The Paris Agreement: an analysis of its effects on Energy Firms' Investments and Profitability in Europe and United States

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The Paris Agreement's effects on Energy companies

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The Paris Agreement has significantly influenced the energy sector, emphasizing the transition to low-carbon economies. This thesis explores its impact on the capital expenditure and profitability of energy companies in Europe and the United States, focusing on differences between firms reliant on fossil fuels and those exclusively using renewable energy. Employing a Difference-in-Differences (DiD) approach, the study examines how regulatory frameworks and policy uncertainty shaped corporate decisions.

The analysis reveals that the Paris Agreement had a negative effect on investments of polluting energy firms, with variations between regions due to differences in policy stability. While the profitability of these firms declined in Europe, we observed no significant impact in the United States, likely reflecting the influence of regulatory and political contexts. Robustness checks support the findings, though some limitations in data interpretation remain.

This research contributes to understanding how international climate agreements affect corporate strategy, highlighting the importance of regulatory design and stable policy environments in driving sustainable investment and financial performance.

Keywords: Paris Climate Agreement, energy companies, investments, profitability, Porter Hypothesis, difference-in-differences

Os efeitos do Acordo de Paris nas empresas do sector da energia

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O Acordo de Paris influenciou significativamente o setor de energia, enfatizando a transição para economias de baixo carbono. Esta dissertação explora seu impacto nos investimentos de capital e na rentabilidade das empresas de energia na Europa e nos Estados Unidos, com foco nas diferenças entre empresas dependentes de combustíveis fósseis e aquelas que utilizam exclusivamente energia renovável. Utilizando uma abordagem de diferença-em-diferenças (DiD), o estudo examina como os quadros regulatórios e a incerteza política moldaram as decisões corporativas.

A análise revela que o Acordo de Paris teve um efeito negativo sobre os investimentos das empresas poluidoras, com variações entre regiões devido às diferenças na estabilidade das políticas. Enquanto a rentabilidade dessas empresas diminuiu na Europa, nenhum impacto significativo foi observado nos Estados Unidos, refletindo provavelmente a influência dos contextos regulatórios e políticos. Verificações de robustez apoiam os resultados, embora algumas limitações na interpretação dos dados permaneçam.

Esta pesquisa contribui para a compreensão de como acordos climáticos internacionais afetam a estratégia corporativa, destacando a importância do desenho regulatório e de ambientes políticos estáveis para impulsionar investimentos sustentáveis e o desempenho financeiro.

Palavras-chave: Acordo de Paris, empresas de energia, investimentos, rentabilidade, Hipótese de Porter, diferença-em-diferenças

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1 Introduction

The climate change crisis has been trending in recent years, with international climate commitments becoming more and more significant. Everything started in 1992 with the UN Framework Convention on Climate Change (UNFCCC), then we saw the adoption of the Kyoto Protocol in 1997, which took effect in 2005, followed by the Paris Agreement in 2015, effective in 2016. Subsequently we had the European Green Deal in 2019 and, finally, the Glasgow Climate Pact in 2021, which reaffirmed the goals of the Paris Agreement. These international agreements set targets and deadlines for carbon emissions, reshaping the corporate landscape through incentives and penalties.

Thus, understanding the effects of climate agreements is fundamental to prevent a tipping point, especially when it comes to investment and profitability impacts from policies. This study aims to analyze how the Paris Agreement specifically has influenced capital expenditure and profitability of energy companies in Europe and the United States.

The Porter Hypothesis argues that well-designed environmental regulations can push innovation and improve competitiveness. In its strong form, it claims that these regulations increase profitability by encouraging investment, in its weak form it proposes they foster innovation without guaranteeing profitability. Although research on the impact of environmental policies on corporate performance is growing, researchers still need to fully explore the influence of the Paris Agreement on energy companies' investments and profitability. This thesis aims to fill that gap, adding new insights by examining how the agreement has influenced capital expenditure and profitability across energy companies in these regions. Furthermore, the different scenarios characterizing Europe and the United States regarding attention to climate change, due to Donald Trump's willingness to withdraw from the agreement in 2017, could highlight relevant differences, adding essential knowledge to the topic.

By comparing companies making use of also fossil fuels against those focusing only on renewables, this study seeks to highlight key differences in how international climate agreements can shape investment strategies. Through a Difference-in-Differences (DiD) approach, this research will explore the possible relationship between the Paris Agreement and shifts in profitability and investments within the energy sector, contributing new insights into how environmental regulations may affect corporate financial outcomes.

1.1 The Paris Agreement

The Paris Agreement is a legally binding international treaty on climate change. 196 countries signed it at the UN Climate Change Conference (COP21) in Paris, France, on the 12th December 2015 and on the 4th November 2016 it entered into force. Its goal is to keep the increase in global temperature by 2 degrees Celsius while also putting the effort of keeping it below 1.5 degrees. To reach the more challenging goal, greenhouse gas emissions (GHG) must decline by 43% by 2030 (UNFCCC, 2015). This brings the world in a direction of powerful acts from governments that have to interact with corporations through laws and incentives to push a steep decrease in emissions. Furthermore, due to how the Paris Agreement asks countries to work, they single-handedly carry increasingly ambitious climate actions based on a five-year cycle.

Nationally Determined Contributions (NDCs) are a way in which nations provide a plan of how they will reduce their greenhouse gas emissions in line with the achievements of the Paris Agreement goals. They started in 2020 but even if that period is not included in the study, it was worth mentioning them in order to fully acknowledge how the Paris Agreement works.

The Paris Agreement also provides a framework for helping countries in need, financially and technically. In fact, developed countries should support the others facing more difficulties, providing voluntarily financial assistance (UNFCCC, 2015).

This worldwide ambitious commitment will inevitably shape a different scenario from the past in which companies will act. As the Paris Agreement states, greenhouse gas emissions must drop by 43% by 2030, a target that will require maximum effort from all the countries that signed it.

1.2 Hypothesis

This study takes in consideration the energy sector, which is expected to be the most impacted among the different industries. In fact, energy accounts for more than three quarters of GHG at a global level (International Energy Agency, 2024). Although transitioning to a greener economy takes time, governments need to act rapidly to cut emissions, and the energy sector, being responsible for a massive amount of them, is the key industry where to push changes.

Firms in this sector produce energy also through renewable sources but fossil fuels remain the dominant source for it. Even though in the more recent past fully renewable energy firms were born, companies reliant on fossil fuels represent the majority of the players in this sector.

Inducing a change is fundamental, but massive investments are needed in order to begin to increase energy production through solar panels, wind turbines and dams. Countries commitment demonstrated with the Paris Agreement becomes relevant here where, with laws

and policies, they can incentivize firms to invest more. Thus, our hypothesis is that after the entrance into force of the Paris Agreement, firms reliant on fossil fuels began investing more. In fact, low-carbon technologies are highly capital intensive, and their cost depends substantially on the cost of capital (International Energy Agency, 2015), so if governments can facilitate access to a lower cost capital, firms will be incentivized to invest in greener technologies. Furthermore, in recent years a significant decline in the cost of energy production through renewable sources appeared, as a result of improved technologies and governmental support (International Energy Agency, 2015). Therefore, the second part of our hypothesis is that, subsequently to augmented investments following the Paris Agreement, profitability also saw improvements.

2 Literature Review

The relationship between environmental regulation, corporate performance and innovation has drawn significant interest in recent decades, with mixed evidence on the outcomes for companies facing stricter climate-related policies. The Porter Hypothesis, foundational to this area of study, states that well-crafted environmental regulations can enhance business competitiveness and incentive innovation (Porter, 1991; Porter & van der Linde, 1995). The weak version of this hypothesis, which declares that regulation induces innovation, is relatively well-supported. Ambec et al. (2011) provide a comprehensive empirical review affirming this weak form, as stricter environmental standards consistently lead to innovation, though outcomes vary in terms of profitability. However, evidence supporting the strong version, where regulation not only encourages innovation but also directly boosts performance, provides mixed results, remaining inconsistent.

Furthermore, Benatti et al. (2023) contribute with recent insights, testing the strong Porter Hypothesis in firms with high CO2 emissions. Their results reject the hypothesis that strict regulations enhance short-term productivity. However, they observe a rise in green patent activity within five years post-regulation, suggesting longer-term innovation benefits, yet with immediate adjustment costs. Similarly, Zhou, Song, and Huang (2023) find that environmental regulations pressure firms to innovate in green technologies, though this often forces some businesses to exit or shift industries due to heightened costs. Over time, such regulations lead to improved performance, highlighting their transformative potential despite initial disruptions. Studies like this highlight how capital access and innovation levels can mitigate the costs of transitioning to greener production methods. Ambec and Barla (2006) similarly find that

environmental regulations might lead to an aging of capital stock, potentially reducing investment as firms delay capital-intensive adjustments. However, Fu, Yang, and Jian (2022) provide contrasting evidence, showing that stricter regulations can directly improve firm performance under certain conditions.

Lundgren and Marklund (2010) further examine the mixed evidence on profitability linked to environmental regulation and refute claims that strict environmental policies generate positive dynamic effects that offset costs. In contrast, Rassier et. al. (2010) specifically investigate clean water regulations and profitability, finding a negative relationship with return on sales, for both short and long terms. These results underscore the complex financial dynamics involved, as regulations can constrain immediate financial performance even when encouraging longer-term innovation.

Policy uncertainty is another critical factor affecting corporate investment decisions. Julio and Yook (2012) report that firms reduce investment expenditures by about 4.8% during election years, attributing this to the increased uncertainty surrounding potential policy shifts. Similarly, Gulen and Ion (2016) document a robust negative relationship between investment and policy unpredictability, especially in sectors reliant on government spending or those with irreversible investment structures. These findings align with Huang and Punzi (2024), who note that uncertainty around environmental policies prompts firms to delay investment decisions until regulatory landscapes stabilize. Bistline (2014) also notes this "strategic delay" approach and suggests that firms may wait and see what happens about future carbon taxes or similar regulatory shifts. Such findings highlight the challenges in securing consistent investment under ambiguous policy landscapes. A fundamental highlight of this study is also that investments are mostly driven by moderate policies, not strict ones.

Arimura et. al. (2007) corroborate the role of policy in driving environmental research and development. They observe that policy-driven investments in environmental R&D are supported, but there is no strong evidence that when policy mechanisms employed are flexible such investments are more likely to be induced. Their findings align with studies emphasizing the need for innovation-based solutions to simultaneously advance environmental and business goals (Porter & van der Linde, 1995). Zhang (2021) builds on this, arguing that well-structured environmental regulations, such as green credit policies, can improve both environmental and economic outcomes. By fostering green total factor productivity and incentivizing R&D in environmentally targeted areas, such policies demonstrate the potential for matching sustainability and profitability. However, studies caution against overestimating regulation's

potential for innovation without considering policy design. For example, Managi et al. (2005) illustrate that while environmental regulation spurs technological change, only a fraction targets environmental sectors, implying limited flexibility for innovation there.

In terms of regulatory impacts on investment, Farooq et al. (2024) highlight the mitigating role of green innovation in offsetting adverse effects of strict environmental policies. Their findings show that increased taxation and regulatory stringency can reduce corporate investments, but firms adopting green strategies can soften these impacts, ensuring more resilient performance. For example, one-unit increase in environmental taxation and policy stringency can impede investment by 3.2% and 0.9% respectively. This complements Khalid et al. (2022), who report that green investments tend to improve profitability, especially when supported by robust environmental laws.

Also, Huang, Sim, and Zhao (2020) explore the connection between corporate social responsibility (CSR) and corporate financial performance (CFP), finding that when studies account for economic fluctuations, CSR practices positively influence financial outcomes. This aligns with Eccles, Ioannou, and Serafeim (2014), who compare companies with high versus low sustainability practices, demonstrating that sustainable firms outperform their counterparts in both stock market returns and accounting measures. Erhemjamts, Li, and Venkateswaran (2013) further reveal that firms with strong corporate social responsibility (CSR) scores invest more heavily in capital expenditures and achieve better returns on assets (ROA).

The influence of regulation on the direction of technological innovation is another focal point, as Magat (1979) illustrates how various types of environmental regulation impact the rate and direction of both abatement and output technology advancements. Magat's findings reveal that regulations induce firms to adjust both their pollution control technologies and production technologies, demonstrating the diverse effects regulatory frameworks can have on a firm's innovation strategies.

Finally, Jensen (2002) provides an opposite perspective, arguing that firms overlooking environmental and social issues will be relatively less competitive and profitable in competitive environments. While this view contrasts the dominant regulatory perspective, Gehring (2016) emphasizes that international economic laws and frameworks have been crucial in facilitating the innovation needed for a green economy transition, but an integrated participation across all government levels is needed to ensure effectiveness.

Collectively, these studies underscore a complex relationship between environmental regulations, innovation, investments and profitability. While evidence generally supports

innovation as a response to stricter regulations, the impacts on profitability and investment are more varied. This happens especially in sectors like energy, where international commitments such as the Paris Agreement set significant goals, that will not be achieved without the effort of all the players involved. This thesis seeks to augment the knowledge already possessed by examining how the Paris Agreement specifically has influenced investments and profitability among European and United States energy companies. We will use a Difference-in-Differences approach to compare fossil fuel-based firms with those focused solely on renewable energy.

3 Data and Methodology

This analysis comprehends data we collected with the help of Refinitiv Eikon LSEG workspace of European and United States energy companies. To be able to assess the effect of the Paris Agreement on profitability and investment we chose two different measures, Return on Assets (ROA), which we calculated as Net Income after Tax over Total Assets, and Capital Expenditure over Total Assets, respectively. We chose to use the ratios in order to offset considerable differences, especially regarding investments, possibly due to totally diverse dimensions of the companies present in the samples. In fact, fully renewable energy firms tend to be more recent compared to companies that started decades ago in this industry using fossil fuels, which subsequently had also more time and resources to grow.

In order to possess a sufficient ample sample, we collected the data over a period of 9 years, going from 2011 to 2019 both included. The Paris agreement was signed on the 12th of December 2015 and entered into force on the 4th of November 2016, and this represents the reason behind the period selection.

The presence of outliers in the study regarding Return on Assets, both in the United States and European samples, required a winsorization at 5%. To handle the problem, we replaced the bottom and upper tails with their respective 5th and 95th percentiles. Due to this process, the skewness of the samples saw drastic improvements. The one of European firms went from -24.55 to -1.59 and for the United States from -39.91 to -1.67, reaching values close to a normal distribution and improving the quality of the data we used.

Regarding the samples about the effects of the Paris Agreement on capital expenditure over total assets, the European one comprises of 112 firms of which 18 are generating their revenue 100% from renewable sources while the other 94 make use of also fossil fuels. The American one comprises of a total of 162 firms of which 24 are completely renewable while the other 138 are not.

Furthermore, we used a European and an American sample to investigate the Paris Agreement influences on profitability. They were composed by, respectively, 125 firms, of which 19 fully renewables and 106 that generated revenue also with the help of fossil fuels, and a total of 179 firms of which 24 provided energy only from renewable sources whereas the others did not. Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom are the countries present in the European sample. We omitted other countries, for example the ones from eastern Europe and others like Malta or Cipro, due to a lower relevance and influence in the European scenario.

In order to find and prove possible connections between climate agreements, in this case specifically the Paris one signed in December of 2015, we chose to use of a Difference-in-Differences regression (DiD). The reason behind this choice is that this regression is a statistical method commonly used in policy analysis to estimate the causal effect of an event or intervention by comparing the changes in outcomes over time between a treated and a control group. The key principle of DiD is that it isolates the effect of the event by assuming that, in the absence of the intervention, the difference in trends between the two groups would have remained constant. This approach is particularly useful for distinguishing the specific impact of an event from other factors that might influence the outcome.

Energy firms which used to and still produce energy utilizing fossil fuels represent the treated group, due to the expectations they were heavier influenced by the Agreement and the stricter carbon emissions target. The energy firms that were born as fully renewable energy producers represent the control group instead.

We used four different regressions in this study, two for Europe and two for the United States. The regressions for Europe have the presence of country fixed effect, to be able to capture possible effects on profitability and investments attributable to characteristics present in only some countries.

From the whole sample, we selected 6 total years in order to analyze the event, 3 before the signing, 2012, 2013 and 2014, and 3 after the entrance into effect in 2016, 2017, 2018 and 2019. The specific choice of not using 2016 as a post Agreement year is due to the fact that, even if the signing happened in 2015, until the end of 2016 it was not entered into force yet, so we considered 2016 as a transitory year from a period pre and post Agreement. We still used the year 2016 in the robustness section, to be able to compare how the main regressions results could have changed with data from the exact year after the signing.

Table of regressions

EUROPE	
Regression 1	Capital Expenditure/Total $Assets_{it}$= $\alpha + \beta_1$*$CountryFixedEffect_i + \beta 2$*$Treated_i + \beta 3$*$After_t + \beta 4$*($Treated_i$*$After_t$) +$\varepsilon_{it}$
Regression 2	Return on $Assets_{it}$= $\alpha + \beta_1$*$CountryFixedEffect_i + \beta 2$*$Treated_i + \beta 3$*$After_t + \beta 4$*($Treated_i$*$After_t$) +$\varepsilon_{it}$
UNITED STATES	
Regression 1	Capex/Total $Assets_{it}$= $\alpha + \beta 1$*$Treated_i + \beta 2$*$After_t + \beta 3$*($Treated_i$*$After_t$) +ε_{it}
Regression 2	Return on $Assets_{it}$= $\alpha + \beta 1$*$Treated_i + \beta 2$*$After_t + \beta 3$*($Treated_i$*$After_t$) +ε_{it}

4 Policy Uncertainty

4.1 Economic Policy Uncertainty and its effects

As mentioned previously in the literature review, policy uncertainty plays a significant role in company decision making. If there is an ongoing uncertainty related to new government policies, firms tend to delay investments waiting for a more stable and predictable political scenario in which plan future actions (Huang and Punzi (2024) and Bistline (2014)). It is understandable that there can be multiple reasons standing behind this rationale, for instance, observing what different governments want to incentivize especially in diverse economic scenarios. Indeed, knowing what will be rewarded or penalized in the future will certainly have a huge impact on the direction companies will take, and when talking about climate problems the topic gets even more relevant.

During recent times climate policies and agreements have shaped the industry environment. Carbon credits, carbon footprint and carbon taxes have become commonly used terms regarding every company and their actions, products and services, making the attention to carbon emissions crucial, leading to more laws trying to direct every industry to take certain paths in terms of polluting.

Baker, S.R., Bloom, N. and Davis, S.J. created an index based on newspaper coverage frequency that measures policy related economic uncertainty. In their paper, Baker et al. (2012) acknowledge how during spikes of uncertainty investments from firms are delayed.

4.2 Policy Uncertainty in Europe

As it is possible to see from Fig. 1, uncertainty in some of the main Europe countries we have studied varies slightly between them in absolute terms, but in all of them there are approximately similar trends. In fact, some of them, for example Spain and Italy, are moving around values of 100 or 150, going sometimes over 200. Others instead, like Germany, France and the European average, are varying similarly overall but taking in general higher values. The

United Kingdom differs significantly from all of them, starting in 2016 with abnormal spikes due most likely to the Brexit event, nonetheless remaining at values that were significantly above their peer nations even afterwards. France and Germany have also seen spikes in uncertainty in the same years, even though not close to the ones of United Kingdom. During those dates the Paris Agreement was going into effect, so it could have caused some uncertainty regarding future policies. It is important then to take into account its presence during those years that could have influenced investment decisions (Gulen and Ion, (2016), Baker et. al. (2012) and Bistline (2014)).

Therefore, it is reasonable to have the expectations based on Baker et al. (2012), that during those years of policy uncertainty, even if due to other reasons rather than the Paris Agreement, companies probably tended to wait for better periods to start new investments. Delaying investments and generating liquidity for the right moment can be crucial when making the right decision becomes difficult due to an instable policy landscape that can change unexpectedly and modify drastically incentives and penalties.

4.3 Policy Uncertainty in the United States

In the United States (Fig. 2) the situation appears to be quite similar to most of the countries already seen in Europe and their average. Policy uncertainty in the United States ranges around 100, with the lowest peak close to 50 and the highest peaks close to 300. In 2016 and 2017 the presence of peaks at 250, circa double the values during lower uncertainty times, leads us to search for reasons behind it. The Presidential elections in the States appear to be one of possible explanations. Indeed, at the end of 2016, around November and December, there is the second consecutive peak at 250, after another one just few months earlier. That coincides with the dates around Donald J. Trump election, which has been a surprise for most people due to the polls which predicted his defeat.

Furthermore, the Paris Agreement has been signed on the 12th December 2015, only one year earlier than Donald J. Trump surprise election. Nevertheless, his willingness to withdraw from it has already been clear since 2017, which became reality three years later, in 2020. However, the future path of USA was decided, being the first nation to leave the Agreement. Thus, economic policy uncertainty regarding the climate topic has been added to the already existing coming from the recent and unexpected elections.

To summarize the last points made, it is helpful to recall what Baker et al. (2012) assert. Economic policy uncertainty makes companies hesitant and cautious in initiating or increasing

new investments (Gulen and Ion (2016)), so when analyzing the effect of new policies, agreements or laws on investments, keeping in mind the possibility that uncertainty had a possible role in determining firms decision-making is fundamental.

5 Findings and Discussion

We enter now the main part of this study, where we chose a Difference-in-Differences method in order to analyze the effects of the Paris Agreement on profitability and investments of energy firms in Europe and the United States of America. The analysis will be divided into 2 parts further divided in 2 sections. We will begin with the investigation of how differently capital expenditure over total assets has changed after this important climate event for companies involved in the usage of fossil fuels and their peers who generate revenue solely from renewable sources. This section will be further divided in two sub analysis, the first regarding Europe and the second one regarding the United States.

The second section will instead focus on the profitability of these firms, still with the main purpose of trying to explain the Paris Agreement effects on these companies. We need to keep in mind that changes in profitability could also be partially explained by how investments changed in that period, reminding of the strong version of the Porter hypothesis.

5.1 Paris Agreement effects on Investments of European firms

Starting with Europe, Table 1 presents the main coefficients of the first regression we adopted. As stated before in the data and methodology chapter, due to the presence of 17 different European countries, we needed country fixed effect in order to isolate and clean the effect of the Paris Agreement from influences result of country characteristics.

All of these values aside from the variable “After” are significant, the constant and “Treated” at 1% level, while “Treated*After” at 10% level, even though its t statistic is precisely 1.96, which could have been considered at a 5% level significance. These results show that while polluting energy firms, overall, invest more than their peers, the Paris Agreement influenced their spending willingness negatively, making it decrease by 3.58 percentage points. While this result contrasts the weak Porter hypothesis that states that well designed policies incentive innovations, Ambec and Barla (2006) support the opposite with their studies, with evidence suggesting that environmental regulation may have a significant negative impact on investments, increasing the age of capital.

Lundgren and Marklund (2010) additionally do not confirm the hypothesis that stringent policies create positive dynamics that offset costs related to the new policies. That could bring firms in the first moments to save money, perhaps reducing investments, to cover up from new higher costs related to updates in policies.

One of the most crucial parts about new policies or climate agreements is the uncertainty they can cause in the new scenario. Companies are well aware that when governments at a global scale meet to agree on something new goals will be set, for instance the 1.5 degrees Celsius increase limit above pre industrial levels, creating the necessity for laws containing incentives and penalties. In this case, being the energy industry one of the key factors for global CO2 emissions, polluting firms will certainly know they will be affected by new policies, and this will create uncertainty in this scenario, bringing these companies to postpone investments, showing a decline in them (Huang and Punzi (2024)).

Furthermore, we can take a look at some countries to be able to better comprehend the context. In fact, considering only few coefficients that are significant at a 1% level to develop more knowledge on this topic, important distinctions come up. Italy and Greece Fixed Effects are respectively -0.0392 and -0.0478 while Sweden Fixed Effect is +0.0879 (Table 9). This shows that if governments agree on a relevant topic at a global scale, specific characteristics connected separately to different countries must be considered when the goal is to enhance investments, especially in the clean energy sector.

5.2 Paris Agreement effects on Investments of United States firms

Now we enter the second section of the first part regarding how Capital Expenditure over Total Assets has been influenced, but the focus will be on the United States. While in Europe the scenario about climate change and the efforts made to control it have been pretty stable since previous years, in the United States we find a different situation. Trump willingness to withdraw from the Paris Agreement, signed less than 2 years before by the previous administration, put them in a limbo of uncertainty regarding new policies on climate, also because the effective exit happened only in 2020, three years later.

From Table 2 we can observe mainly 2 relevant values, 0.102 as the coefficients for “Treated”, significant at 1% level, and -0.0546 as the coefficient for “Treated*After”, the most important one for our analysis, significant at 5% level. The first Beta shows a difference of more than 10 percentage points in Capital Expenditure over Total Assets between treated companies and control companies, in favour of the first ones. Although companies making use of fossil fuels,

perhaps due to their greater age and dimensions, had a tendency of investing more than renewable energy companies, the Paris Agreement had a significant negative impact on them, forcing them to decrease their investments by a considerable amount, 5.46 percentage points.

Comparing this situation to the European one, we can observe more extreme coefficients here. Treated companies had a more significant advantage in investments than the control firms in the US rather than in Europe, where it was circa half of the difference found in the United States. Moreover, also the effect of the Paris Agreement had a stronger negative impact on treated firms here, who have seen their investments reduced by more than 5 percentage points compared to the 3.58 percentage points decrease in Europe.

As Arimura et al. (2007) say, public policies can induce investments in environmental research and development. But if those policies become more flexible, as it could have happened in the United States due to the already declared future withdrawal from the Agreement, the probability of inducing these investments is not likely to increase.

Furthermore, in the US we find an additional policy uncertainty compared to Europe, due to a period where the recent signing and entrance into effect of the Agreement coincided with the clear expressed intent of the President of leaving it. This could have had an even higher probability of making companies, especially the polluting one, delay their investments waiting for a more stable situation (Gulen and Ion, (2016)).

Farooq et al. (2024) support this result by finding the negative effects that environmental regulations have on investments. In fact, they decrease by 3.2% and 0.9% per one unit increase in environmental taxation and policy stringency respectively.

Bistline (2014) instead declares that while climate policies like carbon taxes, especially if moderate, can drive investments, a strategic delay is often optimal, specifically when uncertainty regarding future regulations is high. So, while it is reasonable to expect increased investments from companies after new regulations and agreements, it is also realistic to see them reduce them waiting for the right time.

5.3 Paris Agreement effects on Return on Assets of European firms

After completing the first part of the analysis regarding investments of European and United States firms, we will now shift the focus on their profitability, taking a step further from the weak version of the porter hypothesis to the strong one. This version affirms that well designed regulations can not only incentive innovation, but should also improve profitability and competitive advantage, also due to the innovation induced.

Looking at Table 3, the coefficient of the "Treated" variable immediately stands up, being 0,175 at a 1% significance level. But after taking a look at the constant, the average profitability the control group takes before the Paris Agreement, we can see how even though the coefficient of "Treated" is significantly high, representing an improvement of 17.5 percentage points, the average profitability of energy firms using fossil fuels remains below zero.

Moreover, their profitability did not get better after the effects of the event studied took place. In fact, Table 3 reports the coefficient for the variable "Treated*After" which is -0.0699, meaning that profitability of treated firms decreased by 6.99 percentage points. Recalling the analysis on investments of European firms from Table 1, the Beta of the variable "Treated*After" was -0.0358, meaning that the Paris Agreement had the effect of reducing the treated firms investments. This could have subsequently had the effect of decreasing profitability. In this analysis even more country fixed effects, compared to the investment investigation, are significant, highlighting serious differences between countries about profitability of firms. All of the countries present significant Betas and most of them positive. For example, Denmark FE is 0.235, Finland FE is 0.143, Italy FE is 0.0930, Netherlands FE is 0.107, Portugal FE is 0.0804 and Spain FE is 0.117. The negative fixed effects are possible to find only in Ireland, with a -0.0730, Sweden with a -0.0746 and in the United Kingdom which is represented by the constant with a -0.252 (Table 10). This last one seems to be one of the most extreme, but it is crucial to keep in mind that the Paris Agreement coincided with the years of the Brexit which caused problems to all the companies that, before this event had advantages in importing and exporting goods and services in the European Union.

Lundgren and Marklund (2010) support these results, not confirming that stringent environmental policies can have positive effects that could compensate costs related to environmental policy. Therefore, a reduction in profitability after new policies due to new costs to bear, especially for polluting firms after environmental policies, can be in line with expectations.

Rassier et al. (2010) provide other evidence in support of this result, finding that, still regarding environmental problems, there is a negative relation between clean water regulation and profitability, both in the short and long term.

Especially more affected firms see their profitability worsening after new regulations. Benatti et al. (2023) provide evidence for this, and after having tested the strong version of the Porter hypothesis they reject it, proving that strict regulations do not enhance productivity for firms with high CO2 emissions, at least in the short term. They further state how in the short and

medium term higher costs can come up due to the need of adjusting to greener processes of producing, but a better access to capital and innovations can mitigate this problem. This gives us possible explanations why these companies saw a decrease in profitability in the subsequent years of the Paris Agreement. Indeed, if their productivity has not improved but their costs have increased, a probable consequence faced is that profitability could have seen a decline.

5.4 Paris Agreement effects on Return on Assets of United States firms

Delving now into the last part of the second section, we will further analyze the effects profitability of United States energy firms faced after the entrance into force of the Paris Agreement.

Instantly, the eye get caught by the first non-significant Beta of the variable "Treated*After" in Table 4, which means we can not reject the null hypothesis that this coefficient is different from 0. "Treated" variable presents a positive and significant coefficient of 0.143, indicating a 14.3 percentage points difference with control firms, similar situation to the European one. Though, we can not say the same for the effects of the Agreement on profitability of treated firms.

Additionally, also here in the US non-polluting energy firms present a negative profitability of -16.2%, comparable situation to most of the peers in Europe, even if inside Europe, as confirmed by the country fixed effects, the profitability situation exhibited relevant differences depending on the country.

Ambec and Barla (2006) state that the empirical evidence on the strong version of the Porter hypothesis, which affirms that stricter regulation enhances business performance, is mixed, so this result is in line and falls in a space where it does not confirm nor contradict that hypothesis. Ambec et al. (2011) confirm the presence of mixed result on the relation between environmental and financial performance.

In fact, to support the thesis that environmental policies will enhance not only investments but also profitability and competitiveness we can find Erhemjamts, Li, and Venkateswaran (2013) who state that firms corporate social responsibility relates positively with investments and subsequently with profitability. Instead, to support the opposite there are Rassier et al. (2010) who studied clean water regulation and found that it did not enhance it and Lundgren and Marklund (2010) who also found that policies do not create positive dynamic effects that offset costs, probably leading to a decrease in profitability due to higher costs.

6 Robustness Analysis

6.1 Pre-testing the Parallel trends

After having presented the main analysis where we used Difference-in-Differences regressions, a necessary and meaningful check is required. Indeed, it is best to control for the presence of parallel trends, in order to ensure and visualize the presence of them. If that case subsists, the difference between the differences after the event will be potentially attributed to it, assessing thus the role it played in influencing the variables studied.

This part will be assessing the trends of investments at first, delving then into the analysis of the profitability of firms.

6.1.1 Capital expenditure over total assets trends in Europe

Firstly, taking a look at the European energy companies investment trends throughout the period in Fig 3, from 2011 to 2019, we can clearly notice a downward trend regarding the treated group. From a value of 13% of capital expenditure over total assets in 2011, firms involved in producing energy using also fossil fuels kept decreasing their investments. Indeed, at the beginning of the period analyzed the difference in investments was completely in favour of polluting companies, showing more than 5 percentage points more than the renewable firms. However, close to the end of the period this difference disappeared in 2018 and has been reduced to only 1 percentage point in 2019.

Moreover, despite both trends showing a decrease over time, their slopes differ significantly. The treated group goes, as previously mentioned, from 13% to slightly more than 6%, whereas the control group sees their investment drop significantly less than their peers, going from less than 8% to slightly more than 5%.

Before the signing of the Paris Agreement, in 2015, the two total reductions in investments in percentage points appeared to be almost identical, both considerably close to 3 p.p.. Nonetheless, while the treated group kept seeing their investments decrease during and after the signing and entrance into force of the agreement, the control group inverted the trend for one year, only to come back at the previous levels reached in 2014, in 2019. Despite this return to previous levels, the difference in slope of the investments of the two groups after 2015 and 2016 is easily noticeable. So, we can attribute this modification in inclination to the effects of the Paris Agreement and subsequent policies as seen in the analysis.

6.1.2 Capital expenditure over total assets trends in the United States

Now, regarding the United States, two truly diverse trends are shown in Fig 4. By looking at the investments ratio of United States firms through time, calculated as capital expenditure over total assets, it is observable how treated firms constantly maintain a gap from their peers. In the first years, from 2011 to 2014, pre Paris Agreement, the spread sees an increment, even though both trends display similar performances with increases from 2011 to 2013 and a significant decrease from 2013 to 2014. The two trends here are not perfectly parallel, but they show similarities in their tendencies, although with a difference in magnitude.

Furthermore, also during the two years considered as the Paris Agreement, 2015 and 2016, movements in trends take the same directions, firstly with an increase from 2014 to 2015 and then with a decrease in the subsequent year, although with entirely different slopes.

We can also observe an interesting contrast between the two trends after the dates of the Paris Agreement, because for the first time the trends take opposite directions. From 2016 to 2017, immediately after the entrance into force, treated firms saw a reduction of investments of circa 3 percentage points. Then the trend instantly inverted its inclination, pointing upwards and recovering until it reached and set at a value slightly above 11%. Totally different situation for control group firms, who increased by around 1 percentage point their investments in the first year after the Agreement, reaching 5%, and then stabilized and maintained it until the end of the period.

Even though some similarities appear from the graph, especially before the Paris Agreement, we can not observe and assume a clear presence of parallel trends with 100% certainty. Thus, we can not imply that the results presented are not significant nor irrelevant.

6.1.3 Return on Assets trends

Now, after having examined how investments of European and American energy companies have progressed through time we will analyze profitability keeping the same order, starting with Europe and following with the United States.

6.1.4 Return on assets trends in Europe

Before delving into the analysis of how return on assets varied in each point in time from 2011 to 2019, regarding European companies, it is necessary to state some details that influenced dramatically the graphs, as it is possible to see in Fig 5. The presence of 4 companies among the control group displaying values below the 5^{th} percentile in 2016, which have been replaced by the 5^{th} percentile values after the winsorization, has influenced substantially the average,

resulting in the graph with an abnormal data point out of the trend. Being only 19 the firms in the control group, the average has been brought down noticeably by these 4 companies, who did not show such low values in the previous and subsequent years. Because of that, trying to observe parallel trends between treated and control groups becomes difficult, so the fundamental part in this case is keeping in consideration this inconvenience.

Despite this problem, by looking at Fig 5 it is still feasible to notice some details and differences between the two lines. The first one is how different their variations are. Indeed, the profitability of the treated group ranges between a maximum of -1% to a minimum of around -8%, but with small yearly changes. The control group instead, still taking it with a pinch of salt due to the fewer members inside, sees its values varying from -8% to -18%, a variation of 10 percentage points, 3 more than the 7 of the treated group. Furthermore, the yearly changes are way more drastic, but as said earlier we recommend taking these observations cautiously.

Furthermore, treated companies' trend exhibits three main phases, ascendent from 2011 to 2013, descendent from 2013 to 2016 and ascendent again from 2016 to 2019, exactly after the entrance into force of the Paris Agreement. Control group instead shows large variation from one year to another. In the first observed year it passes from -12% to -18%, then it initiates an upward slope trend that, without the 2016 data point, would have continued until 2017, only to descend and ascend the two years after.

As mentioned before, searching for parallel trends of profitability between the two groups in this case remains challenging, so even if the regression coefficients were significant at a 5% level, it is best to still trust them but with more caution.

6.1.5 Return on assets trends in the United States

The analysis of profitability presented some inconveniences in the United States sample as well, and this time for both trends, as it is possible to see from Fig 6. 17 companies out of the 155 using fossil fuels reported values below the 5^{th} percentile in 2016, compared to 4 and 7 in the previous and the subsequent year, respectively. The lowest peak reached in that year is presumably attributable to this intense presence of values below -84%. Additionally, related to the control group, the highest peak in 2015 corresponds to a year where the values exceeding 30% were 3, while in all previous years and the exact subsequent year there were none. Even though it was single companies showing most of the low values in different years as well, some problems in the data could have occurred causing such a high presence of extreme values all

concentrated there. In this case reminding about this is crucial to avoid being biased when looking at the graph and the trends in profitability.

Even if an analysis here will not be fully relevant since the trends have been heavily influenced by really low or high values, it would still be reasonable to discuss about some characteristics of them.

Treated companies before 2015 see their profitability relatively constant over time, varying only by few percentage points. After that year the main problem occurred so it becomes less relevant to look specifically at 2016, but if we analyze after, we can observe a return to almost previous levels, reaching a value of around -4%.

Instead, their peers who only use renewable sources to produce energy started from a value of -14%, descending in the first year but starting a growing trend afterwards. However, this could have been influenced by the higher presence of values above 30% in 2015. After this peak, profitability started to decline constantly, apart from a small bounce between 2017 and 2018.

Out of the 4 graphs presented, this one occurs to be the most biased by single years values. This is relevant to the robustness analysis and brings us to take even more cautiously the results from the profitability analysis in the United States.

6.2 Robustness check with time period change

As the final part of the robustness check we will present some tables similar to the ones in the main analysis. We want to examine how robust and significant our results are, checking possible differences between our main results and these ones obtained by changing the period post Paris Agreement. In the analysis we have done the examination using 2012, 2013 and 2014 as years pre Paris Agreement and 2017, 2018 and 2019 as years post Agreement, to study the effects taking in consideration both crucial moments, the signing and the entrance into effect. In the robustness check we will change the years post Agreement using 2016, 2017 and 2018. In this way we will take in consideration 2016, the year immediately after the signing, to see if a different chosen time period can lead to important differences in the results.

6.2.1 Capital expenditure over total assets in Europe

As it is possible to see, Table 5 and Table 1 present truly similar coefficients, and the main results keep the same meaning. However, “Treated*After” Beta which was significant but only at a 10% level in Table 1, even if really close to 5%, notably suffers the period change, losing its previously owned statistical power. While we can not say immediately that the first result

was weak and not relevant, we must keep in mind this loss of significance due to this shift of the considered period. Furthermore, we need also to keep in mind that in 2016 the Paris Agreement has not entered into force yet, so the key effects it could have caused were still not fully present that year.

6.2.2 Capital expenditure over total assets in the United States

We test now the robustness of the outcomes retrieved from the regression about the effects of the Paris Agreement on capital expenditure over total assets of United States energy firms. We present the results in table 6, similarly to European one, with a shift of the period post Agreement, which started here in 2016 instead of 2017. As it is observable comparing Table 6 with Table 2, the results did not see almost any change, confirming the robustness of the ones provided earlier. The constant and the coefficients of "Treated" and "Treated*After" keep their statistical explanatory power, remaining significant at a 5% level.

6.2.3 Return on assets in Europe

Shifting the focus on the profitability robustness testing we present Table 7. We obtained it by starting the 3 years period post Paris Agreement one year earlier and now we can compare these results with Table 3. Aside from the Beta of the variable "After" which lost its 10% level significance, all the other coefficients kept their statistical power, remaining almost identical to the ones of the main regression. Thus, we can assume the results we exhibited earlier are relatively robust and do not get influenced significantly by one year shift. However, it is still relevant to consider all the information presented to have a broader view of the conclusions, but with a higher confidence in the explanatory power of the results in Table 3.

6.2.4 Return on assets in the United States

Entering now the final part of the robustness check regarding the last part of the second section, the one where we analyzed profitability, a particular result stands out in Table 8. The "Treated*After" variable presents a coefficient that is significant at a 5% level, different from the one in Table 4 which was not, neither at a 10% level. This arises questions regarding the robustness of the results in Table 4, but it is fundamental to remind of Donald Trump's willingness of withdrawing from the Agreement which has been declared in 2017. So, as we can remember from some studies already cited, stringent policies do not favour profitability (Benatti et al. (2023)). Therefore, the result in Table 4 which do not confirm the hypothesis that

the Paris Agreement had a negative impact on returns of these firms can be attributed to the Trump administration that, eager to leave the agreement, did not pass significant laws in protection for the environment.

7 Conclusions

From this study we can conclude that the Paris Agreement negatively influenced investments of polluting energy companies, both in Europe and the United States. New goals and policies adopted by every state after the entrance into force of the Paris Agreement in November 2016 can be some of the reasons behind this outcome. Additionally, the uncertainty created by a changing policy scenario possibly made the polluting companies, stronger affected by it, take the decision of delaying their investments waiting for a more stable period to deploy the capital. While in Europe the result changed when the period analyzed shifted back by one year, demonstrating some weaknesses, United States "Treated*After" coefficient kept its statistical power, showing robustness to changes.

Robustness checks using pre-test of parallel trends added some additional strength to the already significant results, confirming the Paris Agreement effects on the treated companies of this analysis.

Regarding profitability, in Europe the "Treated*After" negative coefficient presented statistical power, implicating a negative effect on profitability of polluting energy firms, further confirmed by the robustness check with the period shift. Instead, in the United States we have not found statistical significance, possibly meaning an absence of impact on profitability from the Paris Agreement on these companies, which is in line with the mixed results provided by the already existing literature (Zhang (2021), Fu, Yang, and Jian (2022) and Ambec and Barla (2006)). On the robustness of the analysis of profitability some doubts remain, especially about United States where, both the robustness checks did not provide supporting results. Indeed, the pre-test for parallel trends could not provide reliable results due to the large presence of more extreme data points concentrated in few years, and the analysis with the period shift provided a coefficient that, differing from the main result, gained statistical explanatory power. Regarding Europe, the pre-test of parallel trends presented similar problems to the one in the US, with some negative values concentrated in one year that highly influenced the average. The analysis with the period shift instead produced similar results, confirming the negative significant coefficient for the variable "Treated*After", partially corroborating the robustness of the results.

8 Limitations

This study adds to the already existing literature on the topic, trying to fill the gap on understanding how climate agreements can influence investments and profitability of companies, in this case specifically in the energy sector. Some limitations could have occurred as a result of missing data or mistakes in reporting it, which we have taken care of with a winsorization. This approach minimizes the influence of extreme outliers, but if the dataset were already free of outliers no adjustments would be necessary, leaving it unmodified. Literature on this topic presents mixed results on the outcomes of more or less stringent policies. Julio and Yook (2012) show that political uncertainty during elections reduces investment by 4.8%, while Gulen and Ion (2016) link policy uncertainty to lower investments, especially for firms with irreversible projects or government reliance.

Environmental regulations also show varied impacts. Zhou, Song, and Huang (2023) find they drive green innovation and long-term performance but can force firms to exit or shift industries. On the contrary, Fu, Yang, and Jian (2022) report positive effects on performance, based also on the stringency of the regulations, while Farooq et al. (2024) highlight reduced investment due to stricter policies, despite green innovation benefits.

Other studies instead emphasize the design and the context. Huang, Sim, and Zhao (2020) find CSR improves performance when economic factors are accounted for, and Zhang (2021) argues well-crafted environmental policies enhance both economic and environmental outcomes. These mixed results highlight the complexity that arises when discovering potentials and drawbacks of policies and the uncertainty generated from them.

Future studies will have the job of clarifying in which direction these policies influence firms. This study focused mainly on the energy sector, being it a crucial player in the environmental scenario. However, future studies can broaden the analysis to other industries, developing additional essential knowledge on this topic. This will be crucial as further information becomes more and more fundamental in order to deal with climate change.

Furthermore, future studies will also be able to consider more recent agreements and policies, potentially utilizing updated data to draw even precise conclusions.

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10 Appendix

Figure 1

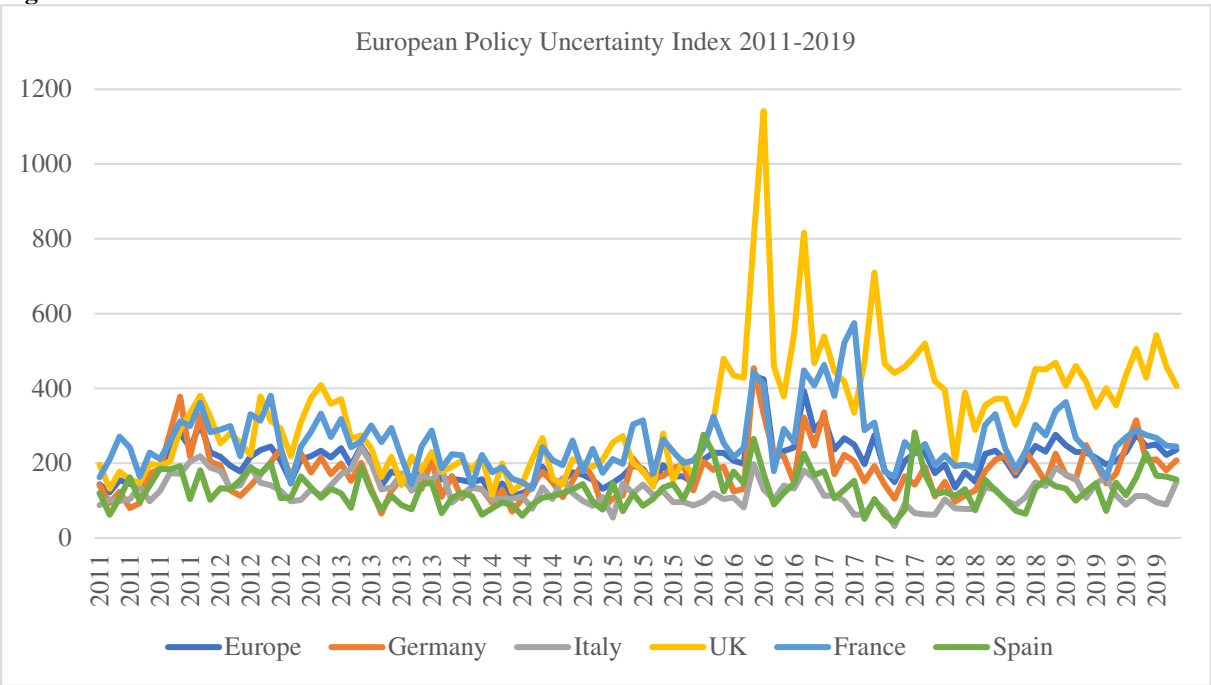

Fig. 1: European Policy Uncertainty Index based on newspaper coverage frequency 2011-2019 (https://www.policyuncertainty.com/about.html)

Figure 2

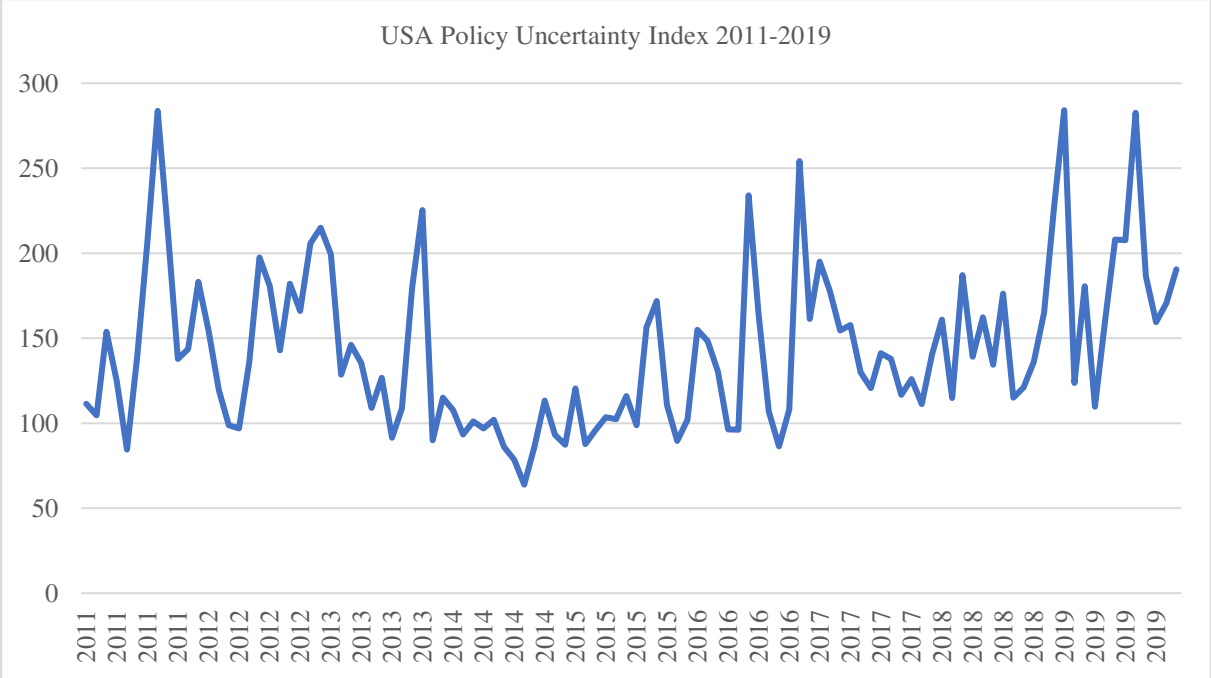

Fig. 2: USA Policy Uncertainty Index based on newspaper coverage frequency 2011-2019 (https://www.policyuncertainty.com/about.html)

Figure 3

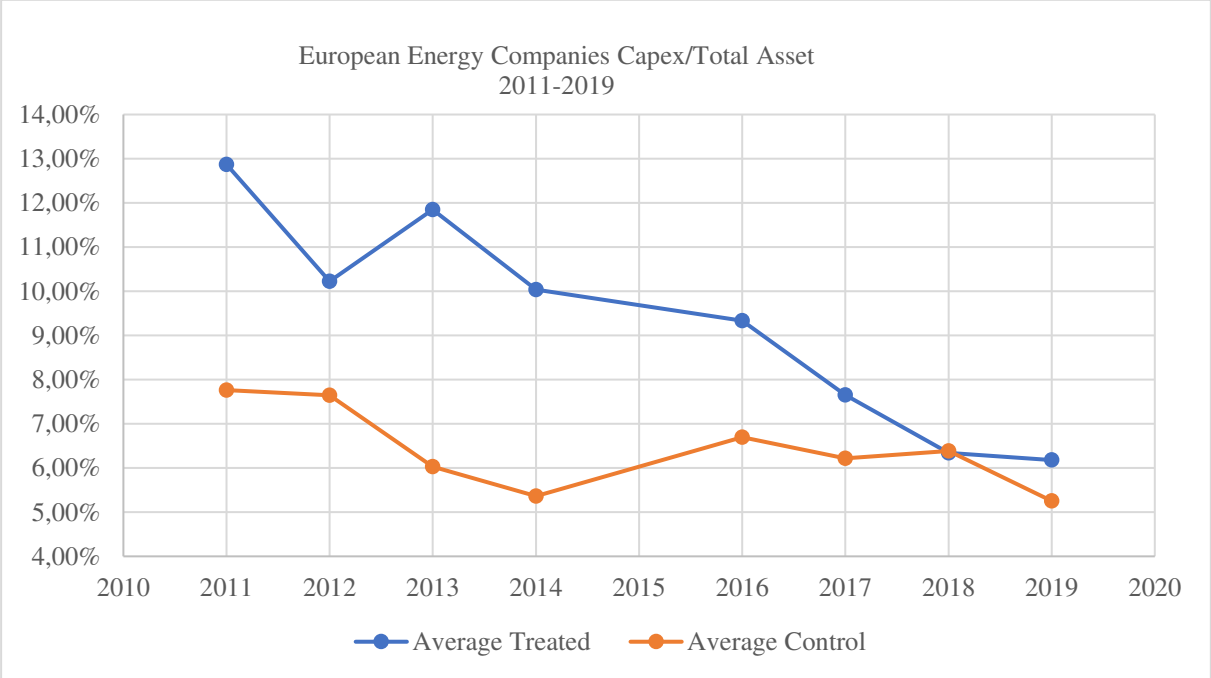

Fig 3: Capital Expenditure/Total assets of European companies 2011-2019

Figure 4

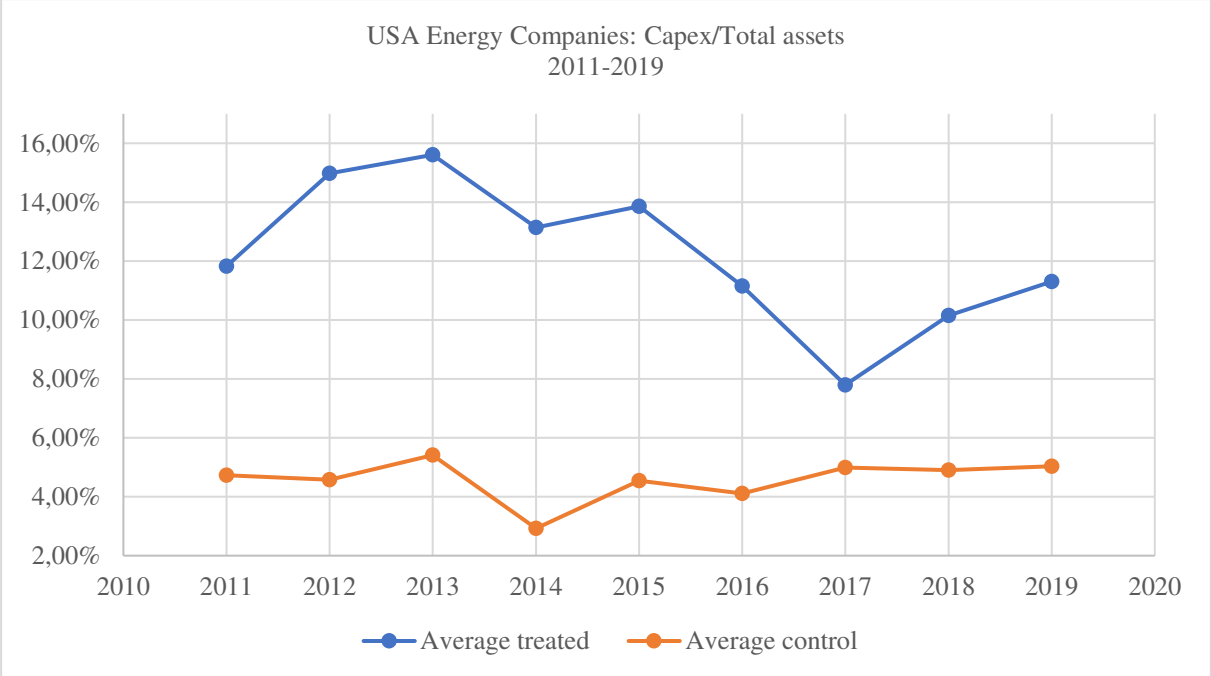

Fig 4: USA Energy Companies: Capital Expenditure/Total assets 2011-2019

Figure 5

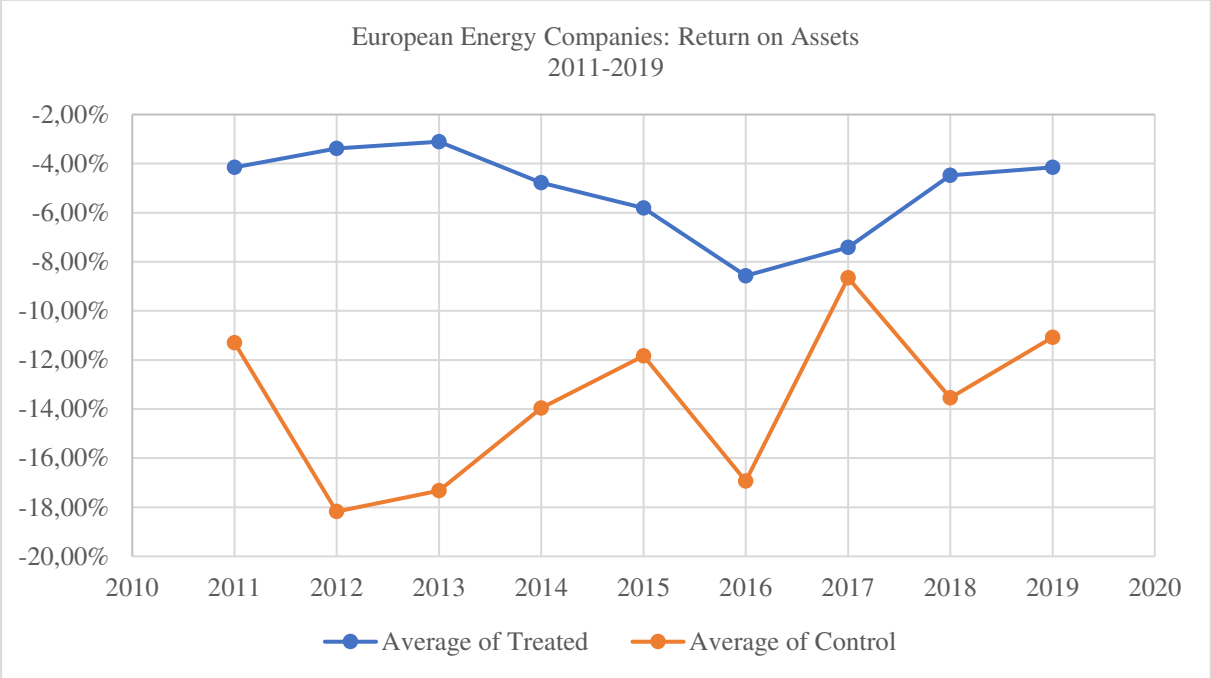

Fig 5: European Energy Companies: Return on Assets 2011-2019

Figure 6

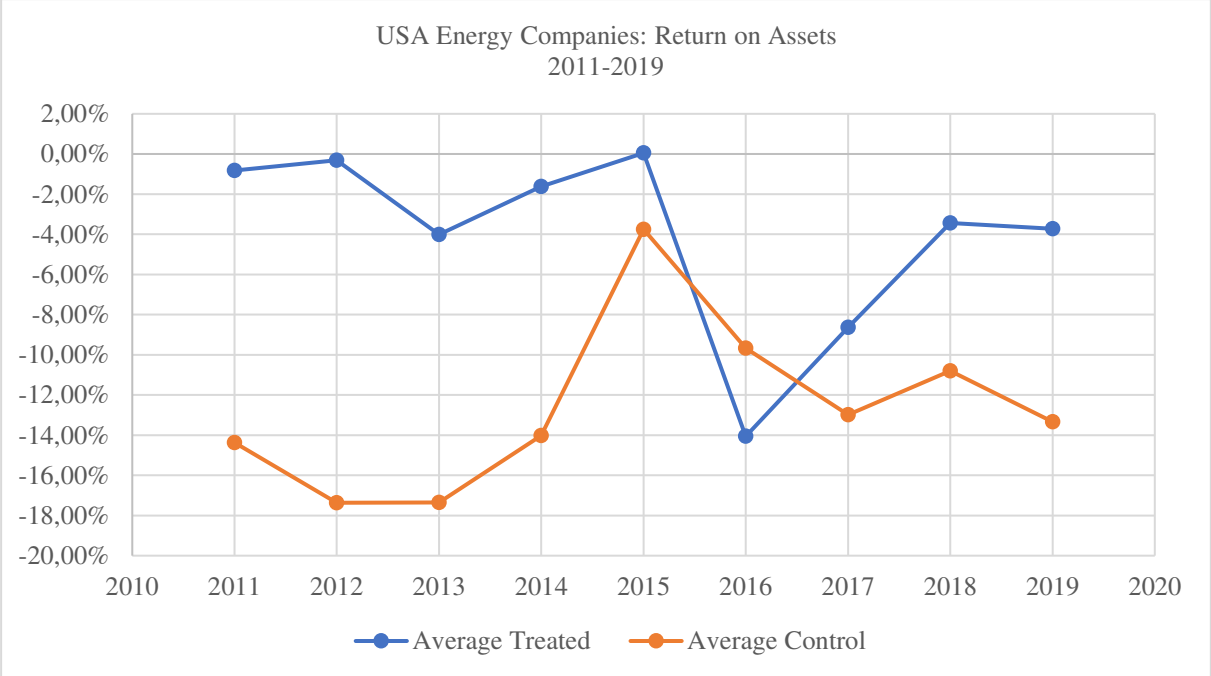

Fig 6: USA Energy Companies: Return on Assets 2011-2019

Table 1: European regression Capital Expenditure over Total Assets

Independent Variables	Dependent Variable: Capital Expenditure/ Total Assets
Treated	0.0530***
	(3.54)
After	-0.00394
	(-0.24)
Treated*After	-0.0358*
	(-1.96)
_cons	0.0668***
	(4.48)
N	672

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1: European firms Capital Expenditure over Total Assets: 2012-2013-2014 years as pre Paris Agreement and 2017-2018-2019 as years post Paris Agreement

Table 2: United States regression Capital Expenditure over Total Assets

Independent Variables	Dependent Variable: Capital Expenditure/ Total Assets
Treated	0.102***
	(5.97)
After	0.00670
	(0.30)
Treated*After	-0.0546**
	(-2.25)
_cons	0.0430***
	(2.72)
N	972

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: United States firms Capital Expenditure over Total Assets: 2012-2013-2014 years as pre Paris Agreement and 2017-2018-2019 as years post Paris Agreement

Table 3: European regression Return on Assets

Independent Variables	Dependent Variable: Return on Assets
Treated	0.175***
	(7.22)
After	0.0539*
	(1.94)
Treated*After	-0.0699**
	(-2.31)
_cons	-0.252***
	(-10.38)
N	750

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: European firms Return on Assets: 2012-2013-2014 years as pre Paris Agreement and 2017-2018-2019 as years post Paris Agreement

Table 4: United States regression Return on Assets

Independent Variables	Dependent Variable: Return on Assets
Treated	0.143***
	(4.40)
After	0.0387
	(0.91)
Treated*After	-0.0716
	(-1.56)
_cons	-0.162***
	(-5.38)
N	1074

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: United States firms Return on Assets: 2012-2013-2014 years as pre Paris Agreement and 2017-2018-2019 as years post Paris Agreement

Table 5: European regression Capital Expenditure over Total Assets

Independent Variables	Dependent Variable: Capital Expenditure/ Total Assets
Treated	0.0478***
	(3.03)
After	0.000880
	(0.05)
Treated*After	-0.0301
	(-1.57)
_cons	0.0748***
	(4.77)
N	672

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: European firms Capital Expenditure over Total Assets: 2012-2013-2014 years as pre Paris Agreement and 2016-2017-2018 as years post Paris Agreement

Table 6: United States regression Capital Expenditure over Total Assets

Independent Variables	Dependent Variable: Capital Expenditure/ Total Assets
Treated	0.102***
	(6.06)
After	0.00365
	(0.17)
Treated*After	-0.0521**
	(-2.18)
_cons	0.0430***
	(2.76)
N	972

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: United States firms Capital Expenditure over Total Assets: 2012-2013-2014 years as pre Paris Agreement and 2016-2017-2018 as years post Paris Agreement

Table 7: European regression Return on Assets

Independent Variables	Dependent Variable: Return on Assets
Treated	0.175***
	(6.91)
After	0.0344
	(1.18)
Treated*After	-0.0651**
	(-2.05)
_cons	-0.257***
	(-10.09)
N	750

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: European firms Return on Assets: 2012-2013-2014 years as pre Paris Agreement and 2016-2017-2018 as years post Paris Agreement

Table 8: United States regression Return on Assets

Independent Variables	Dependent Variable: Return on Assets
Treated	0.143***
	(4.22)
After	0.0509
	(1.14)
Treated*After	-0.118**
	(-2.47)
_cons	-0.162***
	(-5.16)
N	1074

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: United States firms Return on Assets: 2012-2013-2014 years as pre Paris Agreement and 2016-2017-2018 as years post Paris Agreement

Table 9: European regression Capital Expenditure over Total Assets with Country Fixed Effects

Independent Variables	Dependent Variable: Capital Expenditure/ Total Asset
AustriaFE	-0.0297
	(-1.15)
BelgiumFE	-0.0356*
	(-1.90)
DenmarkFE	-0.00892
	(-0.24)
FinlandFE	0.00871
	(0.31)
FranceFE	-0.0423***
	(-3.20)
GermanyFE	0.00830
	(0.51)
GreeceFE	-0.0478***
	(-3.28)
IrelandFE	-0.0202
	(-1.09)
ItalyFE	-0.0392***
	(-2.69)
LuxembourgFE	-0.00319
	(-0.15)
NetherlandsFE	-0.0327
	(-1.54)
NorwayFE	0.00274
	(0.26)
PortugalFE	-0.0474*
	(-1.84)
SpainFE	-0.0654**
	(-2.54)
SwedenFE	0.0879***
	(4.09)
SwitzerlandFE	-0.0327
	(-0.87)
Treated	0.0530***
	(3.54)
After	-0.00394
	(-0.24)
Treated*After	-0.0358*
	(-1.96)

_cons	0.0668***
	(4.48)
N	672

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: European firms Capital Expenditure over Total Assets: 2012-2013-2014 years as pre Paris Agreement and 2017-2018-2019 as years post Paris Agreement

Table 10: European regression Return on Assets with Country Fixed Effects

Independent Variables	Dependent Variable: Return on Assets
AustriaFE	0.122***
	(2.77)
BelgiumFE	0.112***
	(3.50)
DenmarkFE	0.235***
	(3.68)
FinlandFE	0.143***
	(3.01)
FranceFE	0.131***
	(5.85)
GermanyFE	0.134***
	(5.55)
GreeceFE	0.120***
	(4.85)
IrelandFE	-0.0730***
	(-2.76)
ItalyFE	0.0930***
	(3.51)
LuxembourgFE	0.0847**
	(2.33)
NetherlandsFE	0.107***
	(2.95)
NorwayFE	0.0303*
	(1.84)
PortugalFE	0.0804*
	(1.83)
SpainFE	0.117***
	(2.65)
SwedenFE	-0.0746**
	(-2.54)
SwitzerlandFE	0.0904
	(1.41)

Treated	0.175***
	(7.22)
After	0.0539*
	(1.94)
Treated*After	-0.0699**
	(-2.31)
_cons	-0.252***
	(-10.38)
N	750

t statistics in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: European firms Return on Assets: 2012-2013-2014 years as pre Paris Agreement and 2017-2018-2019 as years post Paris Agreement