capability to capture the pure effect of a specific event. Thus, we are able to measure shareholders' perception of committing to the RE100-initiative while isolating all other factors. We find the RE100-initiative well suited for an event study as many of the companies are publicly traded, providing a daily stock price to examine at announcement.

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[1]Taking environmental responsibilities beyond environmental compliance
[2]Activities benefiting the society beyond regulatory requirements

Moreover, the initiative has a concrete and measurable goal [3] making it possible for investors to assess the implications of membership. This is attractive as previous studies find that it is harder to detect a reaction to initiatives with less concrete goals (Fisher-Vanden and Thorburn, 2011).

To perform the event study, we estimate cumulative average abnormal return (CAAR) for a sample of companies announcing their membership in the RE100-initiative. We find that there is no reaction in stock price on announcement of the membership. Thus, it seems like shareholders interpret the commitment neither as a cost nor as a value-creating activity for the company.

The result is interesting as earlier studies have detected a significant drop in stock price for companies that have joined voluntary environmental initiatives (Fisher-Vanden and Thorburn, 2011) (Cañón-de Francia and Garcés-Ayerbe, 2009). Thus, our result might indicate a change in shareholders' perception on voluntary environmental initiatives from negative to neutral. On the other hand, we acknowledge that there can be other explanations. We speculate that the neutral effect might be a result of the initiative having less concrete and measurable goals than we initially believed. As a result, investors might find it hard to assess the implications of a membership in RE100.

In addition to the event study, we conduct a cross-sectional *ordinary least-squares* (OLS) regression acknowledging that there can be different firm fixed effects affecting the immensity of the neutral reaction among shareholders. We apply the cumulative abnormal return (CAR) in event window [-1,1] as the dependent variable.

There are two variables with significant explanatory power; Governance[4] and Region[5]. We find that firms with strong governance, implying stronger shareholder influence, are estimated to have a 1.34% to 1.40% higher CAR than firms with poor governance when committing to the RE100-initiative. An interpretation of this can be that strong governance reduce the principal-agent problem. If managers in companies with high influence from shareholders engage in voluntary commitments, it is likely that the shareholders view the commitment as a value-

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[3]All companies are required to announce the year of when they are becoming 100% renewable on electricity and how the goal will be reached

[4]In this study we define strong governance as a company with one or more owner with a 10% share or more implying strong influence from shareholders

[5]Region is defined as 1 if the headquarters of the company are located in the US and 0 if located in Europe

creating activity, resulting in a more positive reaction on the announcement of the commitment. Looking at Region, estimates show that American companies have 0.47% to 1.13% higher abnormal return compared to European companies, suggesting that investors in US companies are viewing the environmental commitment as more positive than investors in European firms. To explain this, we speculate that the *first mover advantage* (FMA) create favorable returns for American companies while these gains already have been played out for European companies.

There are several reasons to expand the knowledge of shareholders' reaction to voluntary environmental commitments. A large number of governments have, by signing the Paris agreement [6], agreed on mitigating emissions. Private companies accounts for around half of the global pollution (RE100, 2017). Therefore, to accomplish the goal set in the Paris agreement, governments need to have a deep understanding of what motivates companies to lower their emissions. More knowledge can enable them to develop laws and regulations facilitating reduction in emissions. Further, research on the topic will also give management and stakeholders in private companies a better foundation for making value-creating decisions on ES activities.

This thesis is structured as follows. Chapter 2 presents both theoretical and empirical literature in the context of our research question. Chapter 3 introduces the RE100-initiative and provides our rational behind the sample selection and filtering. Then, we derive our methodology for econometric theories applied in chapter 4. Additionally, this chapter highlights the fundamental economic assumptions for the analysis. Evaluation of potential factors affecting profitability are presented in chapter 5, before we in chapter 6 present and investigate the descriptive statistics of the variables applied. Chapter 7 presents our results and relate these to previous studies. Then, the robustness of the results is assessed in chapter 8. Finally, we conclude on our hypothesis in chapter 9.

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[6]Preventing the temperature to increase more than 2.0 Celsius above pre-industrial levels by 2020

Chapter 2

Literature survey

In this chapter, we elaborate on the literature on *Corporate Social Responsibility* (CSR) and its effect on *Corporate Financial Performance* (CFP). Specifically, we will focus on studies that have sought to establish the relation between *Environmental Corporate Performance* (ECP) and CFP.

What impact does Corporate Social Responsibility have on Corporate Financial Performance? This question has engaged scientists for over 40 years, with growing interest for voluntary environmental activities in the last decade. In spite of this, there is no consensus reached.

2.1 Theoretical background

A famous theory addressing the relationship between environmental performance and financial performance is the win-win theory. The theory states that protecting the environment can have positive effects for both companies and the society. Porter (1991), Porter and van der Linde (1995) and Porter and Kramer (2011) support the win-win theory and contend that a win-win situation can be achieved with correct regulations. They argue that through appropriate regulations environmental concerns can be turned into a competitive advantage spurring innovation. Porter (1991) and Porter and van der Linde (1995) state that countries with strict regulations can gain FMA on the international arena, by preparing their private and public sectors for interna-

tional regulations. To illustrate, Porter (1991) shows how the US are leaders in areas with strict regulations, such as reduction of pesticides consumption and the remediation of environmental damage, and that they at the same time typically lag behind in less regulated industries. He further highlight that countries with strict regulations, such as Germany and Japan, both have surpassed the US GNP growth.

Palmer (1995) reacts with strong skepticism to the win-win theory. The study´s largest criticism is that Porter (1991) and Porter and van der Linde (1995) promote a view where environmental activities and regulations do not have a cost. She also question the rationale behind the theory claiming it lacks economic reasoning. Using a static classical economic model, she demonstrates that firms often will be worse off after regulations, even if innovative factors are accounted for.

Another famous theorist is Orlitzky (2008) that in line with the win-win theory presents a theory in favour of a positive relationship between CSR and CFP. Based on a meta study with empirical findings over the last 30 years, he developed a theory describing reputation as an important mediator for CSR´s impact on CFP. Put differently, Orlitzky (2008) finds that voluntary activities have a positive effect on corporate reputation which in turn will increase the financial value of the company. The reputation theory has gained support among other studies preformed by Graafland and van de Ven (2006) and Kreps and Wilson (1982) also finding that non-financial activities can gain companies positive reputation, thus improve financial performance.

A less conclusive theory is presented by McWilliams and Siegel (2001). The authors aim to answer both how much companies should spend on CSR, and the effect of CSR on CFP. Applying demand and supply theory their model predicts that firms will be indifferent to whether they perform CSR or not. They find that responsible companies will have higher cost, but are in a position to charge a premium on their products, resulting in equal profits regardless of their investment in CSR.

In addition to the theories mentioned above reporting mixed results there are theories explaining why firms are joining voluntary environmental initiatives despite of no clear evidence of a positive return. The principal-agent theory explain why these activities are undertaken. Friedman (1970) advocate that CSR can be a way for managers, the agent, to feature their own social,

professional and political career, rather than taking care of the stakeholders', the principals', interest, i.e. maximizing profit. Thus, in companies where the manager has the discretion to take environmental action, they are more likely to join voluntary commitments. This is supported by an empirical study performed by Fisher-Vanden and Thorburn (2011) finding evidence that poor governance often lead companies to join voluntary environmental commitments.

We have presented theories arguing for positive, negative and neutral relations between non-financial and financial performance. Four different theories are discussed in the theoretical review; the win-win theory, the reputation effect, the equilibrium theory and the principal-agent theory. To be able to confirm or reject the different theories they need to be tested and studied empirically. In the further, we will therefore examine a number of empirical studies.

2.2 Existing empirical studies

In this section, we review empirical studies that investigate the relationship between environmental investments and corporate performance. There are three methods used when trying to establish a relationship (1) Regression analysis, (2) Portfolio analysis and (3) Event studies (Fisher-Vanden and Thorburn, 2011). Additionally, some scholars are performing meta studies. Assessing the regression analysis the main criticism is related to confounding variables and therefore misinterpreted causal relations. Further, portfolio analysis is applied when comparing the financial performance of portfolios consisting of different companies. It is often criticized for not being able to separate the influence of other variables (Ziegler et al., 2007). Finally, for event studies the most common criticism is that they only capture a short-term reaction among shareholders, advocating that the efficient market theory must hold.

Further, the methods described above can measure financial performance by applying either (1) Stock price or (2) Accounting data. Stock price is preferred in event studies, while accounting data is widely used in regressions. Stock price is a forward-looking measurement on return, when measuring a reaction in the stock price of an event the pure effect of this unique event is obtained. Accounting data, on the other hand, is backward looking and it can sometimes be difficult to detect the return of one isolated investment or event. Thus, when used it is important

to control for firm fixed effects in addition to other factors affecting the firm value.

Konar and Cohen (2001), Andrew A. King and Michael J. Lenox (2001), Telle (2006) and Ziegler et al. (2007) use pooled regression analysis finding a positive relationship. However, the positive effect no longer exists when controlling for firm fixed effects. This implies that the positive relationship, are not necessarily due to firms being environmentally friendly. On the other hand, there are regression analysis finding a negative relationship or a diminishing marginal positive effect on the return of ECP on CFP. Clarkson et al. (2004) preform a study on high and low polluting firms finding evidence that only low-polluting firms benefit from investing in environmental activities. Further Lioui and Sharma (2012) and Jaggi and Freedman (1992) find a significant negative relationship while Misani and Pogutz (2015) find that environmental activities only are profitable to a certain point.

Despite of mixed reported results in the regression analysis some factors often lead to a positive relation between CFP and ECP. Regulations, or more precisely threats of regulations and liabilities are often found to have a positive effect on the financial reaction to a voluntary commitment. Additionally, studies find that threats motivate companies to take voluntary actions (Khanna, 2001) (Anton et al., 2004). Finding that when there is fear of legal sanctions and regulations, a voluntary commitment can be perceived as a proactive action reducing the likelihood for a costly regulation to occur. Thus, in these situations a voluntary commitment will have a positive expected return (Stuart L Hart, 1998). Further, institutional pressure effect the relationship between CFP and ECP. Institutional pressure can explain why companies located in the same country behave similarly due to social frameworks, norms and values to gain social approval and secure long-term return. Suchman (1995), Meyer and Rowan (1977) and Darnall et al. (2008) do also detect institutional pressure to encourage environmental activities. In line with Darnall et al. (2008), Telle (2006) and Sæther (1998) detect evidence indicating a positive effect of institutional pressure. They find that one industry in their study, due to immense environmental pressure from German consumers, has higher return than other industries on environmental activities.

In the same manner, portfolio studies are reporting mixed results and findings. McGuire J., A. Sundgren, and T. Schneeweis (1981) and Ziegler et al. (2009) find that responsible portfolios have lower return compared to non-responsible portfolios. Ziegler et al. (2009) find negative

abnormal return when exercising a trading strategy buying stocks of companies with high environmental performance and selling corporations with lower level of environmental performance. Interestingly, in line with the discussion above they do find that the abnormal return turn positive in some specified periods of time with stricter regulations and in regions with more environmental regulation. Further, Konar and Cohen (2001) construct two portfolios; "low polluters" and "high polluters" finding that there is neither a penalty or a premium for investing in a low polluting portfolio. Diltz (1995) on the other hand, detect a positive return when studying returns on portfolios fulfilling ethical requirements.

Overall, the event studies find a negative view on allocation of resources to environmental causes. Cañón-de Francia and Garcés-Ayerbe (2009) perform an event study on the ISO 14001 certification[1]. To obtain the certification firms have to fulfill defined criteria on environmental performance. The authors test whether a certification is interpreted as a proactive rather than a reactive action, assuming that proactive adoptions have positive return. The study finds evidence that less polluting and non-multinational firms react negative to voluntary environmental initiatives. This result suggests that the market perceives the certification as a reactive investment.

In line with Cañón-de Francia and Garcés-Ayerbe (2009), Fisher-Vanden and Thorburn (2011) detect a significant negative effect on firm's stock price when joining a voluntary environmental program. Using the event study methodology, Fisher-Vanden and Thorburn (2011) investigate the market reaction when companies join EPA's Climate leaders, a program trying to reduce greenhouse gas emissions. The authors have some interesting findings. The market reaction is more negative for companies with high market-to-book ratio and firms with poor corporate governance structure. However, the study does, as both regression analysis and portfolio analysis, find that in cases of high regulatory risk and high public attention the stock price is less reactive (Khanna, 2001) (Anton et al., 2004) (Darnall et al., 2008) (Brouhle et al., 2009) (Maxwell et al., 2000).

Additionally, the paper analyze Ceres, a program with more general environmental commitments. In contrast to Climate leaders, this commitment has inconclusive results. This indicates

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[1]Standards related to environmental management of organizations, an integral part of the European Union's Eco-Management and Audit Scheme (EMAS)

that more general programs with fewer requirements are seen as a smaller threat to financial return compared to commitments with more concrete targets or goals. Since the result is unfavourable for joining voluntary commitments, the authors try to understand why companies choose to join such voluntary programs. The study detects that the companies most likely to join are the ones with high institutional pressure and poor corporate governance, this is consistent with Khanna (2001), Cañón-de Francia and Garcés-Ayerbe (2009) and Friedman (1970) principal-agent theory presented above.

In the lack of consensus, some interesting meta studies have been conducted. In 2009 Margolis et al. (2009) investigated 192 effects in 167 studies. In contrast to the mentioned event studies, Margolis et al. (2009) detect a small positive effect of CSR on CFP. More interestingly, the paper finds that environmental initiatives have stronger positive effects than social. As mentioned in section 2.1, Orlitzky (2008) also carry out a meta study with over 30 years of empirical findings. He identifies strong support for reputation as a mediator for CFP. The paper argues that acting responsible can make customers willing to pay a premium and make employees more committed and faithful to the company. Contradictory to Margolis et al. (2009), the paper does not find a positive relationship between ECR and CFP. The 2008 study finds that environmental performance is mainly treated as a legal issue, rather than an important factor for reputation and employee retention.

There is no consensus in the empirical studies presented in this overview. However, studies presented using the event study methodology seem to have negative results, while meta studies identify a positive relationship. Moreover, the empirical studies show that the choice of method, the use of accounting data versus trading data, and firm heterogeneity has influence on the results.

2.3 Conclusions and motivation for the thesis

It is evident that the effect of environmental social responsibility on financial performance has received extensive attention in the literature the last decades. However, scientists across the world are increasingly focusing on mitigation of environmental issues. This has recently been

demonstrated by the signing of the Paris Agreement. Therefore, it is desirable to analyze these effects in light of the changing focus of the societies in which companies operate. As a result, we seek to expand the understanding of the interactions between environmental and financial performance of companies in the present environment. Specifically, we formulate the following research questions;

Research question 1: Do investors on average view the commitment to the RE100-initiative as having a positive, negative or neutral effect on the value of the company?

Research question 2: Can firm fixed effects explain the abnormal return?

We examine research question 1 by testing the two-sided null hypothesis against the alternative hypothesis. Furthermore, we review research question 2 by running an OLS with the explanatory variables presented in chapter 5. The hypotheses tested for both research questions are

Research question 1	**Null hypothesis:** Engagement in the RE100-initiative is **not** perceived as *increasing* or *decreasing* the financial value of the company by the shareholders
	Alternative hypothesis: Engagement in the RE100-initiative is perceived as *increasing* or *decreasing* the financial value of the company by the shareholders
Research question 2	**Null hypothesis:** Firm fixed effects do **not** affect the abnormal return
	Alternative hypothesis Firm fixed effects affect the abnormal return

Chapter 3

Sample selection

In this chapter, we start by presenting the RE100-initiative in section 3.1, emphasizing why the collaboration is well suited for investigating the relationship between environmental performance and financial performance. Moreover, we elaborate on the criteria for choosing the RE100-initiative. Further, in section 3.2 we present the databases used and interpret the sample selection and filtering in detail.

3.1 The RE100-initiative

RE100 is a collaborative global initiative aiming to commit influential companies across sectors to 100% use of renewable electricity. The goal is to increase the demand and accordingly increase the supply, creating a larger and more innovative market for renewable electricity. Since its launch in September 2014 during the Climate Week in New York 111[1] companies have joined. RE100 is initiated by The Climate Group [2] in partnership with the Carbon Disclosure Project [3] (CDP) (RE100, 2017).

When committing to the initiative, RE100 requires businesses to report and take action on three criteria (1) *Public commitment*, all companies are required to publicly announce a specific year

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[1]Number extracted October 2017

[2]A non-profit organization working with businesses and governments to accelerate climate action

[3]Organization supporting companies and cities to disclose the environmental impact of corporations

in which they will reach their goal of 100% renewable electricity use. (2) *Self-generation and purchase of 100% renewable electricity*, to reach the goal companies are constrained to either use self-produced electricity from self-owned facilities or source it from the market by purchasing *power purchase agreements* (PPA) or stand-alone energy attribute certificates. In countries where it is difficult to fulfill the criteria the RE100 steering committee can approve alternative claims or create alternative rules for the special case. (3) *Transparent reporting*, members are required to report on their renewable energy consumption annually by filling out the RE100 reporting guidance document. Additionally, their consumption must be verified by a third party.

Committing to the initiative implies no costs. However, it is possible to buy a Gold or Silver membership at the price of respectively, $15,000 and $7,500 per year. By paying this fee members benefit from increased media exposure, high level speaker opportunities and unlimited access to RE100 webinars (RE100, 2016).

To decide on an appropriate initiative to answer our research questions we defined four criteria. We are comfortable that an initiative fulfilling these criteria will be well suited for investigating out research questions with an event study methodology. The criteria are presented in the following; (1) *Publicly traded companies*, listed companies have better quality on financial data, and a daily traded stock reflecting the value of the company at all times. (2) *Global companies*, the climate change is a global problem, we therefore want to capture a cross-boarder reaction and perception among investors. (3) *Measurable and concrete goals*, Fisher-Vanden and Thorburn (2011) find that there is harder to detect a reaction to initiatives with less concrete goals. Concluding that concrete goals are crucial for shareholders to understand the commitment and consequence of engagement. (4) *A suitable time frame*, since the interest for environmental issues has increased over time, a long time period might identify more variables explaining the investors reaction.

Among the companies committed to RE100 92 are publicly traded, and most are global companies. When committed to the initiative companies are strictly required to publicly announce a specific year in which they will reach their goal of 100% renewable electricity. Moreover, they have to be transparent on their progress. These requirements make the commitment concrete. The RE100-initiative is fairly new, making it somewhat challenging to identify variation in firm specific factors explaining abnormal return. Thus, in our case the time period should preferably

have been longer. To conclude, the RE100-initiative fulfill the first three criteria, and the forth to some degree. Hence, we find the RE100-initiative suitable for studying shareholders' reaction on engagement in a voluntary commitment.

3.2   Sample selection

The starting point of the sample selection is the 111 companies that have committed to the RE100-initiative between September 2014 and October 2017. The companies are mainly located in the US and Europe, with some additional companies from Asia.

To create a correct data set giving the most precise results the companies are filtered on several criteria. Firstly, the data set is limited to publicly traded companies since private companies do not trade with a daily stock price. Thus, 19 companies are excluded from the sample. Additionally, one company was eliminated because it was listed after becoming a member of the RE100-initiative.

Essential for the study is the corresponding announcement date for the companies' commitment. Thus, we exclude the companies with an unobtainable announcement date. *The Climate Group homepage*, *The RE100 homepage* and *Company websites* were sources of announcement dates. Further, we searched *Factiva* to double check and confirm the dates in the study. Two companies are eliminated due to missing announcement dates. Companies that with announcement on a non-trading day are not removed, the announcement date is set to the first trading day after announcement.

Further, we searched *Company websites*, *Google News* and *Factiva* for news related to other possible events affecting the stock price five days surrounding the announcement. By excluding companies with additional news during this period we are able to isolate the effect of the event. Earnings, M&A and dividend announcements are the primary reasons for eliminating companies. In total we removed 19 companies.

After filtering the sample we used *Datastream* to gather stock prices. For each company adjusted closing prices were extracted, one year before and two trading days after the announce-

ment date. For three Asian companies the stock prices were unobtainable. Thus, these were excluded. As as result, the final sample consists of 67 companies in 13 different countries from Europe and the US. The companies in the sample are summarized in table 3.1.

Table 3.1: Overview of all companies included in the sample

Companies	Announcement date	Country of origin	Sector	100% goal [4]
AbInbev	28/03/2017	Netherland	Consumer staples	2025
Adobe	01/12/2015	United States	Information technology	2035
AkzoNobel	27/03/2017	Netherland	Material	2050
Alstria	07/10/2015	Switzerland	Financial	2017
Apple	19/09/2016	United States	Information technology	-
Aviva	08/10/2015	England	Financial	2025
AXA	11/07/2017	French	Financial	2025
Bankia	04/01/2017	Spain	Financial	2016
Biogen	25/11/2015	United States	Health Care	2014
BMW Group	06/12/2015	Germany	Consumer discretionary	-
British Land	22/09/2014	England	Financial	2019
BT Group	29/07/2016	United Kingdom	Telecommunication services	2020
CaixaBank	28/06/2017	Spain	Financial	2018
Carlsberg Group	11/07/2017	Denmark	Consumer staples	2022
Coca-Cola ENT.	07/12/2015	United States	Consumer staples	2020
Colruyt Group	13/07/2016	Germany	Consumer staples	2010
Corbion	17/07/2017	Netherlands	Consumer staples	-
Credit Agricole	29/06/2016	French	Financial	2016
Danske Bank	17/01/2017	Denmark	Financial	2015
Diageo	20/09/2016	United States	Consumer staples	2030
DNB	20/09/2016	Norway	Financial	2020
eBay	25/04/2017	United States	Information technology	2025
Equinix	02/06/2016	United States	Information technology	-
Estée Lauder	13/09/2017	United States	Consumer staples	2020
General Motors	15/03/2016	United States	Consumer discretionary	2050
Goldman Sachs	22/09/2015	United States	Financial	2020
Google	03/12/2015	United States	Information technology	2017
H&M	20/09/2014	Sweden	Consumer discretionary	-
Helvetia	14/11/2016	Switzerland	Financial	2020
Hewlett Packard	20/09/2016	United States	Information technology	-
HP, Inc.	30/03/2016	United States	Information technology	-
IHS Markit	10/05/2017	United States	Information technology	2020

4.Companies with no value have not announced a date for becoming 100% renewable on electricity

Companies	Announcement date	Industry	Country of origin	100% goal
ING Group	04/12/2015	Netherlands	Financial	2020
Interface	02/06/2016	United States	Consumer discretionary	2020
Johnson & Johnson	22/09/2015	United States	Health Care	2050
JP Morgan Chase&Co	28/07/2017	United States	Financial	2020
Jupiter Asset Manag.	19/09/2017	United Kingdom	Financial	2018
Kellogg Company	13/09/2017	United States	Consumer staples	2050
KPN	22/09/2014	Netherlands	Telecommunication services	2013
Land Securities	07/10/2015	United Kingdom	Financial	2016
Microsoft	30/11/2015	United States	Information technology	2014
Nestle	22/09/2014	Switzerland	Consumer staples	-
Nordea	07/12/2015	Sweden	Financial	2016
Novo Nordisk	07/12/2015	Denmark	Health Care	2020
Pearson	06/12/2015	United Kingdom	Consumer discretionary	2012
Procter & Gamble	22/09/2015	United States	Consumer staples	-
RELX Group	22/09/2014	United Kingdom	Consumer discretionary	2020
Royal DSM	22/09/2015	Netherlands	Health Care	-
Royal Philips	22/09/2014	Netherlands	Industrial	2020
Salesforce	14/01/2016	United States	Information technology	2015
SAP	27/01/2015	Germany	Information technology	2020
SAVE S.p.A Group	28/06/2016	Italy	Industrial	2016
Starbucks	22/09/2015	United States	Consumer discretionary	2015
Steelcase	22/09/2015	United States	Industrial	2014
TD Bank	01/06/2016	Canaca	Financial	2016
Telefonica S.A	02/06/2017	Spain	Telecommunication services	2030
Tesco	15/05/2017	United Kingdom	Consumer staples	2030
UBS	15/09/2015	Switzerland	Financial	2020
Unilever	22/09/2014	United Kingdom	Consumer staples	2030
Vail Resorts	25/07/2017	United States	Consumer discretionary	2030
Vaisala	08/09/2015	Finland	Information technology	2020
VF Corporation	20/09/2016	United States	Consumer discretionary	2025
VMWare	20/09/2016	United States	Information technology	2020
Voya Financial	22/09/2015	United States	Financial	2015
Walmart	22/09/2015	United States	Consumer staples	-
Wells Fargo	20/09/2016	United States	Financial	2017
YOOX Group	22/09/2014	Italy	Consumer discretionary	2020

Chapter 4

Methodology

In this chapter, we present the mathematical formulation of the event study problem and the multivariate cross-sectional OLS. Section 4.1 presents modelling assumptions for the event study, while section 4.2 discusses the method. Finally, section 4.3 explains the motivation for applying a multivariate cross-sectional OLS model.

4.1   Event study

Event studies are designed to examine market reactions in terms of excess return to a specific isolated event (Damodaran, 2002). In other words, the event study captures shareholders' adjusted perception of all future discounted cash flows. Fundamental for the event study is *The efficient market hypothesis*, assuming that all relevant information is reflected in the stock price at all time (Fox, 1978).

Binder (1998) find that the event study, compared to other methodologies, is better suited to examine abnormal returns across companies when firm-specific event independent on time. Put differently, the strength of the event study lies in that we can precisely estimate how one specific event affect a sample of firms in different time periods (Ahern, 2009).

When applying the event study methodology some elements should be satisfied. (1) The time

of the announcement need to be detectable, (2) shareholders must receive the information at the same time and (3) it has to be feasible to detect the normal return, making it possible to calculate the abnormal return (Henderson, 1990). For the RE100-initiative the announcement date is easy to identify. Further, based on observations regarding communication of the announcement, it seems reasonable to assume that shareholders receive the information at the same time. Finally, our sample consists of publicly traded companies. Thus, we are able get a good estimate of the normal return. Consequently, we believe that the event study is well suited to capture shareholders' perception of engaging in the RE100-initiative. Additionally, we believe it gives a deeper understanding of how investors value voluntary environmental commitments in general.

4.2 Abnormal return

In this section we will discuss the calculation of the normal and abnormal return. Furthermore, two tests will be presented for testing the significance of the cumulative average abnormal return.

4.2.1 Obtaining abnormal return

To formulate the problem at hand, the first step is to determine abnormal return. We detect abnormal return by taking the difference between the benchmark return and the actual return in the event window. There are a large number of methods applied in previous literature for identifying benchmark return. One method is the *Single index model*. The single index model assumes that there is only one factor causing systematic risk, this factor is often a market index. Other models add more explanatory factors like the *Fama French's three factor model*, arguing that there often are other macro factors that affects the stock price. For event studies, most literature apply the single index model, claiming that more advanced models give little variation on the results (Fisher-Vanden and Thorburn, 2011) (Binder, 1998). In line with previous literature, we apply the single index model. Furthermore, the model examine three event windows accordingly [0,1], [-1,1] and [-2,2]. The choice of small event windows is a result of previous studies arguing that small event windows give more precise tests and results (McWilliams and

Siegel, 2001). The single index model is formulated as follows:

$$R_{it} = \alpha + \beta_i R_{mt} + \varepsilon_{it} \tag{4.1}$$

R_{it} is the actual return for each company *i* in the estimation window. R_{mt} represents the market index and epsilon is the error term. We apply the World MSCI index as the market index extracting it from Datastream.

$$A\hat{R}_{it} = R_{it} - (\hat{\alpha} + \hat{\beta}_i R_{mt}) \tag{4.2}$$

We the obtain estimated abnormal return by abstracting actual return from benchmark return for all companies. The betas and alphas are estimated using OLS with an estimation window t_1 = -253 and t_2 =-3 time where 0 is the day of the event. Thus, it follows that the *cumulative abnormal return* (CAR) in the event window is:

$$C A\hat{R}_{i(t1,t2)} = \sum_{t=\tau_1}^{\tau_2} A\hat{R}_{it} \tag{4.3}$$

Further, the average cumulative abnormal return is calculated as follows:

$$CAA\hat{R}_{i(t1,t2)} = \frac{1}{N} \sum_{i=\tau_1}^{N} C A\hat{R}_{i(\tau_1 \tau_2)} \tag{4.4}$$

4.2.2 Testing significance

Next, we test whether the cumulative average abnormal return is significantly different form zero. We run two tests, one parametric test and one non-parametric test. The *Standardized cross-sectional test* and the *Generalized sign test*, respectively.

The parametric test assumes that the returns are normally distributed. Thus, an ordinary cross-sectional t-test can be used. This test require the returns to be drawn from the same distribution. However, there is a possibility that this restriction is violated for returns gathered from different firms (Patell, 1976). The Standardized test is frequently used in previous empirical studies. Boehmer et al. (1991) present The Standardized cross-sectional test which combines Patell's test using standardized abnormal returns and the cross-sectional method to test these returns. Due to high volatility in stock prices, it is appropriate to standardize the abnormal return to make sure that the null hypothesis is not wrongly rejected. Kolari and Pynnönen (2010) highlight that the standardized test is valid only if there is no cross-sectional correlations between the observations' return. The returns in the sample are related to the companies announcement date and the companies trade in 13 different countries. Thus, we assume that no correlation between the observations' return exist. Firstly, we found the standardized abnormal return as follows:

$$SA\hat{R}_{i,t} = \frac{A\hat{R}_{i,t}}{\hat{S}_{AR_{i,t}}} \tag{4.5}$$

where the standard error is calculated in the following way

$$\hat{S}^2_{AR_{i,t}} = \frac{1}{249} \sum_{t=\tau_1}^{\tau_2} (AR_{i,t} - \overline{AR_i})^2 \tag{4.6}$$

and the average abnormal returns determined by this formula

$$\overline{AR}_i = \frac{1}{251} \sum_{t=-253}^{-3} AR_{i,t} \tag{4.7}$$

Secondly, we use the calculated standardized abnormal returns to determine the t-statistic to test our null hypothesis, if cumulative average abnormal return is significantly different from zero. Hence, the null and alternative hypothesis to be tested are

$$H_0 : CAA\hat{R}_{\tau_1,\tau_2} = 0 \tag{4.8}$$

$$H_A : CAA\hat{R}_{\tau_1,\tau_2} \neq 0 \tag{4.9}$$

Finally, we found the t-statistic for CAAR

$$T^{CAR}{}_{T_1 T_2} = \frac{\sum_{t=\tau_1}^{\tau_2} SA\hat{R}_{i,t}}{\sqrt{\tau_1 - \tau_2 + 1}} \tag{4.10}$$

$$T^{CAAR}{}_{T_1 T_2} = \frac{1}{\sqrt{N}} \left(\frac{\sum_{i=1}^{N} T_i^{CAR}{}_{T_2 T_1}}{\sqrt{\frac{251-2}{251-4}}} \right) \tag{4.11}$$

The presented test statistics are tested with a t-test with N-1 degrees of freedom. This is in line with econometric theory (Wooldridge, 2014). Since the returns can be both positive and negative a two-sided test is applied.

To make the results more robust we also perform a non-parametric test not requiring the abnormal returns to be normally distributed. Fox (1978) argues that for stock prices the distribution if often fat-tailed. The portion of positive and negative returns are higher compared to what

is expected from a normal distribution. Therefore, the normal distribution restriction might be violated. Consistent with Fisher-Vanden and Thorburn (2011) we apply The generalized sign test by Cowan (1992). The test is based on the fraction of positive abnormal returns in the event period compared to what is expected under normal conditions. The expected fraction of abnormal returns are obtained from the 250 day estimation period.

$$\hat{p} = \frac{1}{N} \sum_{i=1}^{N} \frac{1}{251} \sum_{t=t_1}^{t_2} S_{i,t} \tag{4.12}$$

where S represent the positive or negative abnormal return as follows

$$S_i, t = 1, \quad A\hat{R}_{i,t} > \quad 0 \tag{4.13}$$

$$S_i, t = 0, \quad A\hat{R}_{i,t} \leqslant \quad 1 \tag{4.14}$$

To test whether the abnormal returns are statistically more positive in the event period we use the test statistic for the generalized sign test presented below. w is defined as the number of stocks with abnormal return larger than zero. N is the total number of companies in the sample.

$$Z = \frac{w - N\hat{p}}{\sqrt{N\hat{p}(1 - \hat{p})}} \tag{4.15}$$

The test is t-distributed with N-1 degrees of freedom.

4.3 Cross-sectional OLS

This section present the rationale for running a cross-sectional OLS on the CAR.

From theory, an OLS model is defined as a statistical method to analyze the estimated relationship between one or more independent variables and a dependent variable. The goal of the model is to minimize the total squared error of the difference between the estimated and observed observations (Wooldridge, 2014). We apply the most appropriate explanatory variables to create a good model that implies the relationships in the best way. To make sure the model applied is correct without misspecifications, heteroscedasticity e.i we conduct several tests, see appendix.

In our study, the OLS is performed to identify company heterogeneity explaining the variation in shareholders' reaction.

Chapter 5

Variables applied

In this chapter, we argue for the rationale behind the variables included in the analysis. To identify variables we have researched previous empirical studies and used economic reasoning in combination with our knowledge regarding financial theory and renewable energy. All variables are presented and summarized in table 5.1.

5.1   Threats of regulations

The Paris agreement is included to capture the effect of threats of environmental regulations discussed in section 2.2. Maxwell et al. (2000), Khanna (2001), Anton et al. (2004), Darnall et al. (2008) and Brouhle et al. (2009) find evidence that the threat of environmental regulations can make companies take proactive measures supported by shareholders. We believe that the Paris agreement can be perceived as such a threat because countries most likely have to incorporate stricter regulations, both in the public and private sector to reach the 2020 goal of emissions. As a result, shareholders might support voluntary environmental actions to proactively mitigate the risk of costly liabilities. Consequently, we expect that the Paris agreement will have a positive impact on the return when committing to RE100.

We have used the Paris agreement both to create sub-samples in the event study and as an explanatory dummy variable in the OLS. The sub-samples give us the opportunity to examine

the average effect of abnormal return for all companies joining before or after the agreement. While we use the dummy to control for firm specific effects for each individual firm. The dummy variable returns 0 if the company committed to the initiative before the Paris agreement and 1 if the commitment is made after. To create the dummy we found the signing date of the Paris agreement from the United Nation's homepage (United Nations, 2017) and compared it to the announcement date for each individual company.

5.2   Cross-border differences

Region is included to capture cross-border differences between Europe and the US. We observe that renewable energy is more available in Europe than in the US. Over 27% of the energy produced in Europe is renewable, in contrast only 12% in the US (Worldbank, 2016).

Further, the climate change issue has been approached in very different ways in the two regions. In contrast to the EU where over 500 directives (European Enviromental Agency, 2016), regulations and laws related to environmental issues have been passed, no major federal legislation on climate change has been passed in the US the last ten years. Moreover, the political philosophy on environmental issues are differing. The US believes in a voluntary system, while the EU is in favor of binding mitigation (Service and Erbach, 2015). Next, it is commonly known that there are more scepticism to global warming in the US. In addition to be the world's largest consumer of CO_2 (Worldbank, 2016), see graph (A.3) in the appendix, the US newly elected a President that is skeptical to the existence of climate change, President Donald Trump, stating that the US will withdraw from the Paris agreement. Taking this into consideration we assume that European shareholders would have a more positive view on voluntary commitments compared American.

The Region variable is included as a dummy in the OLS returning 1 if the company's headquarter is located in the US and 0 if it is located in Europe. Additionally, we have created two sub-samples one with US companies and one with European. In addition to the arguments above, the dummy and the sub-samples are motivated by findings in the descriptive analysis presented in chapter 6.

EPI, the Environmental Performance Index (EPI), is another variable included to control for differences between countries. The EPI ranks countries' environmental performance on two high-priority issues: protection of human health and protection of ecosystems (Yale, 2016). The index reaches from 0 to 100, where 0 implies low environmental performance, while 100 indicates high. In line with Region, the variable may capture the effect of differences between countries, especially differences in institutional pressure. Cañón-de Francia and Garcés-Ayerbe (2009) and Fisher-Vanden and Thorburn (2011) both identify strong institutional pressure as an important positive mediator for shareholders' reaction to voluntary commitments. We therefore expect the EPI score to have a positive effect on the share price under announcement. We extracted the EPI score for each company's country of origin from the *EPI database*.

5.3   Ownership structure

We include Governance to control for ownership structure. As discussed in section 2.1 a strong ownership structure will reduce CEO's opportunity to act against shareholders' interest. Thus, if managers in companies with strong governance engage in voluntary commitments it is likely that the shareholders' view the commitment as a value creating activity. This result in a more positive reaction on announcement of the commitment compared to companies with poor governance. To control for differences in ownership structure we use a dummy variable, taking the value 1 if the ownership concentration is higher than 10% and 0 if less. Thus, we expect the variable Governance to have a positive effect on stock price at announcement. We extracted the ownership structure from *Orbis*, the same year as announcement for each individual company.

5.4   Public interest

Press hits is included as a proxy to capture public interest and knowledge of environmental issues. As discussed in section 2.1, Orlitzky (2008) finds that committing to a voluntary initiative can enhance reputation. However, to gain reputation effects the society need to be informed that a company has made a voluntary commitment. Thus, we assume that high frequency of

press hits increase the information flow and have a positive effect on shareholders' reaction when committing to a voluntary environmental initiative. In line with Fisher-Vanden and Thorburn (2011), we created a proxy for press coverage searching *Factiva* for English published articles containing one of the following phases; *Renewable energy*, *RE100*, *The Climate group*, *Environmental impact* and *Environmental sustainability*. We acknowledge that English is not the first language in the European countries. Thus, the usage of only English articles may be misleading. However, we have observed that most press releases on companies' homepages exist in English, trusting that the press hits variable is still a good proxy. To capture the effect for every individual company we tailored the variable to each announcement date. Put differently, the frequency of press hits are gathered over a one year period, ending one month before announcement.

5.5 Growth

Market-to-book-ratio is a variable identifying growth. The variable is applied based on past studies finding that firms in a growth stage experience a larger drop in stock price when taking on voluntary commitments compared to firms with mature growth (Fisher-Vanden and Thorburn, 2011). The Market-to-book variable is extracted from *Datastream* 6 days before announcement, this is consistent with the study conducted by Fisher-Vanden and Thorburn (2011).

5.6 Time to reach 100% goal

The Announcement to 100% variable measures the number of years from announcement to when the members have decided to reach their goal for becoming 100% renewable on electricity. Fisher-Vanden and Thorburn (2011) detect a stronger negative reaction among shareholders when they announce a specific goal for the reduction in emissions. We assume that the closer to announcement the goal is set the more specific investors perceive the goal as it effects them to a greater extent. Consequently, we believe a more ambitious goal will affect the stock price more when committing to RE100.

We include a dummy variable to control for this effect taking the value of 1 if it is more than ten years to fulfillment or the goal is unannounced, and 0 otherwise. We apply a dummy because 12 companies in our sample have not announced their goal resulting in them being excluded by applying the absolute value. In other words, we infer that companies not announcing their goal will use more than 10 years to become 100% renewable on electricity. The choice of ten years is related to investor's forecasting period when conducting a valuation. Damodaran (2015) states that five to ten years is the most commonly used forecasting period in valuation[1]. Consequently, we assume that investors in companies with goal of fulfillment in less than ten years will value the potential cost of committing to RE100 to a greater extent.

5.7 Sector characteristics

Finally, we have included sector dummies to control for sectors with high versus low consumption of electricity. For instance, we expect companies in sectors where electricity is an important input factor, a variable cost, to have a larger reaction to a commitment on usage of 100% renewable electricity than a company in a sector where electricity primarily is a fix cost as light in the office i.e.. We have segmented sectors applying RE100's definitions of sectors.

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[1]Mainly focusing on discounted cash flow (DCF) valuation

Table 5.1: Summary of all explanatory variables used in the OLS

Variable	Name	Explanation
Environmental regulations	Paris agreement	Paris agreement is a dummy taking the value 1 if the company joined RE100 after the agreement and 0 if it joined before the agreement
Geography	Region	A dummy variable taking the value 1 if the company's headquarter is located in the USA and 0 if the headquarter is located in Europe
Ownership structure	Governance	A dummy variable taking the value 1 if the biggest ownership is above 10% and 0 if the largest ownership is below 10% , extracted from Orbis at year of announcement
Public interest	logPresshit	Presshits is found using Factiva in the time frame 2014-2017, log-Presshits is applied to remove large outliers
Growth	M/B ratio	Market-to-book ratio is used to detect growth, it is calculated as the ratio of the firm's current stock price to the firm's book value per share using numbers form Datastream six days before announcement
Environmental performance	EPI	EPI former ESI [2], is an Environmental Performance Index for countries conducted by Yale Univesity rating all countries on Environmental Health and Ecosystem Vitality, found on EPI website
Time to reach 100% goal	Announcement to 100% goal	Created by subtracting the year of the 100% goal from the year of announcement, all dates are found on the RE100 web page
Sectors	Sectors	Eight different sectors are applied, extracted from We mean business web page

Chapter 6

Descriptive analysis

In this chapter, we provide an descriptive overview of the applied explanatory variables and sample selection in the study. The first section 6.1 analyze the whole sample, and the second section 6.2 comment on the most interesting findings for US and European companies. We have chosen to show European and US companies in two different tables enabling us to show differences related to ownership structure and environmental focus.

6.1 Descriptive statistic for all companies

Table 6.1 presents maximum, mean, minimum, median and total for the explanatory variables applied in the analysis and interesting findings in the sample.

Table 6.1: Descriptive statistic of the variables for all companies

	Paris agreement	Region US/EU	Governance	Press hits*	M/B ratio	EPI	Ann.to 100%	Env.ini.
Max			75%	224,240	21.78	90.68	35	8
Mean			18%	213,013	3.59	85.70	6.70	1.47
Min			2%	203,459	-5.31	82.03	0	0
Median			10%	216,393	2.95	84.72	4	1
Total	31	38/29						94

*Press hits is calculated as the frequency of publications for 12 months ending one month before announcement

Almost half of the sample, 33 of 67 companies joined after the signing of the Paris agreement. US companies constitute 43% of the sample and European companies 57%, making the sample well suited for investigating cross-border differences applying the Region dummy. The Gover-

nance variable shows that there is large variation in the ownership structure, ranging from the largest investor owning 2% of the shares to 75%.

Figure 6.1 shows volume of press hits containing articles concerning either sustainability, renewable energy or global warming[1]. The figure shows that there is not much variation in press hits during the period, and therefore little variation in frequency between the announcement dates within the sample. The press hits are ranging from 224,240 at the highest compared to 203,459 at the lowest.

The Market-to-book ratio variable is a proxy for growth. It shows a large variation between companies, ranging from -5.31 to 21.78. The value of -5.31 represents a company with negative growth and 21.78 a company with high growth. The EPI on the other hand has low variation between countries in the sample, ranging from 82.03 to 90.68. Announcement to 100% goal range from 0 to over 30 years, and there are 12 companies that still have not announced the year the

The sample includes eight sectors[2] ranging from financial institutions to companies within the health care sector. The financial sector represents the largest sector with 20 companies. Further, information technology and consumer staples consists of 13 companies each. Energy, Real estate and Utilities are sectors included in RE100, but not in our sample due to excluding because of violation on the criteria presented in chapter 3.

Finally, Environmental initiatives range form 0 to 8, where 8 indicate that a company has committed to eight initiatives in addition to RE100. Due to large differences between the US and Europe we will discuss environmental initiatives further in the next section.

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[1]Words used for search in Factiva: *Renewable energy*, *RE100*, *The climate group*, *Environmental impact* and *Environmental sustainability*

[2]The sectors represented are; Consumer discretionary, Consumer staples, Financial, Health care, Industrial, Information technology, Materials and Telecommunication services
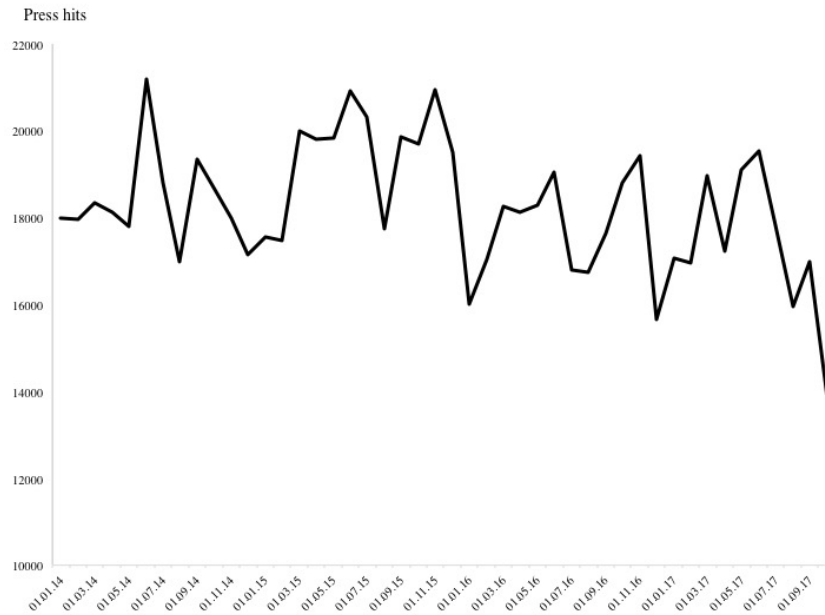
Figure 6.1: Frequency of press hits 2014-2017

6.2 Descriptive statistics divided into regions

Table 6.2 and table 6.3 presents maximum, mean, minimum, median and total for all explanatory variables applied for the two regions in the analysis

Table 6.2: Descriptive statistic of the variables for companies in the US

	Paris	Gov.	Press hits*	M/B ratio	EPI	Ann.to 100%	Env. ini.
Max		60%	224,240	14.62		35	6
Mean		12%	214,958	4.64	84.72	9.19	0.93
Min		3%	203,706	-5.31		0	0
Median		8%	218,084	4.41		4	0
Total	13		6,233,635				25

*Press hits is calculated as the frequency of publications for 12 months ending one month before announcement

Table 6.3: Descriptive statistic of the variables for companies in Europe

	Paris	Gov.	Press hits*	M/B ratio	EPI	Ann.to 100%	Env.ini.
Max		75%	221,198	21.78	90.68	33	8
Mean		23%	211,593	3.04	86.41	5.06	1.86
Min		2%	203,459	0.47	82.03	0	0
Median		12%	208,681	1.97	87.38	4	1
Total	18		7,828,950				69

*Press hits is calculated as the frequency of publications for 12 months ending one month before announcement

The full sample consist of 29 American and 38 European companies. Interestingly, there are substantial differences between the American and European companies. First, the Governance variable has large differences, Europe has a mean of 23% while the US's mean is 13%, ten percentage points lower compared to Europe. This is in line with other studies finding that European companies more traditionally have stronger governance (Porter, 1992). Second, the EPI score has a higher average for European countries implying that Europe perform better than the US on environmental issues. Third, there are large variation in the number of voluntary environmental initiatives companies in the US and Europe are committed to. European companies are committed to almost twice as many voluntary commitment than the US, respectively 1.86 and 0.93. Moreover, there are little differences in number of companies joining RE100 before and after Paris agreement between the two regions, respectively 13 in the US and 18 in Europe.

The descriptive analysis identify variation in the sample selection and explanatory variables. This makes the sample well suited for further analysis in sub-samples and cross-sectional OLS analysis. For more details on each individual company see appendix A.

Chapter 7

Results

This chapter presents the results from the event study and the cross-sectional OLS. We highlight our findings and focus mainly on significant variables and key results of the analysis. Other control variables applied are also discussed but with less emphasis. Further, we interpret our findings in the light of the results in previous literature, presenting similarities and differences. First, we start by refreshing our research questions in section 7.1. Then, section 7.2 presents the findings in the event study. Finally, in section 7.3 we present and discuss the OLS results.

7.1   Research questions investigated

The statistical results presented in this section is the output of the final model and the result from exploring different specifications. A large number of sub-samples have been tested for the event study and we present the most interesting ones. Similarly, for the OLS we have tested a large variation of explanatory variables and performed robustness tests to arrive at a final model configuration. These tests are detailed in the appendix.

Recall, we investigate the following research questions;

Research question 1: Do investors on average view the commitment to the RE100-initiative as having a positive, negative or neutral effect on the value of the company?

Research question 2: Can firm fixed effects explain the abnormal return?

Research question 1	**Null hypothesis:** Engagement in the RE100-initiative is **not** perceived as *increasing* or *decreasing* the financial value of the company by the shareholders
	Alternative hypothesis: Engagement in the RE100-initiative is perceived as *increasing* or *decreasing* the financial value of the company by the shareholders
Research question 2	**Null hypothesis:** Firm fixed effects do **not** affect the abnormal return
	Alternative hypothesis: Firm fixed effects affect the abnormal return

We examine research question 1 by testing the two-sided null hypothesis against the alternative hypothesis presented below. The cumulative average abnormal return is tested using the full sample in addition to four sub-samples; commitment before and after the signing of the Paris agreement and USA versus Europe. We then review research question 2 by running a cross-sectional OLS to test for firm specific effects, we apply the variables presented in chapter 5.

7.2 Result and discussion of the event study

This section presents the results of the event study for the full sample and four sub-samples. The four sub-samples presented are, the two regions; USA and Europe and engagement before and after the Paris agreement.

7.2.1 Cumulative average abnormal return for the full sample

Table 7.1 show cumulative average abnormal return for event window [0,1], [-1,1] and [-2,2]. The study identifies no significant reaction to the announcement of membership in RE100 on average. Put differently, the shareholders are not found to perceive the commitment to RE100 as neither positive nor negative on average. Both the Patell and the generalized sign test show no significance. This is further confirmed when looking at the ratio of positive to negative observations. As a result, we cannot reject the null hypothesis under research question 1. i.e.

we cannot conclude that shareholders perceive commitment to RE100 to increase or decrease the future profitability of the firm.

Two main factors can contribute to this result. First, investors may simply not view the commitment as either positive or negative. This diverges from two other event studies on voluntary environmental initiatives done by Fisher-Vanden and Thorburn (2011) and Cañón-de Francia and Garcés-Ayerbe (2009), finding evidence that there is a negative relationship between ECP and CFP. Although these studies employ different initiatives, samples and time periods, the change in conclusion may indicate that shareholders' perception of the return on environmental investments have changed since the above research was published.

Second, investors' reaction to initiatives with hard-to-measure environmental commitments can be hard to detect (Fisher-Vanden and Thorburn, 2011). RE100 does require each company to state their targeted year for when their electricity consumption becomes 100% renewable. However, the actual cost of reaching the commitment in the long run may be hard to assess. To reach the goal, companies are constrained to either use self-produced electricity or source it from the market by purchasing PPAs or stand-alone energy attribute certificates. To find the cost of the commitment investors need to estimate the premium between renewable electricity and electricity generated from fossil fuels. In addition, investors must estimate what potential benefit the company can gain from committing to RE100, as improved reputation and FMA and so on. Thus, the goal might not be as measurable as it seems making the investors' reaction hard to quantify

Table 7.1: Estimated abnormal average return, full sample (N=67)

Event window	CAAR (%)	Standardized Patell test	Generalizes sign test	Ratio of positive to negative CAAR
(0,1)	0.0013	0.1689	-0.1986	32:35
(-1,1)	0.0021	0.1457	0.2902	34:33
(-2,2)	-0.0009	-0.0826	1.0233	37:30

*p-value<0.1 **p-value<0.05 ***p-value<0.01

Due to insignificant results there are no clear conclusion or explanation to be drawn from investigating the full sample. Therefore to provide further insight, we have investigated four sub-samples.

7.2.2 Cumulative abnormal return for the sub-samples

In the following, we present the results for the four sub-samples introduced in chapter 5. These are divided by companies joining the initiative before and after the signing of the Paris agreement, and by geography, companies based in the US versus Europa, and by time period. The same event windows are applied for the sub-samples as for the full sample.

Cumulative abnormal return on companies joining before and after the signing of the Paris agreement

As argued in section 5.1, the Paris agreement might motivate governments to incorporate more regulations. Thus, the agreement presents a potential threat of regulations that in previous studies are found to have a positive impact on environmental initiatives' effect on financial performance (Maxwell et al., 2000), (Khanna, 2001), (Anton et al., 2004), (Darnall et al., 2008), (Brouhle et al., 2009). By preforming a sub-sectional analysis on companies joining RE100 before and after the Paris agreement we aim to investigate if threats of regulations affect the investors perception of the RE100-initiative.

The sub-samples' CAARs are presented in table 7.2 and 7.3. As for the full sample, the cumulative average abnormal return is indistinguishable from zero in all event windows, with the exception of event window [-2,2] for companies joining the initiative after the Paris agreement. The generalized sign test identify a positive significant effect at the 5% level. However, since the Patell test is insignificant and the sign test only identifies significance in the largest event window we cannot conclude that companies signing after the Paris agreement have returns significantly different form zero. Thus, the overall conclusion is that shareholders do not have a different perception of an engagement in RE100 after the signing of the Paris agreement.

Table 7.2: Estimated abnormal average return, before the Paris agreement (N=34)

Event window	CAAR (%)	Standardized Patell test	Generalizes sign test	Ratio of positive to negative CAAR
(0,1)	-0.0050	0.1476	-1.2790	14:20
(-1,1)	-0.0013	-0.1174	-0.5543	16:18
(-2,2)	-0.0072	-0.3494	-0.9167	15:19

*p-value<0.1 **p-value<0.05 ***p-value<0.01

Table 7.3: Estimated abnormal average return, after the Paris agreement (N=33)

Event window	CAAR (%)	Standardized Patell test	Generalizes sign test	Ratio of positive to negative CAAR
(0,1)	0.0037	0.1689	1.1358	19:14
(-1,1)	0.0071	0.1457	1.1358	19:14
(-2,2)	0.0076	-0.0826	2.5299**	23:10

*p-value<0.1 **p-value<0.05 ***p-value<0.01

Cumulative abnormal return American and European companies

The geographical sub-samples are as discussed in chapter 5 motivated by differences in the political philosophy on environmental issues. Additionally we identified considerable differences between European and American companies in the descriptive analysis in chapter 6.

Table 7.4: Estimated abnormal return on US companies, (N=29)

Event window	CAAR (%)	Standardized Patell test	Generalizes sign test	Ratio of positive to negative CAAR
(0,1)	0.0019	0.1476	0.5208	16:13
(-1,1)	0.0062	-0.1175	1.2636	18:11
(-2,2)	0.0061	-0.3494	2.0064**	20:9

*p-value<0.1 **p-value<0.05 ***p-value<0.01

Table 7.5: Estimated abnormal return on European companies, (N=38)

Event window	CAAR (%)	Standardized Patell test	Generalizes sign test	Ratio of positive to negative CAAR
(0,1)	-0.0031	0.1689	-0.5430	17:21
(-1,1)	-0.0002	0.1457	-0.5430	17:21
(-2,2)	-0.0052	-0.0826	-0.2185	18:20

*p-value<0.1 **p-value<0.05 ***p-value<0.01

Tables 7.4 and 7.5 present the results for each sub-sample. The generalized sign test shows a positive significant result at 5% in event window [-2,2] for the US sub-sample. This is contradicting our initial hypothesis that European companies would have a more positive reaction than US companies to a commitment to a voluntary environmental initiative. However, since the result is detected only in the largest event window[1], and the Patell test does not have any

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[1] A long event window might reduce the power of the test´s because there can be confounding effects (McWilliams and Siegel, 2001)

significant results, we cannot reject the null hypothesis that being a member in RE100 will increase or decrease the financial value of a company located in the US or in Europe.

To summarize, we do not find evidence that the RE100-initiative affects the stock price at announcement. The average cumulative abnormal return is not found significantly different from zero for either the full-sample or any of the sub-samples. Our results differ from comparable previous studies conducted by Fisher-Vanden and Thorburn (2011) and Cañón-de Francia and Garcés-Ayerbe (2009), finding evidence for a negative relationship between CFP and ECP. This may be because shareholders have converged towards being less negative to voluntary environmental initiatives. However, we also speculate that this might be because investors are not able to assess what a membership in RE100 implies in terms of costs for the company.

7.3   Result and discussion of the cross-sectional OLS

This section presents the most interesting findings from the regression analysis. The analysis are performed with CAR [-1,1] as the dependent variable. All significant variables will be discussed, as well as findings highlighted in previous studies differing from our results. First we present the results and discuss the effects of each explanatory variable in sections 7.3.1,7.3.2, 7.3.3 and 7.3.4.

The results of regressions with different variables are presented in table 7.6. Column (1) includes the Paris agreement and Region. Further, in column (2) Governance is included. In column (3) to (5) we perform the regression with the remaining variables one by one. In column (6) all variables are included. Finally, we add the sector dummies to the regression in column (7).

As shown in table 7.6 both Governance and Region is found significant and marginal significant at respectively 5% and 10% level. Further, the Paris agreement is found significant in the first regression. We will therefore discuss this three variables in detail.

Table 7.6: Result of cross-sectional OLS

Explanatory variables	1	2	3	4	5	6	7
Paris agreement	0.0103**	0.00546	0.00638	0.00678	0.00684	0.00442	0.00282
	(2.07)	(0.92)	(1.36)	(1.44)	(1.44)	(0.72)	(0.44)
Region	0.00471	0.00872*	0.00852*	0.00858*	0.00810*	0.0107**	0.0105*
	(0.96)	(1.75)	(1.90)	(1.73)	(1.72)	(2.15)	(1.74)
Gov		0.0134***	0.0132***	0.0126***	0.0128***	0.0132**	0.0140**
		(2.76)	(2.82)	(2.87)	(2.67)	(2.59)	(2.29)
log Presshits		-0.0394				-0.0494	-0.0555
		(-0.39)				(-0.45)	(-0.46)
MB ratio			-0.000423			-0.000509	-0.000867
			(-0.68)			(-0.76)	(-0.91)
EPI				0.000518		0.000562	0.00116
				(0.41)		(0.42)	(0.85)
Announcement to 100%					-0.00116	-0.00143	-0.00386
					(-0.24)	(-0.30)	(-0.66)
Constant term	-0.0050	0.4728	-0.0095*	-0.0555	-0.0105*	0.5498	0.5735
	(-1.21)	(0.38)	(-1.82)	(-0.51)	(-1.91)	(0.40)	0.38
Sector dummies	No	No	No	No	No	No	Yes
N	67	67	67	67	67	67	67
adj. R2	0.049	0.113	0.116	0.113	0.111	0.080	0.012
F	2.917	3.540	3.538	3.493	3.881	2.366	3.675

*p-value<0.1 **p-value<0.05 ***p-value<0.01 White's correction of standard errors, t-values i parentheses

7.3.1 Paris agreement

Firstly, the Paris agreement is found significantly positive at a 5% level in regression (1) in table 7.6. This suggests that companies joining after the signing of the agreement experienced a higher increase in stock price at announcement, ceteris paribus. This result is consistent with our assumptions presented in chapter 5 and can be explained by the fact that the Paris agreement might motivate incorporation of more regulations. However, when controlling for additional explanatory variables in regression (2) to (7) the Paris agreement loses its significance and we cannot conclude that the Paris agreement have explanatory power on the relationship between environmental performance and financial performance. Nevertheless, when excluding the Paris agreement variable the adjusted R-square decreases, and Governance and Region receives a higher explanatory power. This implies that omitting the Paris agreement may introduce an omitted variable problem.

7.3.2 Region

The Region dummy is included to capture cross-border differences between Europe and the US. Our initial hypothesis was that investors in companies based in Europe would perceive the RE100-initiative as more positive than US investors. However, the regression analysis surprisingly shows the opposite result. Region is positively significant indicating that all else equal shareholders in American companies has an 0.47% to 1.07% higher abnormal return compared to European companies. To better understand this finding we researched theory, other empirical studies and descriptive findings in our sample.

The FMA is the advantage gained from being the first to bring a product or strategy to the market. Lieberman and Montgomery (1998) advocate that being a pioneer can give you advantages over competitors. In line with observations from our analysis in chapter 6 it looks like voluntary environmental activities are more common in European companies than in US companies. This is further confirmed by Tschopp (2005) that examines differences between European and US legislation and voluntary commitments to CSR and ECR. To exemplify, he finds that of the companies following the ISO 14001 reporting standard 5% are US companies and 43% are from the EU. Additionally, he detects that only 1% of the facilities certified by SA 8000[2] are from the US, compared to 23% in the EU. Seen together, we believe that this gives some evidence that social and environmental initiatives is more common in Europe than in the US. When firms preform common activities they will no longer have the advantage related to being a first mover. Hence, one might argue that some of the advantages companies could gain from being a first mover on environmental issues in Europe have been played out. In contrast, this does not apply in the US and can, if true, give some explanation to why US companies experience higher return on stock price at announcement.

Another theory, presented in the literature survey by Orlitzky (2008) present reputation as a mediator for positive return from environmental activities. It can be argued that when environmental activity is expected it might provoke a smaller up-side when taking action, like engaging in RE100. For European companies it is reasonable to assume that the engagement might be more expected because of the focus on the environment, while for US companies sharehold-

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[2]A certification standard, modeled on ISO standards, encouraging organizations to develop, maintain, and apply socially acceptable practices in the workplace

ers do not expect environmental action to the same degree. Thus, US companies are able to gain better reputation and better financial results by committing to 100% renewable electricity consumption.

A final explanation can be that many of the companies operate both in the US and Europe making it difficult to isolate the effect of cross-border differences. For example some of the regulations in Europe might also affect American companies operating in Europe and vice versa.

7.3.3 Governance

In line with previous studies (Fisher-Vanden and Thorburn, 2011) Governance is highly significant at a 1% level. Interpreting the beta coefficient, companies with strong governance are estimated to have a 1.26% to 1.40% higher CAR than firms with poor governance when committing to the RE100-initiative.

A possible interpretation for Governance being positively significant is that strong governance reduces the principal-agent problem presented in section 2.1. Put differently, when investors have strong shareholder rights they have considerable influence on the CEO's decisions. On the other hand, with a more fragmented ownership structure guidelines for shareholders might be ambiguous and contradictive providing the CEO with the opportunity to promote their own career rather than taking care of shareholders' interests. Thus, with strong governance the CEO is more likely to act in the shareholders' best interests resulting in a positive reaction from shareholders on the decisions made.

Further, Governance becomes more significant when including the variable Region. This indicates that there might be correlation between these two variables which is confirmed in the correlation matrix, see A.2. Testing the effect of strong governance given the region we include an interaction term, Governance x Region. The variable is found insignificant. Hence, the effect of strong governance do not differ for companies operating in the United States and Europe. Additionally, both variables are tested for multicollinearity, from the result this does not appear to be an issue, see appendix A.1.2.

7.3.4 Insignificant explanatory variables

The logarithm of the number of Press hits is not significant. This is in contrast to Fisher-Vanden and Thorburn (2011) who find a positive significant effect, indicating that higher public attention concerning the climate might cause shareholders to react less negative to the announcement of commitment. A possible explanation for why log Press hits is not significant is the small variation in the frequency of press hits detected in chapter 6. In addition, the lack of significance could be caused by the high correlation between logPresshits and the Paris agreement (Table A.2), affecting the estimated values of logPresshits. To control for this, we included an interaction term, Paris x logPresshits, to test whether Press hits has higher effect for companies joining RE100 after the initiation of the Paris agreement. Hence, the effect of logPresshits do not differ for companies joining after or before the Paris agreement.

Column (3) to (6) include MBratio, EPI and Announcement to 100% goal one by one to test their explanatory power. MBratio is found to have significant explanatory power in past studies due to shareholders perceiving it as more costly for high growth companies to engage in voluntary environmental initiatives (Fisher-Vanden and Thorburn, 2011). Nevertheless, MBratio is not found significant in our analysis indicating that differences in growth cannot explain variation in abnormal return for companies joining RE100. Further, EPI is included to capture the focus on environmental issues in the country where the company's headquarter is located, reflecting cultural differences towards climate change in the given society. However, the variable is not found significant. This might be a result of the sample consisting of large international firms with global investors not necessarily located in the same country as the headquarters which in turn contaminates the cross-border effects. Next, in line with the other variables we find the Announcement to 100% goal insignificant. This indicates that we cannot observe a difference in reaction between companies with the most ambitious goals and companies with more diffuse and long-term goals. Finally, we control for sectors to investigate if high-polluting industries have stronger reactions to RE100-commitment. However, from the regression analysis in column (7) there is no indication that this has an effect on the variation in CAR.

7.3.5 Results summarized

To summarize, there is evidence that two variables have explanatory power, Governance and Region. First, by having strong Governance shareholders perceive the commitment to RE100 as more positive compared to companies with poor Governance i.e. Second, the Region variable indicates that shareholders in American companies are more positive to the engagement in RE100 compared to shareholders in European firms.

Chapter 8

Robustness checks

In this chapter, we elaborate on the robustness of the study addressing misspecification, omitted variables, multicollinearity and homoscedasticity. Further, we run a robustness check on our event study model.

8.1   Assessment of robustness

In this section, we assess the robustness of our analysis. We focus on misspecification of the model, multicollinearity among the independent variables, test the validity of the error term assumptions and test whether our model is capable of isolating the effect of the event.

Correct model specifications are critical to conduct a correct analysis. Through economic reasoning and evaluation of previous studies, we found several potential explanatory variables. However, when running the model including different compositions of these variables, we detected overspecification of the model. For instance, when incorporating the variable Renewable before[1] the adjusted R-square became negative indicating that this variable does not help to explain the variation in CAR. Further, this imply that there are too many explanatory variables relative to the number of observations. Inclusion of MV of equity lead to the same result. Consequently, these variables where excluded. There is a possibility that this would not be a

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[1]A dummy returning 1 if the company was renewable before committing and 0 otherwise

problem with more observations. We consider the sample size when assessing limitations in section 9.1.1.

Further, omitted variables are a source of model misspecifications. This is hard to detect and one can never be entirely sure that no variables are omitted. The Ovtest performed in the appendix indicates this is not a problem. Additionally, by running the regressions several times with different specifications we believe that our final regressions do not suffer from underspecification. For tests and further details see appendix section A.1.1.

Multicollinearity among the explanatory variables can interfere with the robustness of our results. The VIF test does not reveal multicollinearity for any of the explanatory variables, see appendix section A.1.2. Nevertheless, analyzing the correlation matrix, we observe high correlation among some of the variables. First, Region and Governance have a correlation coefficient of -0.275 and both variables are found significant. Additionally, Region becomes more significant when Governance is included. Regardless of this, the VIF test returns values well below 10 for both variables. As a result, we include both variables. Second, logPresshits correlate substantially with all variables except Region. The highest correlation of 0.503 is found between logPresshits and the Paris agreement. This is expected from the definition of the variables as we assume that the press coverage related to renewable energy increased during the signing of the Paris agreement. Running the model including and excluding both variables this high correlation do not appear to be an issue. To conclude, in our final regressions multicollinearity is not perceived as a problem with the highest VIF value of 1.95[2].

Constant variance and normal distribution of the residuals is crucial for a robust model. Firstly, because the dependent variable is CAR, we apply White's correction of standard errors to allow the fitting of a model containing heteroscedastic standard errors. Thus, the potential problem of heteroscedasticity should be removed. Further, inspecting the residual plots from the performed regressions there is no indication of heteroscedasticity in model (2)-(7). For model (1) the plot is not randomly distributed. However, few variables are included in this regression and analyzing the result of the Breusch-Pagan/Cook-Weisberg test there is no reason to believe heteroscedasticity is a problem. Finally, the normality assumption appear to fulfilled, see appendix section A.1.4.

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[2]For Region in regression (7)

We run a robustness check to test whether our model applied is capable of isolating the effect of committing to the RE100-initiative. Put differently, we test whether our model is affected by other factors in the event window. In our sample ten companies had reached the goal of being 100% renewable on electricity before committing. Investors in these companies should not have a reaction to the announcement of the commitment to RE100, because future cash flows is not affected by the commitment. Hence, we expect an event study performed on these companies to return a CAAR insignificantly different from zero. On the other hand, if there is an reaction from the shareholders this implies that there might be other external or internal factors affecting the stock price in the event window. Performing the Patell and generalized sign test the results are as we expected, indistinguishable from zero see table 8.1.

Table 8.1: Estimated abnormal return, renewable before joining (N=10)

Event window	CAAR (%)	Standardized Patell test	Generalizes sign test	Ratio of positive to negative CAAR
(0,1)	-0.0002	0.0169	0.3767	6:4
(-1,1)	0.0025	1.0323	-0.2579	5:5
(-2,2)	0.0019	0.9116	1.0112	7:3

*p-value<0.1 **p-value<0.05 ***p-value<0.01

Chapter 9

Conclusion

In this chapter, we conclude on our analysis. Further, we discuss the most important limitations to our study and suggestions for further analysis.

9.1   Concluding remarks

This thesis sought to expand our understanding of the financial effect of being green. Previous studies produce inconsistent results, indicating that this is an important topic to investigate further. Narrowing the topic, we focus on the RE100-initiative analyzing the share price reaction at announcement date for 67 companies. We investigate two research questions testing whether shareholders perceive engagement in the RE100 initiative as *increasing* or *decreasing* the financial value of the company. To test our research questions we conduct an event study evaluating the cumulative average abnormal return, and a cross-sectional OLS investigating how firm specific factors affected the cumulative abnormal return for the companies in our sample.

Our main finding is that the announcement of the RE100-initiative has on average no effect on the share price. In other words, shareholders do not perceive the engagement as neither positive nor negative. Nevertheless, the OLS reveals two factors affecting shareholders' reaction; ownership structure and location of the company's headquarter. Firstly, strong governance, defined as the largest shareholder holding more than 10% of the shares, is associated with a positive

effect on the stock price at announcement. Put differently, when the shareholders' and CEO's incentives are in line, the engagement has a positive effect. Secondly, companies located in the United States tend to experience a more positive return compared to European companies. We find that Europe is more focused on environmental issues and the transformation to use of renewable energy. Thus, a possible interpretation of our finding is related to the first mover advantage. Shareholders might expect European companies in a greater degree to act more climate friendly than US companies reducing the surprise element of a RE100 commitment. Further, the benefit of being a first mover might be lower in Europe, while this is something American companies still can be able to gain from.

The latter findings imply that there are some firm heterogeneity positively affecting shareholders' reaction. However, the over all conclusion is that shareholders on average neither perceives engagement in RE100 as positive nor negative.

9.1.1 Limitations

In the following we discuss the most critical limitations of our study. These are mainly related to the limited availability of relevant data and the concreteness of the goals in the RE100-initiative.

Time period

Because RE100-initiative is fairly new, most of the limitations are due to a short time period. This affects both the size of the sample and the variables controlled for in the OLS-analysis. As of October 2017, 111 companies have joined the commitment. We believe that more companies will join the initiative in the coming years as it is gaining more attention. As a result, we expect the sample to become larger and more diversified both in geography, size and locations of companies, making it easier to identify explanations for abnormal return from committing to RE100 in the future.

We find that some of the applied variables in our analysis might have increased explanatory power with a longer time period. To exemplify, the frequency of press hits had much higher variation in the time period from 2007 to 2017 than from 2014 to 2017. Further, the EPI

has limited variation due to companies mostly being located in rich and developed countries with relative high focus on environmental issues. As firms from more countries with different cultures and economies join the initiative over time, the EPI variable could measure cross-border differences to a greater extent. Similarly to the EPI variable, the variable Region could be expanded to focus on deeper cross-border differences, not only differences between Europe and the US, but also other regions or individual countries.

More importantly, a larger sample size can make it possible to better control for several effects and differences between sectors. This is because we often find the sample to have fewer observation than the number of explanatory variables we would like to control for, resulting in a low adj. R-square. This is especially evident when we control for sector variables, where some sectors only have five observations causing the model to have low explanatory power.

Measurable and concrete goals

Finally, as discussed in section 7.2.1 the committed goal for the companies joining RE100 might not be specific and measurable enough for investors to react. Fisher-Vanden and Thorburn (2011) identify that initiatives with less concrete goals make it difficult for investors to assess the consequence of the commitment on company value. Therefore, the stock market's reaction to the announcement may be limited. We tested this hypothesis by excluding the 12 companies not announcing their goal, believing that these companies contributed to the overall insignificant result. However, the results remain insignificant. Consequently, investors might not be able to assess the consequences of the commitment as well as first thought.

9.1.2   Further analysis

We believe that it would be interesting to investigate the RE100-initiative in the future both due to the initiative's longer time of existent, but also because of some interesting up-coming events.

First, EU has decided that all large companies have to report on non-financial performance by 2018 (European Union, 2014), this will probably affect the focus on non-financial activities and therefor also the focus on RE100. Second, the goals agreed on during the Paris agreement is set

to be reached by 2020. In order to achieve this, countries would have to accelerate their efforts and focus on renewable energy. Third, Donald Trump, the President of the United States, may slow down the positive development within renewable energy and other important environmental initiatives.

In addition to these events, the market for renewable energy will develop and interesting variables can be added to the analysis. To exemplify we wanted to include a variable reflecting the costs connected to becoming 100% on electricity use compared to using fossil fuels. We tried to detect such a premium using *Guarantees of Orgin* (GoOs), dividing the price of a GoOs with the electricity price of MWh to create a premium. Unfortunately, GoOs do not trade in an effective market place at the moment making it hard to retrieve prices. Further, we thought that the premium of buying green bonds could be used as a proxy. However, the traded volume of this instrument is limited in the years of our sample. As both the market place for GoOs and green bonds develop an improved analysis including the premium can be conducted.

Finally, our result differ from earlier studies that find a negative effect on company value when committing to a voluntary environmental commitment. Thus, it would be interesting to see if our result persist and if there actually is a shift towards a neutral perception of voluntary environmental commitments among investors.

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Appendix A

Appendix

A.1 OLS assumptions and critics

The cross-sectional OLS analysis estimate parameters in an underlying population model. To best describe the true regression model The Gauss-Markov assumptions plus the assumption for normally distributed error terms must be fulfilled (Wooldridge, 2014). These are called the classical linear model (CLM) assumptions. The six are; (1) Linear in parameters, (2) Random sampling, (3) No perfect collinearity, (4) Zero conditional mean, (5) Homoscedasticity. Under assumption (1) through (5) the predicted variables are the best linear unbiased estimators (BLUEs) of the population parameters. By being "best" these estimators are defined as having the smallest variance. Finally, the last and strictest assumption is the normality assumption (6). In this section, we will elaborate on the assumptions most relevant for our model.

A.1.1 Model specifications

Misspecification can result in unbiasedness of the OLS model. Sources of misspecification are use of wrong functional relationship, including irrelevant variables and excluding relevant variables. We will focus on the two later cases, overspecifying and underspecifying the model. First, including variables without explanatory effect does not create unbiasedness, but it has an

undesirable effect on the variation on the estimator. Thus, this is a source of misspecification. Second, if a variable with explanatory power is correlated with variables applied in the the regression, assumption (4) is violated and the error term will not have an expected value of zero. To test whether important variables are omitted we run an *Ovtest* assessing the null hypothesis; The model has no omitted variables. For the Ovtest all regressions show p-values well above 0.05 and we can not reject the null hypothesis. Thus, the test implies that the model has no omitted variables. Additionally, we run a *Link test* for misspesification to examine whether the model is specified correctly. Testing the null hypothesis; The model is specified correctly. Rejection indicates existence of misspesification. For the Link test all regressions return a p-value well above 0.05, the null cannot be rejected. Consequently, we cannot conclude that the model is misspecified. The results from the two tests are presented in the table below.

Table A.1: Ovtest for testing omitted variable problem and Link test for misspesification

Test	1	2	3	4	5	6	7
Ovtest F-statistic	2.34	0.63	0.05	0.23	0.74	0.001	0.42
	(0.1308)	(0.6013)	(0.9840)	(0.8743)	(0.5342)	(0.9980)	(0.7394)
Linktest Hat-square	-156.11	-16.04	-7.69	1.69	-13.91	-3.98	-8.68
	(-1.54)	(-0.53)	(-0.24)	(0.05)	(-0.44)	(-0.13)	(-0.47)

P-value in parenthesis

Testes in Sata/IC 15.0

A.1.2   VIF test for multicollinearity

In the case of multicollinearity high correlation between two or more independent variables exists. This is not a violation of the Gauss-Markov assumption (3) where the variables have to be perfectly correlated. However, by including non-correlated variables the model will be improved. To detect multicollinearity we use *Variance Inflation Factors* (VIF), which quantify how much of the variance in the model that is inflated due to correlation between two or more variables. In the table below the VIF and 1/VIF is presented. A VIF value higher than 10 and 1/VIF less than 0.1 indicate multicollinearity. Observing the results from the VIF test the highest value is 1.95 and there is therefore no indication of multicollinearity in the regressions.

Table A.2: VIF test for multicollinearity

Test	1	2	3	4	5	6	7
Paris agreement	1.00	1.56	1.10	1.08	1.08	1.64	1.82
	(0.99)	(0.64)	(0.91)	(0.92)	(0.92)	(0.61)	(0.55)
Region	1.00	1.23	1.11	1.17	1.11	1.45	1.95
	(0.99)	(0.81)	(0.90)	(0.85)	(0.90)	(0.69)	(0.51)
Governance		1.19	1.14	1.17	1.17	1.25	1.40
		(0.84)	(0.87)	(0.85)	(0.85)	(0.80)	(0.71)
logPresshits		1.55				1.61	1.72
		(0.64)				(0.62)	(0.58)
MBratio			1.05			1.09	1.68
			(0.95)			(0.91)	(0.59)
EPI				1.16		1.18	1.51
				(0.86)		(0.84)	(0.66)
Ann. to 100%					1.09	1.11	1.59
					(0.92)	(0.90)	(0.62)
Sector dummies							< 10
							(< 0.1)
Mean VIF	1.00	1.39	1.10	1.14	1.12	1.33	2.41

1/VIF presented in parenthesis

Testes in Sata/IC 15.0

A.1.3 Homoscedasticity

For assumption (5) to hold the error term must have the same variance given any of the explanatory variables. In cases where this assumption fails, there is a case of heteroscedasticity. We perform a *Breusch-Pagan/Cook-Weisberg test* to assure that our models have uncorrelated error terms. We test the null hypothesis; Constant variance. From our results, there is no reason to believe that heteroskedatisity is an issue in our models. Additionally, the residuals are plotted against fitted values to visually inspect whether heteroskedatisity is a problem. For regression (1) the residuals seem to follow a pattern indicating non-constant variance. However, few variables are included in this regression and analyzing the result of the Breusch-Pagan/Cook-Weisberg test there is no reason to believe heteroscedasticity is a problem.

Table A.3: Breusch-Pagan/Cook-Weisberg test for heteroskedatisityTest

Test	1	2	3	4	5	6	7
SW test stat.	0.35	0.64	0.66	0.61	0.46	0.35	0.24
	(0.5520)	(0.4235)	(0.4153)	(0.4340)	(0.4963)	(0.5530)	(0.6214)

P-value in parenthesis

Testes in Sata/IC 15.0

A.1.4 Normality of errors

Normally distributed error terms is the last of the CLM assumptions. To perform statistical inference the distribution of the sample must be known, and the distribution of the sample depend on the distribution of the errors (Wooldridge, 2014). To test the normality condition we perform a *Sharpio-Wilk normality test*, where the null hypothesis is; The error term is normally distributed. We cannot reject the null hypothesis. Consequently, there is no reason to assume that our models not have normally distributed errors.

Table A.4: Test for normality of errors

Test	1	2	3	4	5	6	7
SW test stat.	0.986	0.979	0.979	0.981	0.979	0.986	0.986
	(0.692)	(0.300)	(0.349)	(0.379)	(0.319)	(0.646)	(0.661)

P-value in parenthesis

Testes in Sata/IC 15.0
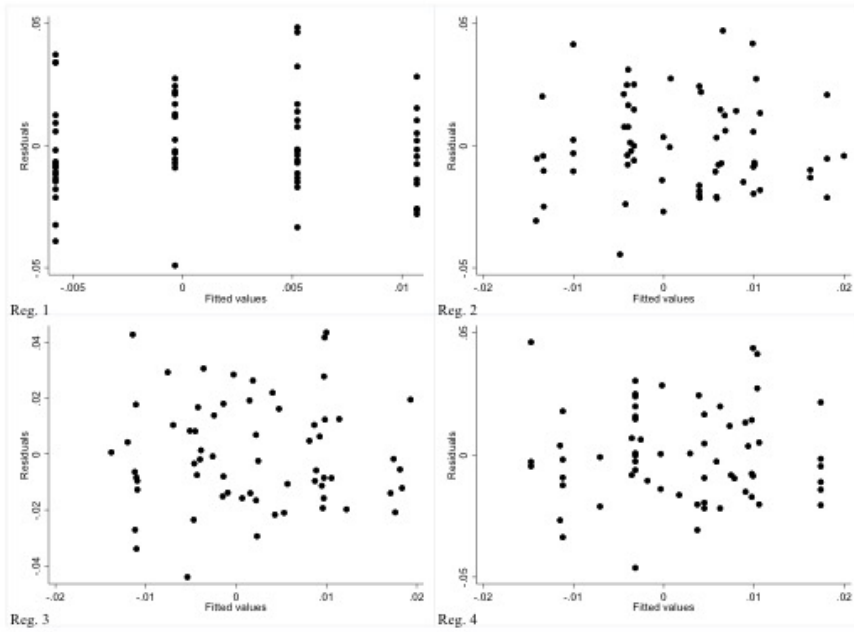
Figure A.1: Residual plot regression 1-4
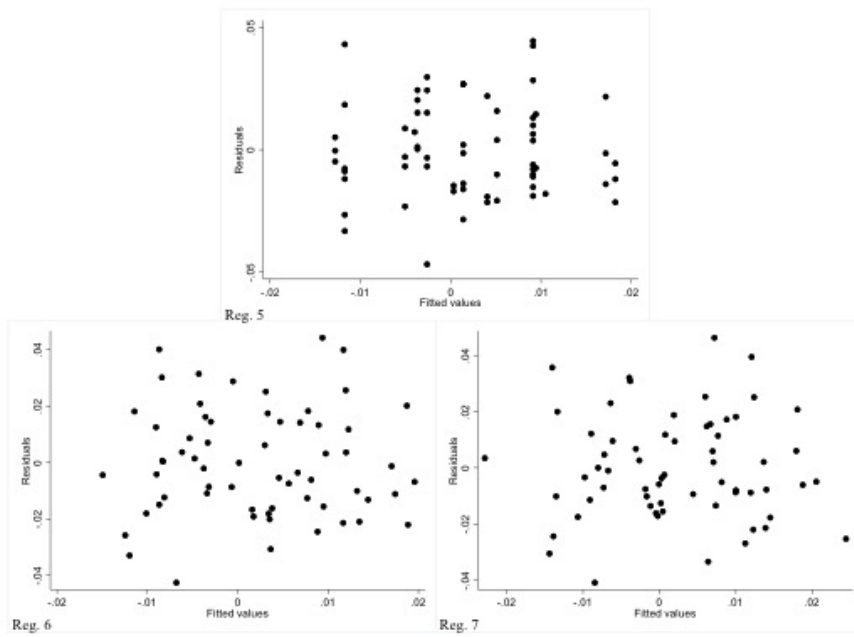
Figure A.2: Residual plot regression 5-7

A.2 Correlation matrix

The table below presents the correlation between the variables applied in the OLS.

Table A.5: Correlation matrix

	Paris	Region	Gov.	logPressHits	MBratio	EPI	Ann.100%
Paris	1.00						
Region	-0.0183	1.00					
Gov.	0.2379	-0.2750	1.00				
logPressHits	-0.5026	0.2867	-0.0252	1.00			
MBratio	-0.1291	0.1805	-0.0407	0.0213	1.00		
EPI	0.0427	-0.3677	0.2061	-0.1305	0.0298	1.00	
Ann.100%	-0.0225	0.2722	-0.2245	-0.0389	0.0297	-0.1442	1.00

A.3 Descriptive statistic of the independent variables

The table below present descriptive statistics, number of observation, mean, standard deviation, minimum value and maximum value, of the variables used in the regression.

Table A.6: Descriptive statistic on all sample variables

Variables	Obs.	Mean	St.Deviation	Min	Max
Paris agreement	67	0.49	.50	0	1
Region	67	0.43	0.50	0	1
Governance	67	0.20	0.22	0.02	1
log Press hits	67	12.26	0.032	12.22	12.32
MBratio	67	3.71	3.85	-5.31	21.78
EPI	67	85.73	2.20	82.03	90.68
Announcement to 100% goal	67	0.33	0.47	0	1

A.4 Descriptive statistics divided into regions

Table A.7: Descriptive statistic for companies located in the US (N=29)

Company	Paris	Region	Gov.	Press Hits*	MBratio	EPI	Ann.to 100%	Renewable before	Envi.ini.
Adobe	0	United States	6.68%	219,752	6.52	84.72	20	0	1
Apple	1	United States	5.77%	212,211	4.49	84.72	-	0	0
Biogen	0	United States	7.50%	219,372	6.75	84.72	0	1	1
Coca-Cola	0	United States	5.41%	220,644	7.26	84.72	5	0	2
Diageo	1	United States	6.34%	211,682	5.06	84.72	14	0	6
eBay	1	United States	6.41%	203,706	3.49	84.72	8	0	0
Equinix	1	United States	16.20%	218,801	6	84.72	-	0	0
Estée Lauder	1	United States	5.30%	205,276	9.09	84.72	3	0	0
General Motors	0	United States	5%	222,545	1.05	84.72	34	0	0
Goldman Sachs	0	United States	4.83%	218,084	1.05	84.72	5	0	0
Google	0	United States	29.52%	220,581	4.41	84.72	-	0	0
Hewlett Packard	1	United States	13.06%	211,681	1.13	84.72	-	0	1
HP, Inc.	0	United States	8.20%	221,170	-5.31	84.72	-	0	4
IHS Markit	1	United States	9.97%	205,135	2.25	84.72	3	0	0
Interface	1	United States	11.52%	218,801	3.20	84.72	4	0	0
Johnson&Johnson	0	United States	6.30%	218,084	3.66	84.72	35	0	0
JP Morgan	1	United States	3.47%	205,730	1.42	84.72	3	0	0
Kellogg	1	United States	9.22%	205,276	12.45	84.72	33	0	4
Microsoft	0	United States	8%	220,675	5.88	84.72	0	1	0
Procter& Gamble	0	United States	5.63%	218,084	3.32	84.72	-	0	2
Salesforce	0	United States	6.46%	224,240	9.82	84.72	0	1	1
Starbucks	0	United States	7.35%	218,084	14.62	84.72	0	0	1
Steelcase	0	United States	15.12%	218,084	3.23	84.72	0	0	0
Vail Resorts	1	United States	12.81%	204,725	5.25	84.72	13	0	0
VF Corporation	1	United States	35.45%	211,681	4.86	84.72	9	0	1
VMWare	1	United States	60%	211,681	3.7	84.72	4	0	1
Voya Financial	0	United States	19%	218,084	0.75	84.72	0	1	0
Walmart	0	United States	44.20%	218,084	2.54	84.72	-	0	3
Wells Fargo	1	United States	3.45%	211,682	1.33	84.72	5	0	0
Max			60%	224,240	14.62		35		6
Mean			12%	214,958	4.64	84.72	9.19		0.93
Min			3%	203,706	-5.31		0		0
Median			8%	218,084	4.41		4		0
Total	13			6,233,635				5	25

- is given to companies that have not yet announced the year they will become 100% renewable

Table A.8: Descriptive statistic for companies located in Europe (N=38)

Company	Paris	Region	Governance	Press Hits*	MBratio	EPI	Ann.to 100%	Renewable before	Envi.ini.
ABInBev	1	Netherland	28.90%	204,195	2.94	82.03	8	0	0
AkzoNobel	1	Netherland	5.03%	204,584	2.95	82.03	33	0	2
Alstria	0	Switzerland	22.79%	217,888	1.09	84.26	2	0	0
Aviva	0	UK	5.44%	218,460	1.19	87.38	10	0	1
AXA	1	French	14.13%	204,588	1.06	88.2	8	0	4
Bankia	1	Spain	67.19%	204,897	0.87	88.91	0	1	0
BMW Group	0	Germany	33.80%	221,198	1.6	84.26	-	0	0
British Land	0	UK	6.36%	205,452	0.87	87.38	5	0	1
BT Group	1	UK	12%	216,278	4.59	87.38	4	0	5
CaixaBank	1	Spain	59%	203,459	1.04	88.91	1	0	0
Carlsberg Group	1	Denmark	75%	204,588	2.07	89.21	5	0	1
Colruyt Group	1	Germany	51.95%	216,507	3.39	84.26	0	1	0
Corbion	1	Netherland	4.65%	205,293	3.07	82.03	-	0	0
Credit Agricole	1	French	30.05%	217,311	0.47	88.2	0	0	1
Danske Bank	1	Denmark	20%	204,524	1.34	89.21	0	1	0
DNB	1	Norway	34%	211,682	0.8	86.9	4	0	0
H&M	0	Sweden	69.70%	205,432	9.72	90.43	-	0	6
Helvetia	1	Switzerland	34.10%	208,681	1.11	86.93	4	0	0
ING Group	0	Netherlands	5.07%	220,790	1.07	82.03	5	0	1
Jupiter As. Mngt.	1	UK	9.99%	205,827	4.02	87.38	1	0	0
KPN	0	Netherlands	25%	205,452	3	82.03	0	1	4
Land Securities	0	UK	9.30%	217,888	0.85	87.38	1	0	4
Nestle	0	Switzerland	2.80%	205,452	3.21	86.93	-	0	6
Nordea	0	Sweden	21.40%	220,644	1.37	90.43	1	0	1
Novo Nordisk	0	Denmark	25%	220,644	21.78	89.21	5	0	2
Pearson	0	UK	4.20%	221,198	1.05	87.38	0	1	1
RELX Group	0	UK	50%	205,452	8.5	87.38	6	0	4
Royal DSM45	0	Netherlands	5%	218,084	1.44	82.03	-	0	4
Royal Philips46	0	Netherlands	2.20%	205,452	1.97	82.03	6	0	5
SAP	0	Germany	9.99%	220,355	3.38	84.26	1	0	1
SAVE Group	1	Italy	51.23%	218,000	3.23	84.48	0	0	0
TD Bank	1	Canada	10%	219,263	1.57	85.06	0	0	0
Telefonica S.A	1	Spain	5.10%	204,244	2.71	88.91	13	0	3
Tesco	1	UK	5.98%	204,436	2.3	87.38	13	0	4
UBS	0	Switzerland	9.14%	217,845	1.38	86.93	5	0	0
Unilever	0	UK	6.20%	205,452	7.17	87.38	16	0	8
Vaisala	0	Finland	12.20%	217,455	2.37	90.68	5	0	0
YOOX Group	0	Italy	24.98'%	205,452	7.09	84.48	6	0	0
Max			75%	221,198	21.78	90.68	33		8
Mean			23%	211,593	3.04	86.41	5.06		1.86
Min			2%	203,459	0.47	82.03	0		0
Median			12%	208,681	1.97	87.38	4		1
Total	18			7,828,950				4	69

- is given to companies that have not yet announced the year they will become 100% renewable
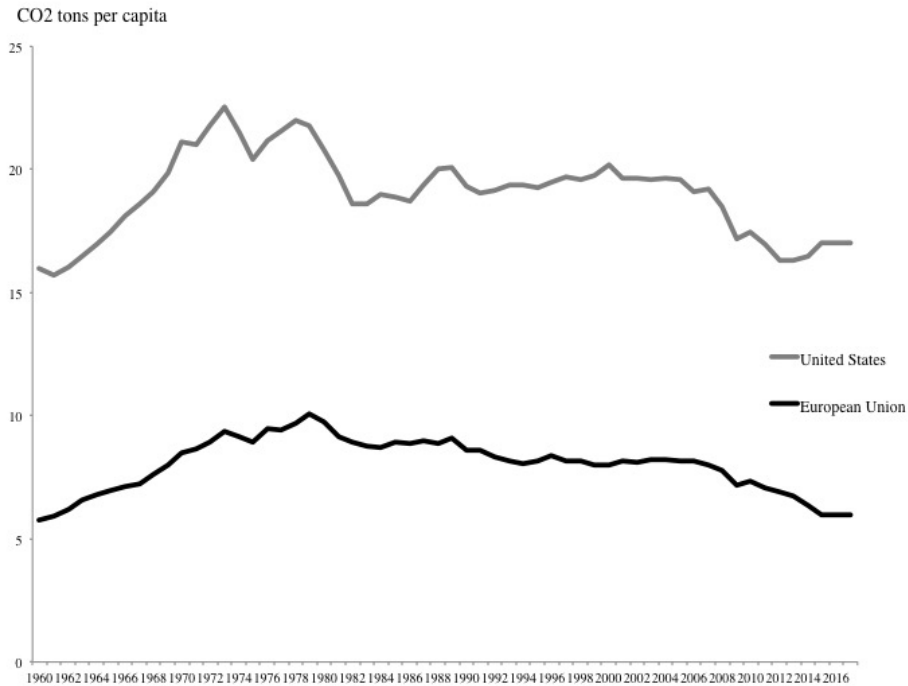
A.5 Historical CO2 emission

Figure A.3: CO_2 emission per capita 1960-2016