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"Relationship between Profitability and Sustainability through a Difference-in-differences Approach using The Paris Agreement as a Shock to ESG Ratings"

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Abstract

This paper explores the relationship between sustainability through the ESG metrics and profitability through stock price and return on assets (ROA). Data is collected for 312 companies divided into two sectors: financial and energy. After the Paris Agreement there was a change in sustainable indexes parameters due to changes in government goals and expectations. By using the MSCI sustainable index a Difference-in-differences (DID) analysis is done taking into account this shock to see from which side the relation is coming from. The results suggest that for the energy market, firms who were rated sustainable during the agreement grew 5% more than firms who were rated non-sustainable. For the financial market no significant differences were found. These results are important for corporate strategies and investors regarding sustainability. They show that in some markets increasing sustainable ratings has a positive effect on a company's profitability measures.

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Introduction

Environmental, social and governance (ESG) criteria works as a tool to measure the key sustainable metrics of a company's performance. Its main purpose is to show a company's consumers and stakeholders the opportunities, risks, goals, and business practices regarding sustainability. The ESG criteria works as a general rating and is composed of 3 main components that try to approximate a general measure of sustainability in a specific area. *Environmental* includes the energy efficiency usage, resource intake, waste management and climate change contribution a firm makes in order to operate. *Social* addresses human rights, labor standards, inclusion with society and relationship with institutions in the community. *Governance* examines the internal organization system of a company including practices, controls, and procedures in order to make decisions and carry them out.

In this paper, I try to answer the question whether stock prices and return on assets (ROA), truly reflect a company's commitment to sustainability through the ESG variables. This question is relevant because finding a causal relation between sustainable variables and market returns will help investors and companies make clearer decisions regarding sustainability. For example, a situation that companies always have trouble assessing is, if they should invest in becoming more socially and environmentally conscious by sacrificing part of their profits in the short-run. Another situation arises from an investor's decision whether to invest in a more sustainable company or in a less sustainable, with other focuses. Becoming more sustainable might be rewarding in many different ways for a company, for example, by gaining more market value and loyalty (Henisz Witold et al., 2019). The following questions then present whether it is more profitable to invest in sustainable practices because of some direct and indirect benefit or, if investing in these sustainable practices sacrifices efficiency and profitability. Knowing this relationship and, finding an explanation for these will help investors, companies and policy makers trying to make decisions regarding sustainable practices.

There has been extensive research regarding this topic in the last few years and the majority of the papers have found a positive relation between stock prices and sustainable commitment. The problem is that the cause of this relation is unknown. There are two possible scenarios: First, a company is doing well in the market because of other external reasons and then decides to become more sustainable with the extra profits it has. Second, a company invested in being more sustainable, and as a consequence is doing well in the market.

After the Paris Agreement in April of 2016 there was a significant change in ESG ratings. Specifically, in the "E" component. Companies that were more exposed to environmental risks saw their ratings decrease in comparison to more environmentally friendly companies**.** By looking at this event as a shock to sustainable ratings, the problem is then approached with a Difference-in-differences technique. The studied effect can be interpreted as the change in sustainable companies' stock price and return on assets (ROA) after the Paris Agreement. Firstly, companies in the MSCI database were separated into two different groups: sustainable (rated A or higher in ESG rating) and not sustainable (rated BBB or lower in ESG rating) during the Paris Agreement. This way, the "rater effect" and discrepancy between rating companies was minimized by clustering companies in the top quartiles into general categories (Berg Florian et al., 2019)**.** Secondly, companies were separated into two different sectors: financial and energy. This was done because, if there is an effect, then it is expected to be more significant in the energy sector because of the type of market. For the financial sector, consequences are bigger if there is an effect but expected to be smaller or not significant. The resulting sample is therefore: 167 companies for the financial sector of which 115 were rated not sustainable and 52 sustainable during the Paris Agreement and 145 for the energy sector of which 92 were rated not sustainable and 53 sustainable. Monthly and yearly data for ROA, stock prices and ESG sustainability index was collected for each company from the year 1998 to 2018.

The estimated Difference-in-differences model can be interpreted as a simple OLS with an interaction term consisting in a dummy variable for post Paris Agreement date multiplied by another dummy variable for a company being sustainable during this event. The dependent variables are measures of profitability consisting in stock prices and ROA. The analysis is done through different periods of time after the Paris Agreement, specifically 1 month, 2 months, 6 months and 1 year after the event took place.

The results for the financial sector are not significant for all time specifications for both ROA and stock prices as dependent variables. For the energy sector, positive significant results for stock prices 1 year after the Paris Agreement are found, suggesting that sustainable companies in the energy sector grew on average 5% more annually than not sustainable ones.

The paper is divided into 5 sections: The first section consists in the literature review of previous studies regarding the topic of sustainability through the ESG variables and its relationship with measures of profitability. In the second part, the structure, sources and main statistics of the data and variables used in this study are presented. For the third part, the methodology, main assumptions, and possible problems are discussed and explained. In the fourth section results are presented, interpreted, and given a possible explanation. The paper ends with a conclusion and recommendations.

Literature Review

In recent years investors and stakeholders have developed a big interest in the ESG variables for long-term decisions and investments, (Balluchi et al., 2021). Because of this, a big increase in sustainable investment has also been observed. The Global Investment Alliance found that global sustainable investments increased from $13.3 trillion in 2012 to $30.7 trillion in 2019. Nowadays, almost every company in the market deals with decisions regarding this topic. For example, sustainable ratings for companies in the top-polluting sectors classified by the European Union, such as electricity, gas, and air conditioner supply, saw a significant decrease after the Paris Agreement, (Carbone Sante et al., 2021).

Among researchers, there has been an ongoing debate whether adding more sustainable layers to a firm's composition increases its value. As discussed by (Milton Friedman 1970), the sole responsibility of a company is to increase its shareholders value, therefore, to increase profits. Studies based on this assumption have expressed different point of views and have found different results. Some argue that focusing on sustainable factors (ESG) reduces the firm's efficiency, therefore decreasing its value. For example, (Walley and Whitehead, 1994**)** argued that a firm's costs of adhering to sustainable standards will be reflected in higher product prices, creating a competitive disadvantage, and lowering profitability. Other studies like (Porter and van der Linde, 1995) and (Fish Alexander et al., 2019) state that an improvement in social or environmental standards can actually lead to an enhancement in the input-output process by reducing the usage cost of resources and/or generating new market opportunities. (Damodaran and Cornell, 2020) also argued that an improvement in the ESG variables rewards companies through lower discount rates and a better relationship with the regulating authorities causing more flexibility with fines and law protocols. Another type of research focuses on discussing how data disclosure has a positive impact on a company's ratings, therefore investment and profits, and how this effect outweighs the negative effect of the change in the production process as a consequence of a more sustainable approach (Reuters, 2017). Also, the disclosure of a solid plan for a future sustainable

transition has a positive impact on a company's environmental rating, (Carbone Sante et al., 2021). What all these studies have in common is that they try to capture a relationship between sustainability, profitability, and data disclosure but none of them look for a causal interpretation for this relation. By analyzing a sample of 2000 studies, (Henisz Witold et al., 2019) found that 68% of them displayed a positive correlation, 24% no correlation, 8% a negative correlation, but no causality. The problem is that the source of the relation is unknown. There are two possible scenarios: First, a company is doing well in the market because of other external reasons and then decides to become more sustainable with its surplus. Second, a company invested in being more sustainable, therefore it is doing well in the market because of it. Another important aspect to consider is that in practice investors act as if there is causality and assume that investment in sustainability entails a better market performance (Bernow Sara et al., 2019), even though causality has not been proven yet. This study is different because it tries to give a causal interpretation on the results through the difference-in-difference approach even though the parallel trends assumption is not completely fulfilled.

In his research, (Cornell and Damodaran, 2020) raised 3 fundamental questions: First, do companies with a greater sustainable mindset create more value than companies with a less sustainable mindset? Second, do market prices reflect these sustainable mindsets? Third, are investment returns affected by these mindsets?

In the first question, (Henisz Witold et al., 2019) found 5 reasons on how a strong ESG position adds value: It facilitates top-line growth, reduces costs, minimizes regulatory and legal interventions, increases employee productivity, and optimizes investment and capital expenditures. (Cornell and Damodaran, 2020) also found significant evidence that supports this position, in particular they found that having a strong ESG position reduces the discount rate, optimizing investment and that a weak ESG position punishes companies by increasing regulatory and legal interventions.

For the last question, studies were first done by measuring sustainable mutual funds returns and comparing them to the conventional or non-sustainable ones (Bauer Rob et al., 2002) and (Statman, 2000). Later, (Bauer Rob et al., 2004) argued that measuring returns through mutual funds gives biased results because of the non-quantifiable aspects such as portfolio management and does the comparison with two different portfolios that only differ in the "E" (environmental) characteristic. They found that portfolios with a higher "E" rating indeed have increased returns when controlling for other variables. A more recent study focusing only on the US and Europe and taking into account all 3 of the ESG components, also found an increase in portfolios returns for a high ESG rating (Fish Alexander et al., 2019), therefore answering the question that investor returns are affected positively by a good ESG rating.

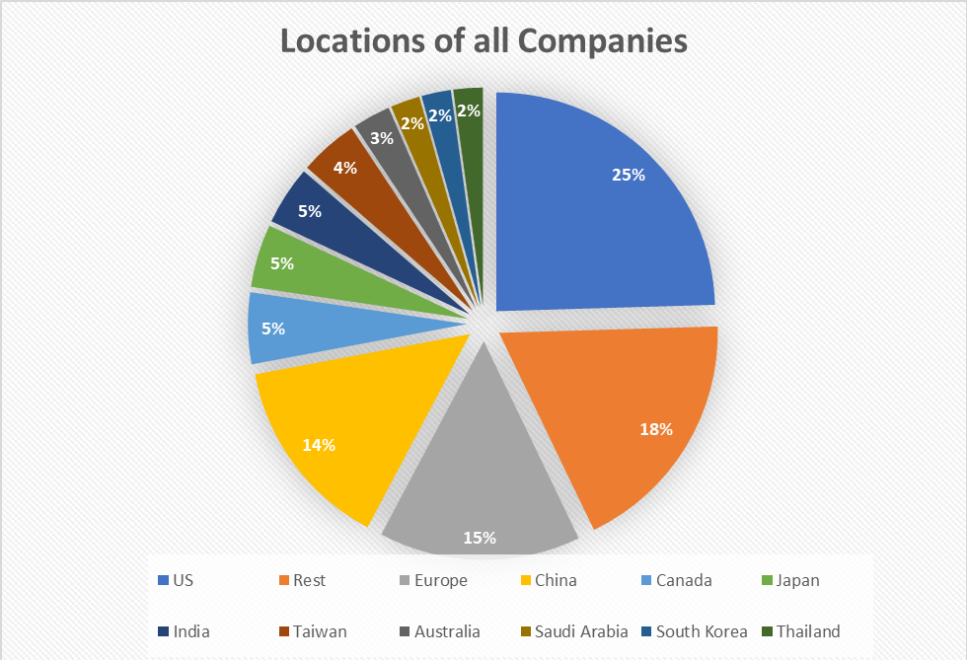
The second question can be approached by looking at a company's different indicators like ROA, ROE, ROI, PM, EBITDA, or stock price. By looking at multiple stocks in a sustainable fund and comparing them to stocks outside of the fund, (Cornell and Damodaran, 2020) found that the relationship between market pricing and ESG values is weak. As argued before, this method might have a bias because of the non-quantifiable aspect (Bauer Rob et al., 2004).

This paper focuses on this second question through a completely different econometric approach based on a global shock in sustainable ratings. It also takes into account ratings discrepancies, specifically the top quartile discrepancy, which suggests that 20% of the companies in the upper and lower quartile are much less correlated among rating companies than the companies in between (Berg Florian et al., 2019). Finally, the effect of being sustainable against a company's profitability measures is separated for two different sectors, energy and financial. The expected result of doing this is that the effect would be better seen in the energy market, but the implications will be stronger in the financial sector.

Data and Variables

To construct the data set used in this research, companies around the world in the MSCI sustainability index dataset were divided by industry sector. 167 companies were used for the financial sector and 145 companies for the energy sector. For each company, monthly data on stock price from 1998 to 2018 was collected from Yahoo Finance and Marketwatch. For the stock prices, data was converted in logs and then first differences were taken in order to convert them into growth rates. This was done in order for comparisons between different stock indexes, that use different prices, to be valid. Data on the geographical location of the company was also added and a dummy variable was created if the company main headquarters was located in a country which is part of the Organization for Economic Co-operation and Development (OECD).

Figure 1: *Companies geographical locations. Source: Own elaboration with data from OSIRIS.*



For the other financial measures such as return on assets (ROA), and Profit Margin annual data was used. The values were collected from the OSIRIS database from 2002 to 2018. These values are in percentages and are unitless so comparison between different companies with different currencies is possible. Finally, a dummy variable for "being sustainable" during the Paris Agreement was added,

taking the value 1 if a company was rated A or more and 0 if a company was rated BBB or lower by the MSCI sustainability ratings. These ratings go from CCC to being the lowest possible grade all the way up to AAA being the highest rating.

Descriptive Statistics

Summary statistics on stock growth rates, return on assets (ROA), Profit Margin, sustainable dummy during the Paris Agreement and OECD dummy are provided in table 1.

Table 1: *Summary statistics of all variables.*

Variable	Observations	Mean	Std. Dev.	Min	Max	Median
Monthly Energy Stock Prices Growth Rates	27,062	0.0025745	0.10206	-2.3724	1.6806	0.0051393
Monthly Financial Stock Prices Growth Rates	26,924	0.00089025	0.11603	-4.75	1.558	0.0036656
Yearly Energy Stock Prices Growth Rates	2410	0.030218	0.3779	-2.3884	1.9989	0.053185
Yearly Financial Stock Prices Growth Rates	2349	0.020052	0.32884	-3.8761	1.8322	0.02405
ROA Energy	2,236	5.4149	9.5102	-80.8	44.83	4.825
ROA Financial	2,004	1.6559	2.6462	-58.15	22.8	1.33
Profit Margins Energy	2,174	13.8	18.623	-99.38	96.3	12.335
Profit Margins Financial	1,952	35.209	20.469	-96.18	98.2	37.8
Sustainability Dummy Energy	3045	0.36552	0.48165	0	1	0
Sustainability Dummy Financial	3,423	0.30704	0.46133	0	1	0
OECD Dummy Energy	3,045	0.67586	0.46813	0	1	1
OECD Dummy Financial	3,423	0.52761	0.49931	0	1	1

*Note: The complete definition of all variables is given in Appendix. Source: Own elaboration with data from MSCI.

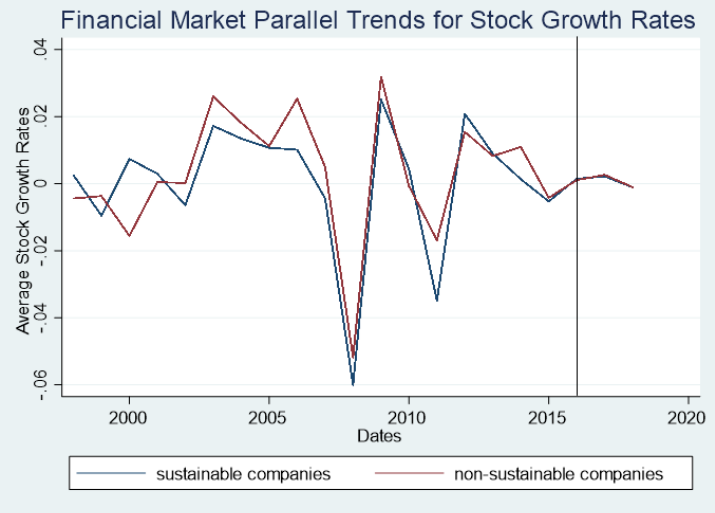
The number of observations vary in different variables, because data from some companies was available for the whole-time range subject to the analysis, while others had data from more recent years. This could result in a sample selection problem by omitting data, but as (Berg Florian et al., 2019) proved that it is worse for a company to omit data in its performance, we assume there is no significant problem. The structure follows a panel data form for a total of 312 companies.

In order to do a Difference-in-differences approach, the main assumption that has to be proven is the "Parallel Trends" assumption. The number of dependent variables that were subject to the analysis are 3, stock price, ROA, and Profit Margin. This means that the "Parallel Trends" assumption has to be fulfilled in each case in order for the results to be consistent.

In the case for both the financial and energy sector, the parallel trends assumption likely holds for the variables of stock price and ROA. For the Profit Margin specification, the assumption clearly does not hold (Appendix figure X).

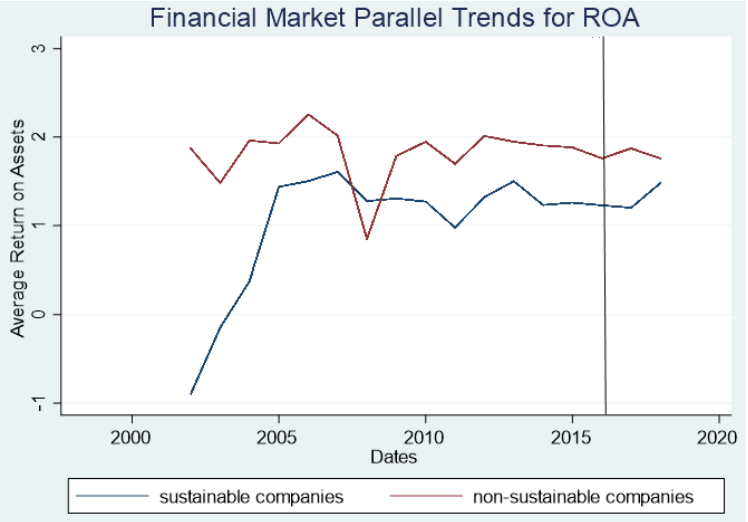
Figures **2, 3, 4** and **5** show the "Parallel Trends" assumption for stock growth rates and ROA.

Figure 2: *Parallel trends assumption of financial sector for stock growth rates. Source: Own elaboration with data from Yahoo Finance.*



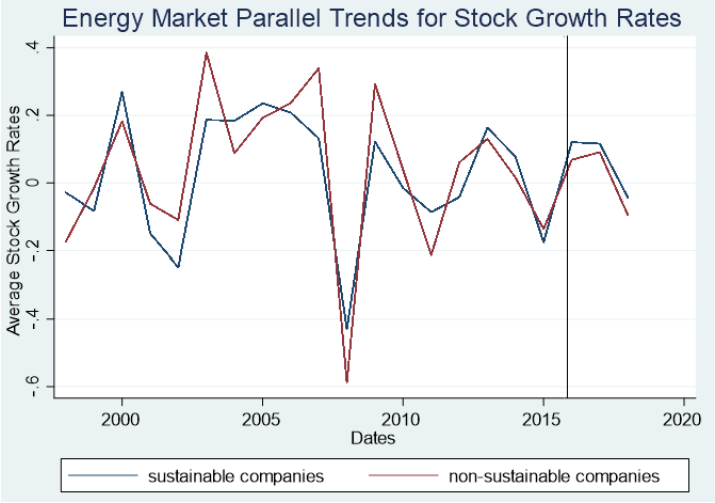
In this first graph we can observe that financial companies' stock growth rate likely followed a parallel trend during the sample period. After the Paris Agreement there is almost no difference between trends, which is surprising for our analysis. One will expect to see a difference after the changes in sustainable ratings but here, it is clearly not seen, but maybe it will be seen in later periods. The expected outcome of this specification is not significant which will be shown later in the analysis.

Figure 3: *Parallel trends assumption of financial sector for ROA. Source: Own elaboration with data from OSIRIS.*



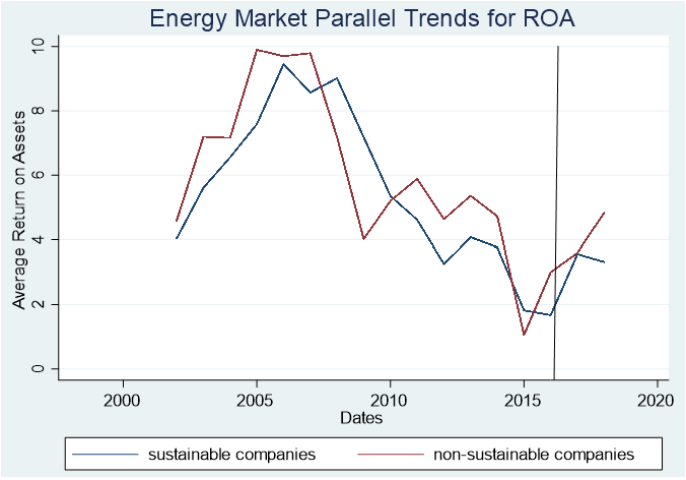
This graph we can observe that not sustainable financial companies have better ROA than sustainable across our sample. It is not that clear if there is an effect after the Paris Agreement.

Figure 4: *Parallel trends assumption of energy sector for stock growth rates. Source: Own elaboration with data from Yahoo Finance.*



This is the most interesting graph, where we can observe some changes in trends before, after and during the 2008 financial crisis. They follow a similar path until 2016 which is our event of interest. After the Paris Agreement we can observe that the sustainable companies tend to grow more than the non-sustainable, which is consistent with our main arguments.

Figure 5: *Parallel trends assumption of energy sector for ROA. Source: Own elaboration with data from OSIRIS.*



For this last specification, the parallel trends assumption is questionable because there are clearly some differences in trends before 2016. It seems like, in general, non-sustainable companies seem to have a higher ROA just like the financial market, and there doesn't seem to be a significant effect after the Paris Agreement.

Methodology and Results

As explained before, the analysis consists of a Difference-in-differences approach (DID). The Paris Agreement in 2016 will serve as an external shock to sustainable ratings because it may have shifted the assessment of credit rating companies (Moody's Investors Service, 2016). This shock is a consequence of a change in governments goals and expectations in regard to climate change. This change in the government policies affects sustainable ratings parameters. Sustainable companies, who were more exposed to environmental risks, saw their credits deteriorate in relation with others who followed a less sustainable path from the beginning, with the effect being larger for European firms than the rest (Carbone Sante et al., 2021).

The experimental group for this methodology are the companies who were rated sustainable by MSCI during the events of the Paris Agreement and saw changes afterwards in sustainable parameters, due to government expectations and goals. The control group are the companies who did not follow a sustainable path during and before this event and saw almost no changes in their ratings. The dependent variable will consist of two different profitability measures, ROA, and stock growth rate. The model will then look as following:

$$Rentability = \alpha + \beta_0 PostParisAgreement + \beta_1 SustainablePath + \beta_2 PostParisAgreement \times SustainablePath + \varepsilon \quad \textbf{(1)}$$

The variable $PostTimeDummyPA$ is a dummy that takes value 0 if the observation date is before the Paris Agreement and value of 1 after. $SustainablePath$ is also a dummy which takes a value of 1 if a company followed a sustainable path during the Paris Agreement and 0 otherwise. The interaction term takes a value of 1 if the company followed a sustainable path and after The Paris Agreement. The coefficient of interest, and what this paper focuses on, is β_2 which reflects the effect of the change in

sustainable indexes on profitability for sustainable companies. If the value is negative, then it will mean that sustainable companies grew less than not sustainable companies after the Paris Agreement. If the value is positive, then it will suggest that the sustainable companies grew more. The 2000 analyzed studies on this topic by (Henisz Witold et al., 2019) tells us that this value is expected to be not significant and, in case of being significant, it will be a small positive number.

The first set of results uses specifications from equation (1) with the time dummy taking different values, depending on the post-observable period. The results are presented in table (2).

Table 2: *Results of monthly stock rates Difference-in-differences regression.*

Dependent variable (Y): Monthly Stock Growth Rate					
Variables	Same Month After Paris Agreement	1 Month After	2 Months After	6 Months After	1 Year After
Financial Market					
Time Dummy Paris Agreement	0.0105***	0.0111***	0.0134***	0.0115***	0.014***
	[0.0013]	[0.0014]	[0.0014]	[0.0015]	[0.0018]
Sustainable Path Dummy	−0.0034	−0.00340186	−0.0035	−0.0033	−0.0032
	[0.0028]	[0.0028]	[0.0029]	[0.0028]	[0.0027]
Time Dummy Paris Agreement × SustainablePath	-0.0019	0.00155077	0.0032	0.0007	−0.0016
	[0.0023]	[0.0024]	[0.0028]	[0.0029]	[0.003]
Energy Market					
Time Dummy Paris Agreement	0.003*	0.0041**	0.0038**	0.0045**	0.0096***
	[0.0016]	[0.0017]	[0.0018]	[0.0023]	[0.0034]
Sustainable Path Dummy	−0.0009	−0.0009	−0.0008	−0.0009	−0.0005
	[0.0011]	[0.0011]	[0.0011]	[0.0011]	[0.001]
Time Dummy Paris Agreement × SustainablePath	0.0026	0.0019	0.0013	0.003	−0.0054
	[0.0029]	[0.003]	[0.0032]	[0.0038]	[0.0052]

notes: *standard deviation in brackets []. The statistical significance of the estimated parameters is indicated by *** for a p-value of 0.01, ** for a p-value of 0.05, and * for a p-value of 0.10. Source: Own elaboration.*

The results suggest that there is no significant difference in the monthly stock growth rate for any time period after the Paris Agreement between sustainable and non-sustainable companies. Monthly data for stock price can contain a lot of noise due to the high frequency of movements in the growth rates.

In the next analysis, yearly data is used, and the analysis is done for both ROA and stock growth rate. The time dummy now becomes the effect on the next year after the Paris Agreement. The results are presented in table (3).

Table 3: *Results of yearly stock rates and yearly ROA Difference-in-differences regression.*

Yearly Data Regressions			
Variables		Dependent Variable (Y) = ROA	Dependent Variable (Y) = Stock Growth Rate
Financial Market			
Time Dummy Paris Agreement		−0.0441	−0.0026**
		[0.1538]	[0.001]
Sustainable Path Dummy		−0.563**	−0.0035**
		[0.245]	[0.0017]
Time Dummy Paris Agreement × SustainablePath		0.0696	0.0035**
		[0.2323]	[0.0017]
Energy Market			
Time Dummy Paris Agreement		−2.181***	−0.0125
		[0.609]	[0.0209]
Sustainable Path Dummy		−0.3102	−0.014
		[1.1978]	[0.0135]
Time Dummy Paris Agreement × SustainablePath		−0.6523	0.0569*
		[1.3035]	[0.0293]

notes: *standard deviation in brackets []. The statistical significance of the estimated parameters is indicated by *** for a p-value of 0.01, ** for a p-value of 0.05, and * for a p-value of 0.10. Source: Own elaboration.*

When the analysis is performed with yearly data, the results are non-significant for the ROA variable for both markets. In the case of stock growth rate, we can observe a small positive effect of 0.35% for the financial market and a bigger effect of 5.7% with a p-value of 0.054 for the energy sector. These results suggest that company stocks rated sustainable during the Paris Agreement in 2016, grew larger than companies not rated sustainable, with the difference being greater in the energy sector.

For the last specification, a separate effect for OECD countries is studied by employing a triple Difference-in-differences estimator. In this part, the estimated effect for OECD countries is expected to be larger because of higher weights in policies and strategies adopted by governments to fight climate change in comparison to countries outside the OECD. A dummy is then added to the model taking the value 1 if a company is located in an OECD country and 0 if otherwise. The identifying assumption for this specification is that the difference between OECD countries and non-OECD countries should have parallel trends. Regardless, new research has proven that this does not have to hold for the results to be consistent as long as the general parallel trends assumption holds (Olden and Molden, 2020).

The triple Difference-in-differences estimator model for OECD companies is described as following:

$$Rentability = \alpha + \beta_0 PostParisAgreement + \beta_1 SustainablePath +$$
$$\beta_2 PostParisAgreement \times SustainablePath + \beta_3 OECD +$$
$$\beta_4 OECD \times PostParisAgreement + \beta_5 OECD \times SustainablePath +$$
$$\beta_6 OECD \times PostParisAgreement \times SustainablePath + \varepsilon \quad \textbf{(2)}$$

In equation 2 we can observe that the control variable for being an OECD country is added with the triple difference-in-differences estimator, being the last term consisting of 3 interactions. The model was estimated, and results are presented in table 4.

Table 4: *Results of yearly stock rates and yearly ROA Triple Difference-in-differences regression with OECD as a control variable.*

Triple DID with yearly data and OECD control			
Variables		Dependent Variable (Y) = ROA	Dependent Variable (Y) = Stock Growth Rate
Financial Market			
Time Dummy Paris Agreement		−0.2437***	−0.0499***
		[0.0827]	[0.0167]
Sustainable Path Dummy		−0.3388	−0.0583**
		[0.2289]	[0.024]
Time Dummy Paris Agreement × SustainablePath		0.1752*	0.0666***
		[0.1043]	[0.0246]
OECD Dummy		0.2666	−0.05315 ***
		[0.4066]	[0.02]
OECD × Time Dummy Paris Agreement		0.4066	0.0433**
		[0.3101]	[0.0201]
OECD × SustainablePath		−0.4342	0.0436
		[0.4854]	[0.0324]
OECD × SustainablePath× Time Dummy Paris Agreement		−0.2415	−0.0563*
		[0.4409]	[0.0328]
Energy Market			
Time Dummy Paris Agreement		−2.4667***	−0.0421
		[0.8997]	[0.0368]
Sustainable Path Dummy		0.6616	−0.0335
		[2.3688]	[0.0362]
Time Dummy Paris Agreement × SustainablePath		1.1513	0.1332**
		[1.3194]	[0.052]
OECD Dummy		−4.0147***	−0.0143
		[1.527]	[0.0218]
OECD × Time Dummy Paris Agreement		0.4408	0.0533
		[1.2245]	[0.0436]
OECD × SustainablePath		0.5836	0.026
		[2.8521]	[0.0393]
OECD × SustainablePath× Time Dummy Paris Agreement		−2.2124	−0.1043*
		[1.2]	[0.0612]

notes: *standard deviation in brackets []. The statistical significance of the estimated parameters is indicated by *** for a p-value of 0.01, ** for a p-value of 0.05, and * for a p-value of 0.10. Source: Own elaboration.*

The results from table 4 suggest that in the financial sector, stock price growth rate from sustainable companies in the OECD was 5.63% less than sustainable companies from outside the OECD. This result is not as expected, but it might be due to the effect of companies in the database located in countries outside the OECD such as India, Thailand and other Asian countries, where growth was higher. In the energy sector, we observe the same result but with a more significant difference of 10.4%. The bigger effect might be explained because of the properties of the sector. The energy sector in developing countries not belonging to the OECD, like India, Qatar, Saudi, Thailand, etc. has recently observed a big growth without caring too much about climate change, emissions and sustainable practices. Because of this, non-sustainable but profitable companies have received government support, affecting the stock price growth rate in a positive way and reducing the impact of sustainable ratings. Finally, when using ROA as a dependent variable we do not observe real significant differences for either sector, suggesting that companies had similar returns on assets independently from the area they were located or if they were sustainable during the Paris Agreement.

Conclusion

This paper examines how a company's profitability, specifically ROA and stock growth rate, was affected by being rated sustainable in the MSCI Sustainability Index during the Paris Agreement. This event is interpreted as a shock to less sustainable companies by further decreasing their rating because of a change in sustainable parameters, as a consequence of governments' policies and objectives derived from the Paris Agreement in 2016. The companies are separated into energy and financial sectors. This was done because if there is an effect, it will be clearer to see in the energy sector because of the market type and, because the effect will have higher economic consequences in the financial sector.

A normal Difference-in-differences is first done with no significant results for the financial sector in any specification suggesting that financial companies, regardless of their rating, had the same ROA and stock growth rate after the Paris Agreement. For the energy sector there is a significant result in the yearly stock growth rate, suggesting that companies which had been rated sustainable grew on average 5.69% more than non-sustainable after the Paris Agreement. The results tell us that being sustainable can positively affect the profitability of the company through stock growth rate.

In the second specification, a triple Difference-in-differences analysis was done to see the difference in the results from countries belonging to the OECD. This was done in order to see the previous analysis but also taking into account the effect of being a company in an OECD country. The results show negative coefficients for both the energy and financial sectors. For the financial sector, companies that were rated sustainable and belonged to an OECD country grew 5.63% less than companies from other economic areas. For the energy sector, this result was 10.4%. An explanation for these results can be found in the recent rapid economic growth in Asian countries, where governments put less emphasis on sustainable practices and more on profitability.

Future work could consider analyzing more specific areas and events in order to narrow down the causal effect. One concrete example can be to look at the European Sustainable Finance Action Plan (SFAP) and the effects it had on European companies' profitability measures. With the available data used for this research, the sample becomes too small, and the parallel trends assumption stops holding, making the results difficult to interpret. This can be solved by adding more European companies to the sample, therefore, increasing the sample size, so the main assumption holds, and it can reflect a causal effect only for European companies.

In addition, further research could also measure the effect of each ESG component individually and look for parameters with a higher effect on profitability in different markets. For example, to look, if having a high rating in the "E" is more important for profitability, than having a high rating in the "G". This could help companies be more efficient with their investments in sustainable parameters.

Overall, the results obtained in this paper are based on the main assumption of Parallel Trends which, in some of the time frames, is not clearly observed, but they are relevant because they appear to present an actual causal relationship compared to other research.

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Appendix A: Variables Description

Monthly Energy Stock Prices Growth Rates: monthly stock price growth rates from Yahoo Finance and Marketwatch for the companies in the energy sector.

Monthly Financial Stock Prices Growth Rates: monthly stock price growth rates Yahoo Finance and Marketwatch for companies in the financial sector.

Yearly Energy Stock Prices Growth Rates: yearly stock price growth rates from Yahoo Finance and Marketwatch for the companies in the energy sector.

Yearly Financial Stock Prices Growth Rates: yearly stock price growth rates from Yahoo Finance and Marketwatch for the companies in the financial sector.

ROA Energy: yearly return on assets from OSIRIS for companies in the energy sector.

ROA Financial: yearly return on assets from OSIRIS for companies in the financial sector.

Profit Margins Energy: yearly profit margins from OSIRIS for companies in the energy sector.

Profit Margins Financial: yearly profit margins from OSIRIS for companies in the financial sector.

Sustainability Dummy Energy: dummy variable taking value 1 if a company from the energy sector was rated sustainable by the MSCI (A or higher) during The Paris Agreement in 2016 and 0 otherwise.

Sustainability Dummy Financial: dummy variable taking value 1 if a company from the financial sector was rated sustainable by the MSCI (A or higher) during The Paris Agreement in 2016 and 0 otherwise.

OECD Dummy Energy: dummy variable taking value of 1 if a company from the energy sector had its main headquarters in an OECD country and 0 otherwise.

OECD Dummy Financial: dummy variable taking value of 1 if a company from the financial sector had its main headquarters in an OECD country and 0 otherwise.

Appendix B: Profit Margin Parallel Trends

Figure 6: *Parallel trends assumption of energy sector for Profit Margins. Source: Own elaboration with data from OSIRIS.*

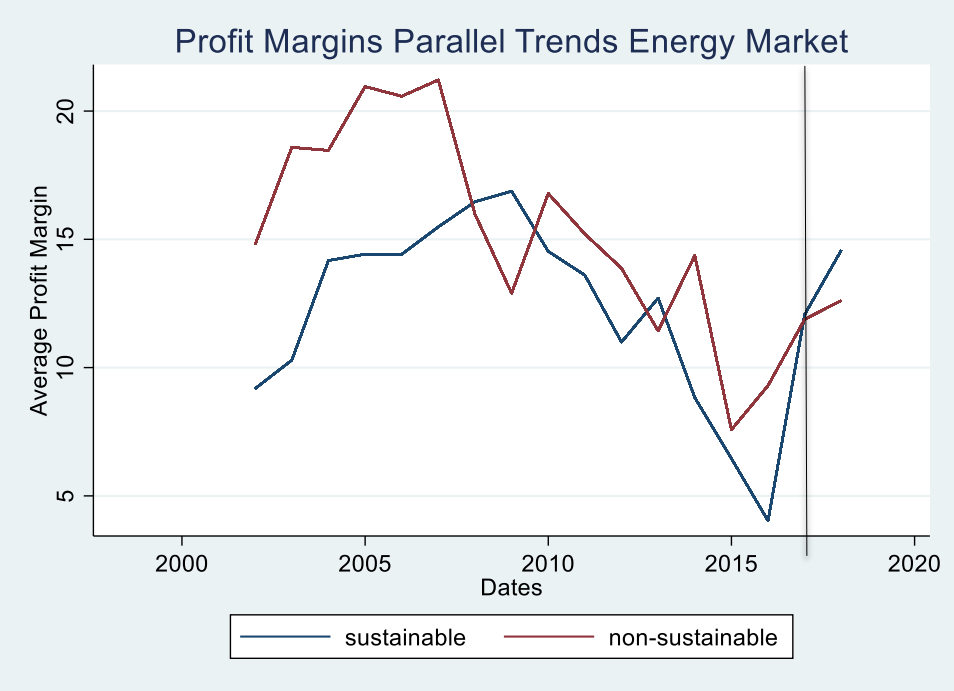
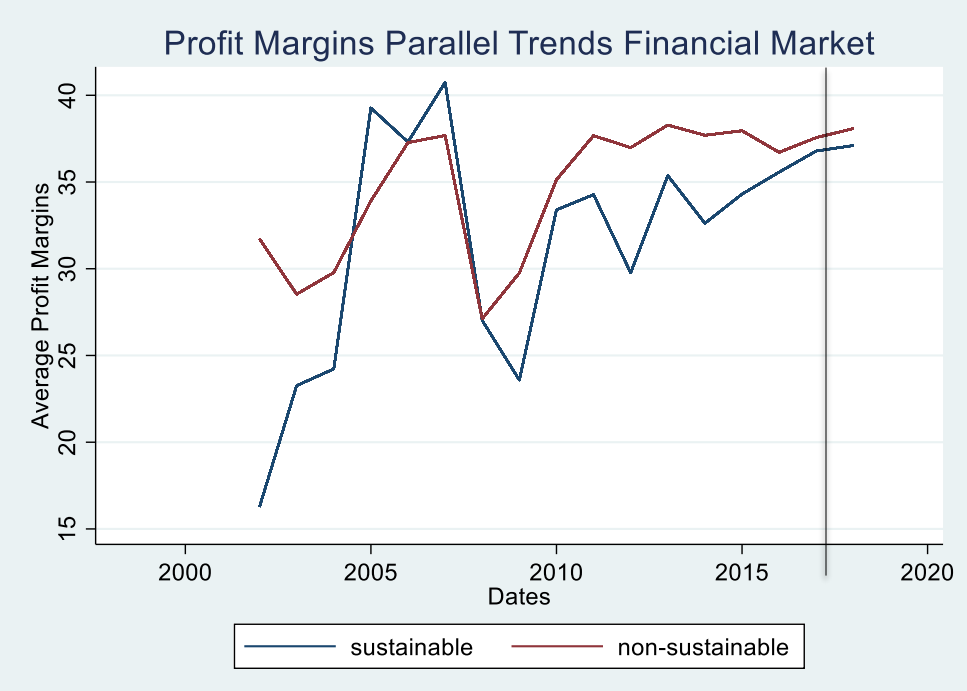


Figure 7: *Parallel trends assumption of financial sector for Profit Margins. Source: Own elaboration with data from OSIRIS*



Appendix C: Energy and Financial Markets Location of Companies

Figure 8: *Location of companies from the financial market. Source: Own elaboration with data from OSIRIS.*

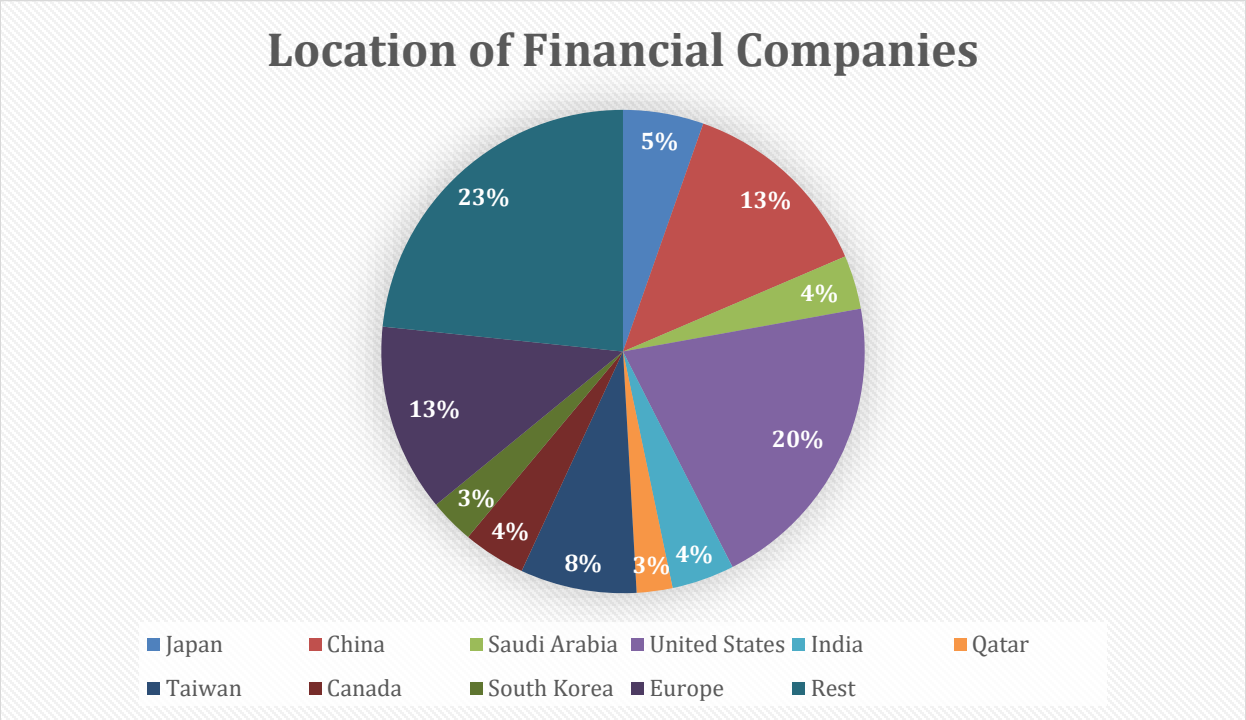
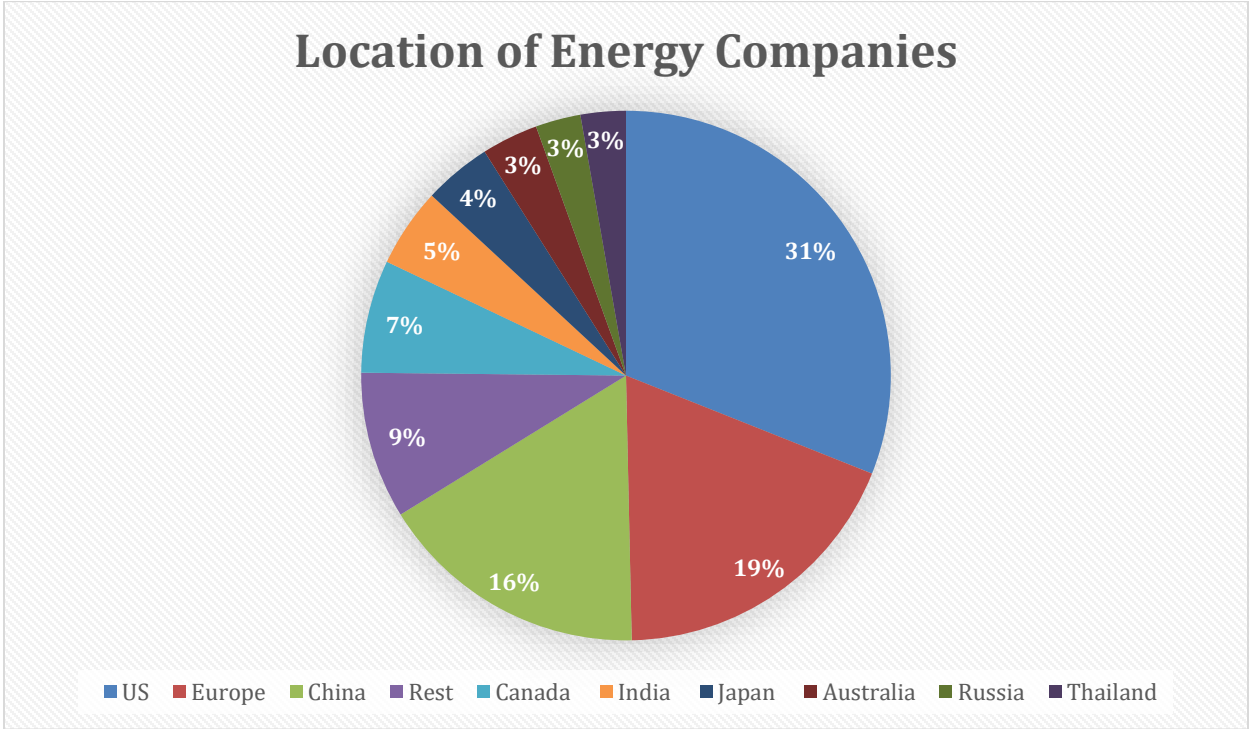


Figure 9: *Location of companies from the energy market. Source: Own elaboration with data from OSIRIS.*



Appendix D: Energy and Financial Markets OECD

Figure 10: *Percentage of companies in the financial market from the OECD. Source: Own elaboration with data from OSIRIS.*

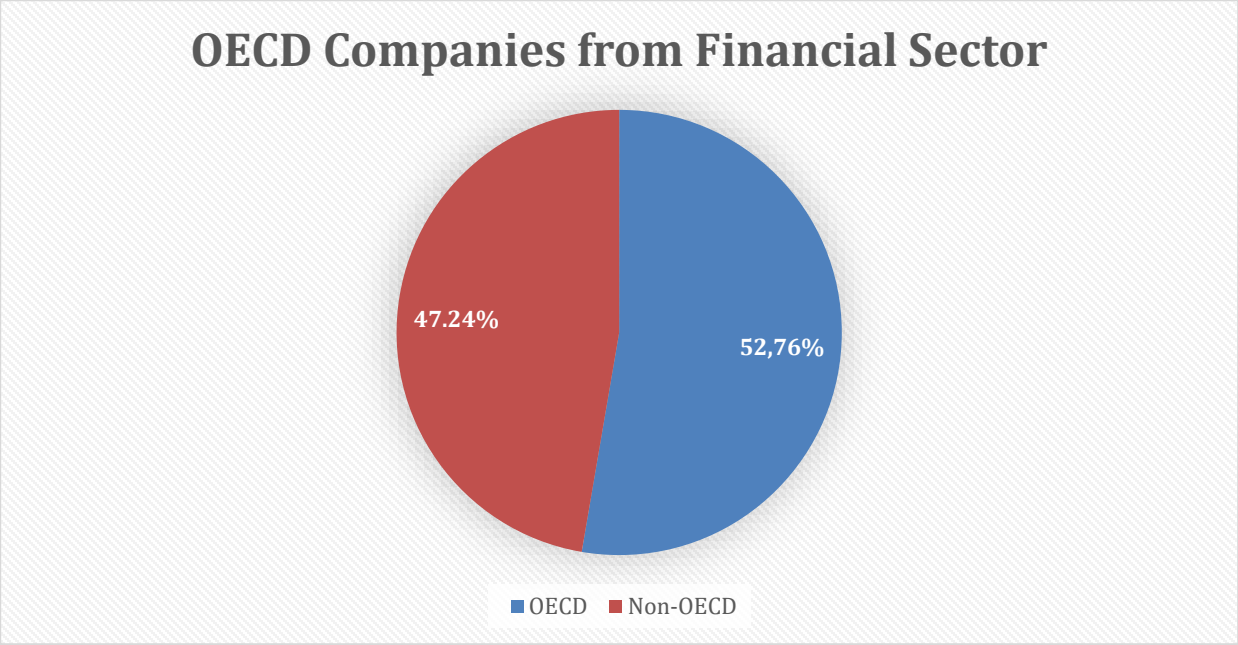


Figure 11: *Percentage of companies in the energy market from the OECD. Source: Own elaboration with data from OSIRIS.*