MODELLING PROFITABILITY AND EXPOSURE TO RISK IN RENEWABLE ENERGY INDUSTRY

DOCTORAL THESIS

FATBARDHA MORINA

EPOKA UNIVERSITY
FACULTY OF ECONOMICS AND ADMINISTRATIVE SCIENCES
DEPARTMENT OF ECONOMICS

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FATBARDHA MORINA

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APPROVAL PAGE

Student Name & Surname: Fatbardha Morina
Faculty: Faculty of Economics and Administrative Sciences
Department: Department of Economics
Thesis Title: Modelling Profitability and Exposure to Risk in Renewable Energy Industry
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I certify that this final work satisfies all the requirements as a PhD Thesis for the degree of Doctor of Philosophy in Economics, Banking and Finance profile.

Dr. Erinda Imeraj
Head of Department

This is to certify that I have read this final work and that in my opinion it is fully adequate, in scope and quality, as a PhD Thesis for the degree of Doctor of Philosophy in Economics, Banking and Finance profile.

Assoc.Prof.Dr. Uğur Ergün
Supervisor

MODELLING PROFITABILITY AND EXPOSURE TO RISK IN RENEWABLE ENERGY INDUSTRY

ABSTRACT

Reputed as living in the era of fossil-fueled economies, due to their low cost, fossil fuels are deemed the main energy source. Fossil fuels emissions are the main causes of global warming and climate change, while the demand and consumption of energy is constantly increasing. On the other hand, there are limited resources to meet the ever-increasing needs. Thus, it is necessary to carry out related studies in this field, in order to find alternative sources in order to provide energy for future generations and to end the age of fossil fuels. Therefore, there is a sparking interest in renewable energy in order to reduce the negative effects on the environment and to create sustainable development. The question raised is how profitable, and what risks renewable energy companies face? The aim of this study is to identify the factors that influence the profitability of renewable energy companies and exposure to risk for the biggest energy companies that operate in European Union countries. For this purpose, three different estimation methods are used. The study uses a sample of 43 Renewable Energy companies in the European Union extracted from DataStream over the period 2004-2020. For the static model, the Ordinary Least Square (OLS) and Random Effects method to define factors that shape Renewable Energy (RE) companies' performance is employed. In addition, due to the existence of endogeneity in OLS estimator, the results of profitability in terms of ROAA and Tobin's *q* are presented by using the two-steps dynamic system GMM (Generalized Method of Moments) that deals with endogeneity issues. The findings show that market capitalization is crucial to enhance profitability.

Leverage has a significant positive effect on firm's profitability measured by ROAA, and Tobin's *q*. Capital intensity has a negative effect on short-term profitability (ROAA). Moreover, the effect of support schemes shows that firms under the Feed-in Tariffs perform better than Tradeable Green Certificates (TGC) in terms of ROAA, while the opposite is in terms of Tobin's *q*. This is the first comprehensive study that sheds light on determinants for this sector by investigating the effect of firms-specific, industry specific, macroeconomic factors and the effect of remuneration that is solely dedicated to Renewable Energy companies. Short-term and long-term profitability of RE companies is important for practitioners related to demand for energy, and to create strategies that becomes those firms profitable. A study on renewable energy companies that produce clean energy improve human development and consequently economic growth is crucial for sustainable development.

Keywords: Renewable energy profitability, Risk, Sustainable development, ROA, Leverage ratios, Tobin's *q*, GMM

MODELIMI I PËRFITUESHMËRISË DHE EKSPOZIMI NDAJ RISKUT NË INDUSTRINË E ENERGJISË SË RINOVUESHME

ABSTRAKT

E njohur si koha e të jetuarit në epokën e ekonomisë së lëndës djegëse fosile, për shkak të kostos së ulët, lëndët djegëse fosile konsiderohen burimi kryesor i energjisë. Ndotja nga mbetjet fosile është shkaku kryesor i ngrohjes globale dhe ndryshimeve klimatike, ndërsa kërkesa dhe konsumi i energjisë është vazhdimisht në rritje. Nga ana tjetër burimet janë të kufizuara për të plotësuar këto kërkesa gjithnjë në rritje të energjisë. Prandaj është e rëndësishme të bëhen studime në këtë fushë në mënyrë që të gjenden burime alternative për të siguruar energji për brezat e ardhshëm dhe për t'i dhënë fund epokës së lëndëve djegëse fosile. Kohët e fundit ka një rritje të interesit për energjinë e rinovueshme në mënyrë që të reduktohen efektet negative në mjedis dhe të krijohet një zhvillim i qëndrueshëm. Pyetja kërkimore e këtij punimi është sa fitimprurëse dhe me çfarë rreziqesh përballen kompanitë e energjisë së rinovueshme? Për t'iu përgjigjur pyetjes kërkimore, ky studim ka identifikuar faktorët që ndikojnë në përfitueshmërinë e kompanive të energjisë së rinovueshme dhe ekspozimin ndaj rrezikut për kompanitë më të mëdha të energjisë së rinovueshme që operojnë në vendet e Bashkimit Evropian. Për këtë qëllim, përdoren tre metoda të ndryshme matjeje. Studimi përdor një kampion prej 43 kompanish të Energjisë së Rinovueshme në Bashkimin Evropian të marra nga DataStream gjatë periudhës 2004-2020. Për modelin statik, përdoret Metoda e Zakonshme e Katrorëve më të Vegjël (OLS) dhe metoda panel me efekte të rastit (RE) për të përcaktuar faktorët që ndikojnë përfitueshmërinë e kompanive të Energjisë së Rinovueshme (RE). Gjithashtu, për shkak të prezencës së endogjenitetit në metodën e OLS, rezultatet e përfitueshmërisë në terma të ROAA dhe Tobin's *q* janë paraqitur duke përdorur Metodën e Përgjithësuar të Momenteve me dy hapa (GMM) që trajton çështjet e endogjenitetit. Gjetjet tregojnë se kapitalizimi i tregut është vendimtar për të rritur përfitueshmërinë.

Punimi tregon që leva financiare ka një efekt pozitiv të rëndësishëm në përfitueshmërinë e firmës, e matur nëpërmjet treguesve financiar si ROAA, dhe Tobin’s *q*. Intensiteti i kapitalit ka një efekt negativ në përfitueshmërinë e firmës në periudhë afatshkurtër (ROAA). Gjithashtu, efekti i skemave mbështetëse tregon se firmat sipas që operojnë në vende të cilat aplikojnë FIT performojnë më mirë se kompanitë që aplikon çertifikat (TGC) , kur përfitueshmëria matet me ROAA, ndërsa e kundërta vihet re kur përfitueshmëria matet me Tobin’s *q*. Ky është studimi i parë gjithëpërfshirës që hedh dritë mbi përcaktuesit për këtë sektor duke marrë parasysh efektin e faktorëve të brenshëm të firmës, faktorët e industrisë , faktorët makroekonomik dhe efektin e skemave suportuese që i kushtohet vetëm kompanive të Energjisë së Rinovueshme. Përfitueshmeria afatshkurtër dhe afatgjatë e kompanive të RE është erëndësishme për të gjitha grupet e iinteresit që lidhen me kërkesën për energji dhe për të krijuar strategji që i bëjnë këto firma fitimprurëse. Një studim mbi kompanitë e energjisë së rinovueshme që prodhojnë energji të pastër përmirëson zhvillimin njerëzor dhe rrjedhimisht nxit rritjen ekonomike e cila është thelbësore për zhvillimin e qëndrueshëm.

Fjalët kyçe: Përfitueshmëria e energjisë së rinovueshme, rreziku, zhvillimi i qëndrueshëm, ROAA, raportet e levës, Tobin's *q*, GMM

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DECLARATION

I hereby declare that this PhD Thesis, titled "Modelling Profitability and Exposure to Risk in Renewable Energy Industry", is based on my original work except quotations and citations which have been duly acknowledged. I also declare that this thesis has not been previously or concurrently submitted for the award of any degree, at Epoka University, any other university or institution.

Fatbardha MORINA

January 2023

DEDICATION

This dissertation is dedicated to the memory of my father, Sulejman T. Morina.

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LIST OF ABBREVIATIONS

CAPM	Capital Assets Pricing Model
CEER	Council of European Energy Regulators
CFP	Corporate Financial Performance
CO2	Carbon Dioxide
CSR	Corporate Social Responsibility
EP	Environmental Performance
EU	European Union
FIT	Feed-In Tariff
FP	Financial Performance
GDP	Gross Domestic Product
GDP	Gross Domestic Product
GI	Green Investment
IEA	International Energy Agency
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
NRBV	Natural Resource Based View
OLS	Ordinary Least Square
PV	Photovoltaic
RBV	Resource Based View
RE	Renewable Energy
RE	Random Effects
RES	Renewable Energy Sources
ROA	Return on Assets
ROI	Return on Investment
ROS	Return on Sales
S&P	Standard and Poor’s
SRI	Socially Responsible Investment

SYS-GMM	System GMM
TGC	Tradeable Green Certificate
USD	US Dollar

CHAPTER 1

1. INTRODUCTION

1.1 Introduction

This chapter underlies the background of the study by redefining the objectives of it and the research questions. In addition, a brief overview of the feature of renewable energy market are provided. At the end of this chapter, the organization structure of the research is explained that includes information about analytical framework, literature review flowchart, methodology framework, research model and theoretical framework of the thesis.

1.2 Background of the Study

Contributing to the sustainable development of a country, energy is regarded as the primary source for all production industries and individual activities. Although, countries are looking for alternative ways to provide enough energy supply for future generation, as it is still a major problem in the word. Around 1.06 billion people, or approximately 14% of the global population, live without an energy source. In addition, around 2.8 billion people use traditional sources of energy such as fossil fuels but not clean energy (REN21, 2018).

The current primary energy source in all the world is based on fossil fuels, but these cause pollution and environment changes. Despite the difference in opinion, the global warming is becoming a real threat and the reduction of greenhouse gas emission is necessary. This environmental problem provides a natural requirement to find alternative sources to generate energy in place of traditional energy generated from fossil fuels.

In 2020, the EU Commission in their climate target plan has decided a reduction of CO2 emissions by at least 55% until 2030, and a set of goals for carbon neutrality to be achieved by 2050. Thus, the transition toward new energy sector (clean, renewable energy) that provides energy from renewable energy sources (RES) such as wind, solar, geothermal is crucial for climate targets.

Renewable energy is seen as pivotal as it is the main power source for many countries. Nonetheless, a special attention is drawn from financial analysts, policymakers, and investors who want to foster the renewable energy consumption. The increasing demand for clean energy has increased the investment in renewable energy sector at a global level. Investment in technology, costs reduction, and financial supporting has increased the attention of renewable energy as an engine of economic growth.

The development of renewable energy sector in EU is supported by several measures and regulation guidelines. The EU Renewable Directive has put a 20% target of renewable for 2020, in order to straggle the actual two biggest challenges, energy security and climate change. This target is mandatory for each country of the European Union, and the share of renewable energy sources (RES) in gross final energy consumption should be at least 20% (EREC: European Renewable Energy Council, 2011).

According to the European Commission (2019) the EU is on track to achieve the target of 20% for 2020 since the share of renewable energy during 2017 was around 17.52%. Over and above, the policies related to renewable energy have in focus not only shifting from fossil fuels toward clean energy but also to engage renewables in all five dimensions of the Energy Union such as: *energy security, the internal energy market, energy efficiency, decarbonisation of the economy*, *research*, *innovation*, *and competitiveness*. As aforementioned, a shift towards clean energy is related to the technological development, and the increase efficiency of the equipment used in the production of renewable energy.

The fastest growing component in energy sector's changes are related to alternative energy. In the initial stage, green investment in the market were a niche and the interest toward green energy was very low or almost nothing, and quickly these investments became very attractive. Greater investment and financial activities are conducted in the renewable energy sector due to increased demand for clean energy. Since the trend towards renewable energy continues, the economic performance of those companies is fundamental. Renewable energy companies should be remunerative in order to have the opportunity to operate in the market, and to generate profits. Clean energy producers are interested towards profit, as well as the environment. The advantages of renewable energy companies are greater since they generate energy with low emission, create new jobs and fulfill the energy needs for future generations. All the benefits considered, the financial performance of RE companies is fundamental for market sustainability.

Thus, long-term financial benefits for firms are related to engagement in corporate social responsibility but also enhance the reputation in the market such as customer satisfaction and the efficiency of internal business processes (Mishra & Suar, 2010). Furthermore, the market reputation for clean energy companies is first-rate compared to traditional producers, that in return become very attractive for investors. Return from renewable energy stock is a feature that influences the decision-making from the investors' side.

The European energy industry faced many obstacles, firstly a decrease in energy demand due to unfavorable economic condition because of financial crises, and on the other hand a de-industrialization that fosters industrial plants to think about energy efficiency. Secondly, an excess in energy supply because of overinvestment and using the energy from fossil fuels. EU countries have a high-energy import dependency and are characterized by shortage of energy security, therefore, analyzing factors that have an impact on the economic growth of renewable energy companies operating in such countries is fundamental. As the energy produced by local natural resources is continuously restocked and reduces the need for importing electricity and fossil fuels that contribute to the energy security at the EU level, as a result, fossil fuel replacement with renewable energy is environmentally friendly (Gökgöz & Güvercin, 2018). Long-term actions and the use of renewable energy sources are deemed the most efficient and effective means for tracking environmental issues, that the renewable energy sector requires for sustainable development (Ruggiero & Lehkonen, 2017). Additionally, sustainability of these renewable energy firms, apart from causing low pollution in the environment, mediates society to have access to reliable and affordable energy supplies. In the hence, mitigating climate change and fighting energy insecurity is pivotal for RE firms' sustainability. These obstacles along with lack of resources enhance the need for the use of renewable energy that has become "grid priority".

A vast amount of studies in renewable energy performance measurement have analyzed the performance based on project level. In addition, existing research has paid attention only on the effect of support schemes, the main unresolved issues of which are the drivers of performance, and the sustainability of these companies. Only few studies have evaluated the performance of renewable energy in China, or specific countries, in terms of the company level with the focus to evaluate the influence of support schemes on performance. This limitation drives to the development of a new performance framework that could be used as a baseline for renewable energy company performance. The aim of this thesis is to evaluate the performance in terms of profitability and the effect of risk for renewable energy companies that operate in EU. Developing a model that includes firm-specific factors, industry characteristic, macroeconomic factors and support schemes, are main contributions in the existing literature. Furthermore, to the best of my knowledge there is no prior studies that incorporates firm-specific, industry-specific, macro-economic factors and support schemes, altogether in order to distinguish the factors that significantly influence profitability of the analyzed companies. Therefore, investigating factors that influence the profitability of 43 renewable energy companies for the period 2004-2020 is the main contribution of this study. This study is focused only on renewable energy companies and take into account a long period of 17 years. In addition, we have constructed three regression equation that are estimated by using three different estimation method such as Ordinary Least Square (OLS), Random Effects (RE) and the most advance estimation techniques, two-step dynamic system GMM to deal with endogeneity issues and provide consistent results. Profitability for companies is measured based on accounting measures (ROA), and market-based measures (Tobin's *q*) in order to identify, if there is any significant difference between them. In addition, the difference between firms' profitability for companies that operate in countries where the Tradeable Green Certificate (TGC) compared to companies that have adopted Feed-in Tariffs (FIT) support schemes, is distinguished.

1.3 Renewable Energy Market

Energy market is considered as a complex one, but it is attractive at the same time. This is true not only for companies that operate in energy sector, but also to the government' viewpoints that has evaluated this sector due to increased job opportunities, and the size of the capital that is invested in it. In addition, this market supports other sectors to operate effectively. Climate changes and the global warming are the most important issues that have created a debate related to energy regulation changes, that are necessary to make in order to protect the environment, and to address the energy security issue.

European Union (EU) countries are continuously investing in renewable energy, since the member countries are exposed to any risk in transnational energy markets compared to other countries in the world. The total amount of the EU import energy consumption is 54%, which shows the high dependency rate on imports. Low oil and gas reserves, along with enlargement towards Central and Eastern Europe, engage EU in additional challenges for energy security. The new member states, that were mainly developed under the former Soviet Union Regiments, need to be integrated with energy policies that are adopted by existing countries. The divergence between new and existing members on energy policies leads to unaccomplishment energy objectives and impede the effectiveness of policy instruments, and approaches that are followed by the European Commission (Correljé & van der Linde, 2006). The European Commission has continuously worked on a common European energy policy, despite the difficulties that faced.

The Energy sector needs a restructuring to provide a sustainable development in the near future that is clearly visible in the Renewable Energy Directive of the European Union, in the United Nations Framework Convention on Climate Change and in other regulations worldwide (European Commission, 2009). The shift from conventional energy sources towards renewable sources is related to technological development. Due to these global changes, traditional energy producers are looking for new investment in technology that increase efficiency of equipment used in the production of clean energy. In addition, "democratizing" the energy system, particularly the electricity system is one of the main objectives of the European energy policy apart from pollution reduction. Therefore, the establishment of local energy communities and the encouragement of self-consumption are major priorities for developing energy policy in Europe. Due to these global changes, and well-known benefits of clean energy generation, traditional producers of energy are looking for new investment in new technology that increase efficiency of equipment used in the production of clean energy. Thus, one aspect of the changes that should be made in the energy sector is related to investment in new technologies. The other aspect that is crucial for renewable energy sector is financial efficiency of companies that are engaged in the generation of clean energy. The question related to the transition toward renewable energy is related to the ways that companies and government should follow-up in order to have sustainable energy system. Investments in technology are crucial for the renewable energy sector, but to be sustained in the long run, the technological solutions for several market players should be based on business models which are successful.

The performance of renewable energy firms varies across EU member countries since different promoting schemes for RE and public policies are applied. Energy transition from conventional toward renewable energy sources is a process that affects the structure of the electric power industry. Also, the way how the energy is generated, transmitted and sold experience changes.

Thus, related to countries that relay on fossil fuels energy source measures are taken by the European Commission to support the transition to renewable sources. In 2019, the European Commission has presented a set of initiatives towards climate neutrality in 2050, called the European Green Deal. The climate change problem has forced the EU to set ambitious targets related to greenhouse gas emissions. European Climate Law as part of European Green Deal has decided for a reduction of emission for at least 55% by 2030, and in 2050 (FiT for 55) to be the first continent that has achieved climate neutrality (European Commission, 2021a). To achieve 'FiT for 55' there is a need for efforts and collaboration between society, industry, and the economy.

Although the investment in RE are increasing and companies are taking market shares, managers of utilities do not see renewable energy as a threat in their business model (Richter, 2013). It is seen that utilities are interested to invest in utility-side renewable energy projects and mainly in large-scale projects. Thus, for conventional energy firms the adoption of business model innovation capabilities is fundamental in order to operate in the market, otherwise, if they have no capabilities to adopt their business models, they will continuously lose their market shares in electricity generation.

For the first time in 2020, the renewable energy surpasses fossil fuels as the EU' top power energy generated source, which provides 38% of energy compared to 37% that was generated from fossil fuels (European Commission, 2021b). Furthermore, to meet the 2030 target related to share of renewable energy, the revised Renewable Energy Directive recommends rising the total binding target from 32% to 40% for renewable energy in the EU energy mix .

1.3.1 Green Investment and Main Components

Mitigating greenhouse gas and air pollutant emissions in the environment without significant reduction of production and consumption of non-energy goods requires large investment that are called as green investment (GI). Today, many companies to be competitive and sustainable in the market are interested toward green investment. The company's aim should not only be focused on making profit, but also taking care of the development of the society and economy by protecting the environment. Green investment's long-term goal is to achieve sustainability in the long run. Achieving the ecological goal and at the same time to be profitable is not an easy process, and many firms undertake green investment when they are profitable. Furthermore, identifying the main drivers of green investments is crucial, since they provide various advantages for the economy, the environment and the society (Figure 1.1). According to Eyraud, Clements, & Wane (2013) , three main components of green investment are low-emission energy supply, energy efficiency, and carbon sequestration. Green Investment in energy sector requires a shift of energy supply from fossil fuel towards alternative sources such as renewable energy sources, that are considered as less polluting electricity generation. Renewable energy sources of electricity such as hydropower, wind, solar, biomass, biofuels, and geothermal can be used to produce electricity without emission, but they require financial investment in renewable technologies. Despite the growing debate on the cost of new technology installation in many countries, renewable energy is an important element that is part of European energy policy as a worthy option to provide energy. Furthermore, smaller-scale private investments are part of renewable energy investments.

The main question that arises related to Green Investment is: What methods can be used to facilitate RE investment? Subsides for companies that implement green investments, discounts granted toward customers who buy green products, or environmental tax will be some factors that facilitate green investments and protect the environment. However, Shah, Hiles, & Morley (2018) show that for countries in which the support toward RE is lower, the role of macroeconomic factors becomes more significant in order to support the development of RE sector. In addition, they found that in countries in which the oil price is reduced, the government support is essential for boosting RE investment. In conclusion, there are numerous benefits for companies that are engaged in green investments, including competitive advantage in the market since it meets the requirements of customers with regard to green products, government support, attracting investors that are interested to invest their financial resources responsibly, usage of green technologies for which there is no tax. With such benefits, it matters to implement green investment in the long-term, as the payback will be enormous for public and private firms.

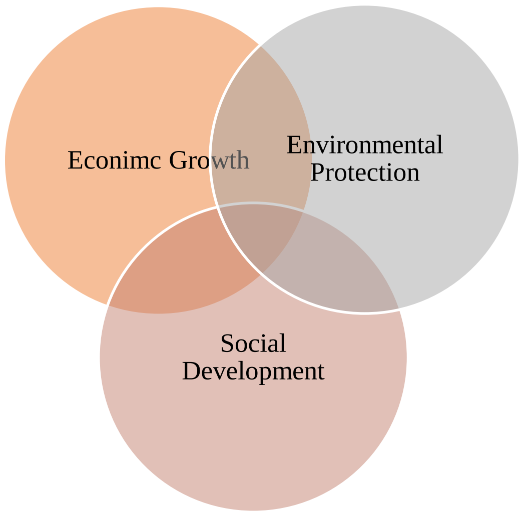


Figure 1.1 Role of green investment on sustainable development

1.3.2 The Growing Importance of Renewable Energy Sources?

The need for power energy is growing while the conventional sources such as fossil fuels and minerals are limited, thus it is clear that these kinds of resources are not sustainable (Huesemann, 2003). It is known that a lot of nonrenewable energy sources such as coal, gas and oil reserves can be found underground, or under the ocean. Nonetheless, their occurrence is becoming more difficult, and their exploitation can pose a serious risk. Human health and the environment can also be threatened by the use of nuclear fuels (US Government Accountability, 2012). Therefore, the radiation generated, and the large areas of radioactivity contaminated land will affect people health in the long run. Moreover, global warming and fossil fuel depletion are becoming a concern for experts and general public, since they have consequences on the quality of human life. In order to reduce these negative effects, it is a crucial responsibility for governments to investigate the importance of renewable energy sources (RES) as an alternative option to fight energy crises, and to reduce pollution. An increased trend of the demand for energy is associated with an increase of fossil fuels imports from countries that are rich in recourse, but this implies an increase of expenditures. Therefore, those countries that are highly dependent on energy imports create an uncertainty that can foster a conflict between countries regarding which country has the power related energy sources. European Union members depend on fossil fuels imports, especially oil and gas, and around half of the energy consumption is covered by imports. Thus, for these countries the uncertainty related to energy security is at a high level. Therefore, to increase the security related to energy supply includes not only the reduction of imports but an increase of domestic production of energy. To solve this problem, there is a need to identify the options to decide for the best solution. This approach may involve energy diversification and alternative energy, the development of technology in the field and new management of energy demand. The importance of renewable energy resources is related to their environmental-friendly nature and solving the problem of excessive energy demands in the future.

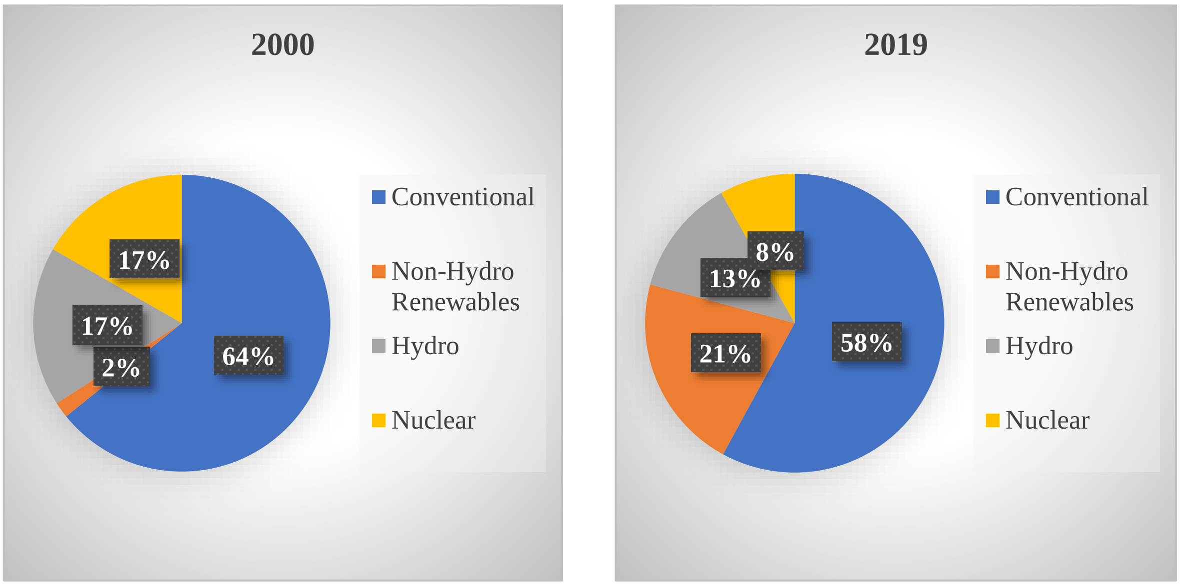


Figure 1.2 World electricity generation (GWh)

Source: International Energy Agency (IEA), author's calculation

Furthermore, using the data from International Energy Agency (IEA) website related to world energy statistics, the current state related to electricity generated by using renewable energy sources is noticed. In 2000, the global electricity generated by using conventional sources was 64%, while only 2% was generated from renewable energy sources excluding hydropower. The growth trend of renewable energy usage can be seen in figure 1.2 that shows that in 2019, the share of electricity generated from non-hydro renewables is 21% compared to 2000 that was 2%. Conversely, the share of energy generated by traditional sources (coal, gas, oil) still remains in high levels, but has a decrease trend. Although, the contribution of renewable energy to total energy remains still in low levels compared to the traditional sources of energy, their contribution is becoming crucial in recent years.

Renewable energy production has an increase trend from 2000 to 2019 because of increased price of conventional sources, support schemes towards renewable energy investments, and increasing demand of population for clean environment (figure 1.3). Also, investment in renewable energy is increased due to a reduction of costs that in turn is achieved through economies of scale. In addition, borrowing with low interest rates is another way to foster renewable investment. Different countries are following support schemes toward RE in order to increase the share of renewable energy consumption. However, the difference for energy that is produced by nuclear sources is getting higher from 2000 to 2019, where the share in 2000 was 17%, while in 2019 it was 8%.

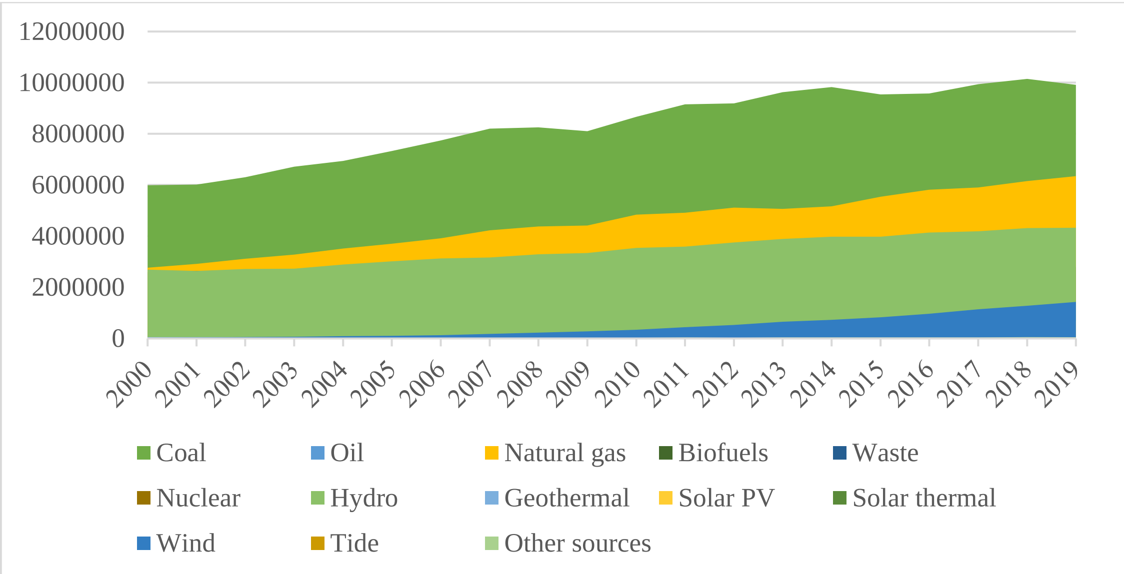


Figure 1.3 World electricity generation (GWh) according to sources
Source: International Energy Agency (IEA), author’s calculation

Some prominent examples of RES are wind, solar, hydropower, geothermal, and marine energies. Among renewable energy sources, wind and solar energy are the most promising forms of RE sources that are growing rapidly worldwide. Solar energy is utilized all around the world and is becoming increasingly popular for generating power, heating, and desalinating water. It can be produced through Photovoltaics (PV), often known as solar cells, are electrical devices that directly convert sunlight into energy. Solar PV plants can be used to provide commercial-scale energy, or to generate for personal consumption. Furthermore, concentrated solar power (CSP) that is used in large-scale power plants, is another way to generate electricity from the sun that concentrate sun radiation using mirrors.

These rays heat fluid, resulting in steam, which drive the turbines and generate energy (IRENA, 2020). Wind power usage is increasing globally, due to decrease of costs and expanding the renewable energy technologies. Wind is used to produce energy by using the kinetic energy created by air in motion. Wind turbines, or wind energy conversion devices altering this into electrical energy. The energy obtained from flowing water is known as hydropower. This type of energy is considered the preferred technique where accessible, since it is the most cost-effective method.

As a more ecologically beneficial alternative, small-scale hydro can be considered. Related to other sources of RE, despite being a handful, they have great potential to increase. According to data from Renewable Capacity Statistics (2021), the total energy generated from RE worldwide accounted 2799 GW during the last year, outpacing expansion in 2019 by over 50%, despite the economic downturn caused by the COVID-19 pandemic. The increasing trend in RE production is shown in figure 1.4.

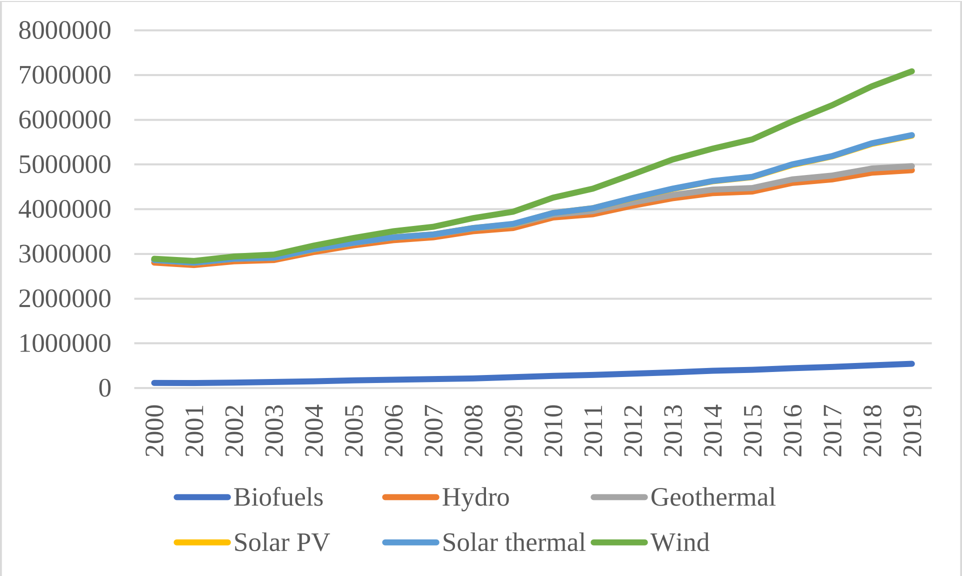


Figure 1.4 World electricity generation from renewable energy sources (GWh)

Source: International Energy Agency (IEA), author's calculation

Furthermore, to promote the renewable energy, the European Commission has decided targets related to the share of renewable energy consumption. This 20% target was to be reached by 2020, meaning that the share of renewable energy consumption had to total energy consumption for EU countries. According to the European Commission (2020), share energy consumption coming from renewable sources in 2020 was 21.3% meaning that EU countries have achieved the target of 20% by 2020. Achieving the target is supported by the consistent work of each EU country, even if the nation's energy policies may differ among countries. This objective was achieved in 2020 under unexpected circumstances, despite the pandemic situation that caused the interruption of the activities in various sectors, where the demand for energy during this period was reduced by facilitating meeting the renewable energy target. In addition, the target to be achieved by 2030 is 32% of energy consumption share that comes from renewable sources for EU countries. Figure 1.5 shows the trend toward the share of renewable energy sources in the EU from 2005-2020. The share of renewable sources is doubling from 10.24% in 2005 to 21.3% in 2020. This increased trend shows the importance given to renewable energy development and to achieve the target of climate changes.

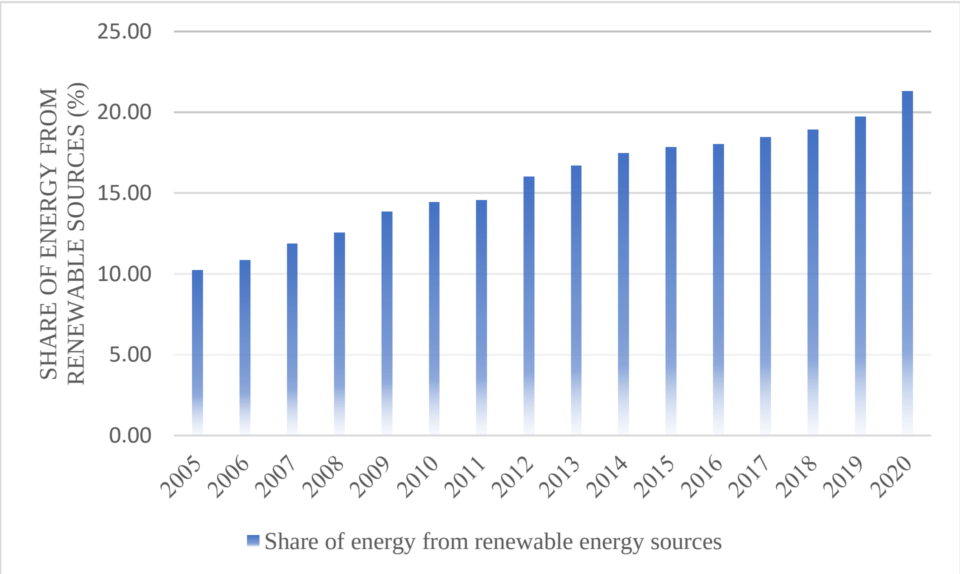


Figure 1.5 Estimated market share of green energy

1.3.3 Conventional Energy (coal, gas, oil) vs RE

The chronicle of electricity transition in Europe begins with a small number of big energy companies that were the largest suppliers, and today the energy lies increasingly in the hands of cites and millions of citizens across Europe. The energy transition has taken special attention and is already well underway. However, the process of transition is occurring at different rates across continents. For many years, geopolitical strength is focused on the utilization of fossil fuels resources and now the focus is at the same time to provide energy for the population that is increasing and to ensure clean energy.

In 1951 the Treaty of Paris established the European Coal and Steel Community, where it was decided that coal to be the first fuel to be exploited. Once again in 1957, energy was the backbone of European integration with the signing of Euratom Treaty to promote nuclear energy. These facts show that, energy has played a crucial role for the EU throughout history. In this way the energy cooperation across the European Union countries was further strengthened with the Treaty of Rome in 1957 that created the European Economic Community. Although, in the early stage of European integration, the most dominated issues have been energy issues, during this period the national energy markets were isolated from each other, and it was the oil crisis in 1973 that spur the collaboration of Europe's leaders to develop a jointly approach to fix energy shortages.

It was the Single European Act of 1987, that liberalized the European market with procedural reform that removed the barriers to cross border energy trade. This reform was the most successful compared to others that failed, and it is the first attempt to further integration. The SEA helped to remove the cross-border energy trade, but the main obstacle was the monopolistic energy structure of the national market that generates and transmits the energy causing limit access on grid for third parties. The Kyoto Protocol 1997 decided some measures to be more sensitive related to environmental issues. According to the protocol, the level of Greenhous Gases should reduce up to 8 % by 2012 compared to the level in 1990.

In order to give a solution for this market structure, the EU during 1996 and 2003 issued the first electricity directives that are related to free choice among electricity suppliers and to increase the competition to protect customers. In 2009, the Lisbon Treaty came in force with the main objective for sustainable development, to mitigate climate changes, and with the main focus on renewable energy sources. This important policy regarding energy has the priority to ensure the functioning of the internal market, and to prevent negative effects on the environment for all the EU member states.

According to Calliess & Christian (2012), the EU energy policy presented these objectives for all members:

> "*ensure the functioning of the energy market; ensure security of energy supply in the Union; promote energy efficiency and energy saving and the development of new and renewable forms of energy; and promote the interconnection of energy networks*."

This directive encourages the EU to put targets in terms of energy and climate framework to provide a sustainable development. In 2007, the targets of renewable energy shares in final energy consumption was decided to be 20% for 2020, also an improvement of energy efficiency of 20% target. The European Commission in the path to decarbonization objective has committed to reduce greenhouse gas emissions to 80-95%, below the 1990 levels in 2050. This target is planned to be achieved by developed countries as a group with the focus on solution for the transport sector and creating a Single European Transport Area (European Commission, 2011).

Furthermore, climate and energy framework for 2014 adopts its 2030 target to increase the share of renewable energy by at least 27%, and to reduce emissions by 40% (Bartz & Stockmar, 2018). Clean Energy Package for the EU coming into legal effect in June 2019 that is composed of four Directives and four Regulation for future energy policy, and the target of 38% renewable energy shares to be adopted for 2030 was further discussed (Nouicer & Meeus, 2019). For EU countries ensuring energy is fundamental since they import 54% of it, and finding alternative ways such as utilization of renewable energy sources is a solution that strengthens their energy security. The energy transition towards renewable energy for Europe is going smoothly and is making a remarkable progress. There is still more work to be done since there is a debate among advocates of fossil fuels industries and supporter of renewable energy.

Advocates of fossil fuels believe that the price of energy produced by renewable sources such as wind, solar and biomass is too expensive, and they can fulfill 3-4 percent of the demand for electricity. However, the pioneer of renewable energy pushed their investment in this sector that led on falling costs of the technologies, and increasing the share of renewable energy in the final energy consumption. One thing is clear that renewables are becoming even more competitive than conventional energy sources. Choosing the right policy, is the key strategy followed by Europe to be the leader in renewable energy. The support schemes for renewable energy are an example that the energy system will change from centralized, monopolistic utilities, towards decentralization and greater democratization.

Renewables, combustion plants and nuclear plants are three main sources of generating electricity. But the question posed is what is the relationship between energy security and energy sources? In the EU the energy market is highly dependent on imports, which means that the development of renewable energy deployment would reduce not only the fossil fuel /electricity import but also the share of energy generated by nuclear, and combustion plants since they substitute each other. The study conducted by Gökgöz & Güvercin (2018) in 25 EU for the period ranging between 1992 to 2014 confirm the leverage effect of RE in energy security since RE deployment has a negative effect on the level of fossil fuels and electricity import. A positive relationship between fossil fuels imports and combustion plants is founded but it results negative with electricity imports. The adoption of renewable energy is related to government policies in terms of support schemes, taxes, and policy changes, which explains the difference of renewable energy production between countries. The country level is important to explain why some countries overvalue investment in renewable energy sector, while some others have low investment in this sector.

1.3.4 The Role of Government in the Development of RE Companies

Renewable energy is the main political priority of the European Union to become the global leader of renewables. In order to increase and to promote the production of energy from renewable energy sources, the Energy Union has set some targets related to renewable energy that each company should produce. Renewable energy accounted for 17.52 percent of total energy in 2017, compared to a target of 20 percent for 2020, indicating that the EU is on the right track to meet this goal (European Commission, 2019). According to the European Commission report (2019), an increment of 2.48 percent of the renewable energy was expected from 2017 to 2020, which is reflected to a set target of 20 percent. In 2020, however, the share of renewable energy reached 22.1%, this way surpassing the set target and meeting the EU goal for the share of renewable energy. Henceforth, establishing policies aimed at increasing market share and shifting away from fossil fuels, is encouraged by incorporating renewable in all the five elements of the Energy Union. The five elements are as following:

a) *Energy efficiency*
b) *Decarbonization of the economy*
c) *The internal energy market*
d) *Research, innovation, and competitiveness.*
e) *Energy security*

Special attention is paid to the transport sector, which is accounted to be the highest sector polluter. In turn, measures are taken to reduce the emission in this sector by using renewable energy sources. The renewable energy sources used in transport in 2020 were around 10.2% that contribute on pollution reduction compared with the target of 10% to be achieved by 2020. According to the EU Green Deal initiative, the transport sector needs transformation to make transport greener. The transition will be completed by enhancing the usage of 100% fossil-free fuels and offering cleaner road transport. Furthermore, the EU has settled new standards about new cars to increase the number of cars with zero-or low emissions, that contribute to 'Fit for 55' by 2050 (European Commision, 2021).

The effect of support schemes is reflected on the cost of electricity from solar PV and wind power which is reduced by around 50%. Also, from 2009-2018 the electricity cost from renewable energy sources decreased by nearly 75%. In addition to support measures, the reduction is due to increased efficiency, lower capital costs, and better supply chain management. The European Union countries have adopted the Plan for the Promotion of Renewable Energies throw different series of promotion mechanisms. Furthermore, the increase share of renewable energy in European power mix is fostered by the introduction of subsidies or support schemes that in turn has affected the development of renewable energy technology. Given that, the introduction of the EU's Renewable Energy Directive (RED) in 2009, national support programmes for renewable energy sources (RES) have undergone significant adjustments. Starting from 2014, the Council of European Energy

Regulators (CEER) member nations have been gradually adjusting their schemes to meet with the European Commission's Guidelines on State Aid for Environmental Protection and Energy", which lay out the broad parameters for assistance to renewable energy sources (European Commission, 2014). The revised Electricity Market Regulation and Renewable Energy Directive in November 2018, both as part of the "Clean Energy for All Europeans" mentioned that starting from 2021 in Europe will be implemented standard criteria such as the principles of competitiveness, non-discrimination, and cost-effectiveness for support schemes towards RES.

The changes in renewable energy policies will have a variety of effects on customers, since the support schemes have implications on the electrical system. It means that the end users will bear the expenses of reaching the renewable energy goals, such as in the electricity bills is added the RES support. In addition, customers are interested in achieving the most cost-effective RES implementation possible. RES costs accounted for roughly 13% and 14% of the electricity bills for household in 2016 and 2017 respectively, instead of 11% in 2014. During 2019, the cost of RES support accounted around 14% of customer's bills. The most common used support schemes in Europe include: Feed-in Tariffs, Feed-in premiums, and Tradeable Green Certificates (TGC), Investment grant.

In table 1.1 a general information related to support schemes form government in different EU countries is presented. Feed-in Tariffs and Feed-in Premium are the most adopted schemes in EU. Access to grid and long-term pricing at which power producers may sell energy generated from renewable sources into the grid or thermal system are guaranteed by Feed-in-Tariffs. In Austria, Portugal, Slovakia, Slovenia, renewable energy is supported via a feed-in tariff (FIT), which varies based on the technology employed. Tradeable green certificates that represent a preferential pricing in long-term agreements is adopted in Belgium. In Bulgaria, renewable energy is encouraged by a feed-in tariff and premium. Thus, electricity must be sold on the market by the producer of green energy in case they have a total installed capacity of at least 4 Megawatt. Renewable energy generation in Croatia is supported by feed-in tariff and feed-in premium awarded through competitive tenders. Investment grands are used in Cyprus and Spain to encourage renewable energy generation. Feed in tariff and feed-in premium are the support schemes in Czech Republic that enhance renewable energy generation. In Estonia, Feed-in premium is supporting electricity generating by renewable energy sources. In recent years, major adjustments to the legislation governing RES support schemes have occurred. In June 2018, the action was to replace the existing premium tariffs. The subsidies in Finland related to RE are divided into Feed-in premium and investment subsidies. The goal of the premium system is that the market price risks be divided between the state and the producer. Thus, premium support scheme helps the producer of the energy in case that the price in the market decrease, but it exposes the producers to the market risk. In France, the new support scheme that is a premium will pay above the energy market price for a maximum of 20 years after the connection of plant with grid.

Table 1.1

Renewable Energy Support Schemes in Electricity in EU countries

Country	RES-E			
	Feed-in Tariff	Feed-in Premium	Green certificates	Investment grant
Austria	✓			✓
Belgium			✓	
Bulgaria	✓	✓		
Croatia	✓	✓		
Republic of Cyprus				✓
Czech Republic	✓	✓		
Denmark	✓	✓		
Estonia		✓		
Finland		✓		✓
France	✓	✓		
Germany	✓	✓		
Greece	✓	✓		
Hungary	✓	✓		
Ireland			✓	
Italy	✓			
Latvia	✓			
Lithuania	✓	✓		
Luxembourg	✓	✓		
Malta	✓	✓		✓
Netherlands		✓		
Poland	✓	✓		
Portugal	✓			
Romania			✓	
Slovakia	✓			
Slovenia	✓			
Spain				✓
Sweden			✓	✓
United Kingdom	✓	✓	✓	

Source: CEER 2021

Feed-in Tariff is the support mechanisms for the promotion of renewable energy companies in Germany. The support for individual power plants is fixed for twenty years following commissioning. The question is what will happen when the support system ends? RE companies are usually looking for new strategies in the market to get competitive advantages. Greece and Hungary have adopted Feed-in Tariff and premium support schemes. In Ireland and Romania in order to promote the development of renewable energy, the government has decided to follow Tradeable Green Certificates (TGC). Lithuania, Luxembourg, Malta and Poland have adopted FIT and premium schemes which is based on the idea that the producer may choose whether to sell the electricity generated at a set tariff or to sell on the open market, to take advantage of a premium on the sales price. Italy and Latvia are based on FIT, while Netherlands operates under premium remuneration. Sweden operates under TGC and investment grands. As for the United Kingdom, the FIT, premium and TGC is adopted. The support mechanism used in Spain is investment grants.
To sum up, in EU countries the energy taxation and subsidy policies are the two types of policies toward RE development. Thus, both policies have affected the EU regulation, however even while the EU has created the Energy Union that has impacted the environmental and energy policy, each country has its national policymakers that approve the final decision about renewable energy promotion.

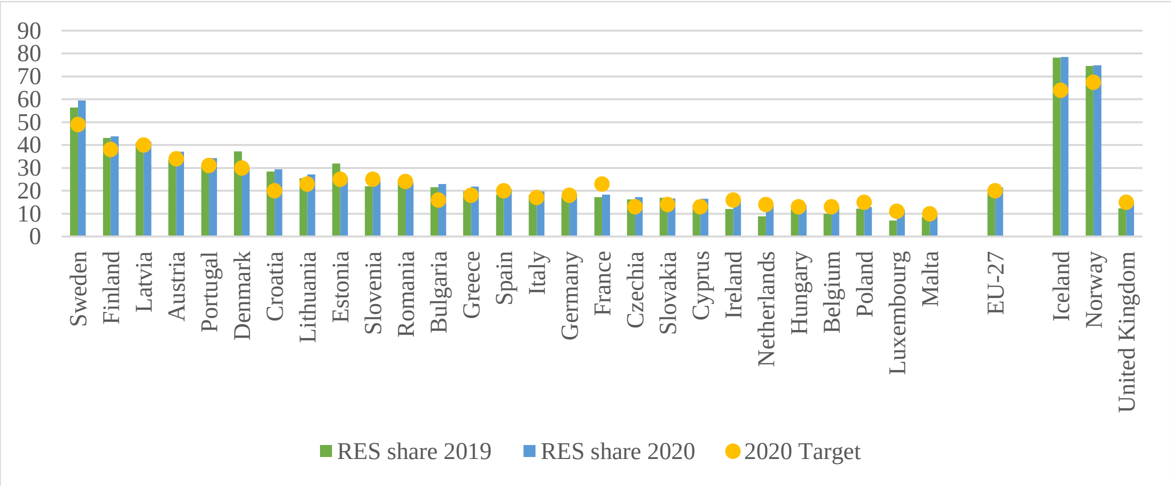


Figure 1.6 Share of renewable energy and the targets for 2020

After analyzing the support schemes for each country in the EU, it is fundamental to investigate the effect of remuneration to achieve the target of 2020. Figure 1.5 shows the renewable energy share for 2019 and 2020. In addition, the target related to renewable energy in national level during the year of 2020 is presented. In order to meet the national target related to renewable energy share, more than half of countries surpass their RES share target in the electrical sector for the year 2020. With 4.69% points below the target, France has the biggest negative disparity between planned and current level of RES share in 2020, while Iceland had the highest exceedance of the target 64% with 14.48 percentage points.

1.3.5 What Are the Recent and Future Trends for Renewable Energy Usage? Support Schemes

Renewable energy is becoming an important issue for financial analysts, investors, and policymakers. Since the sustainable development of green energy is crucial for every company to create profits but, in addition to take care for the environment. Progressively the shift towards renewable energy has increased the interest for conventional producers of the energy, as they are adopting new strategies in order to diversify their revenues toward new trends of clean energy. The technology development and the increase efficiency of new equipment that are used in the production of renewable energy is a factor that has changed the trend toward renewable ones. Another important factor is the financial efficiency of the power producers. The structure of energy system in the EU has undergone some changes considering the importance given to renewable energy deployment and the target of 20% to be achieved in 2020 according to the EU directive. Renewable energy usage is seen as a contributor to economic growth, social and environmental benefits. Economic agents that are engaged in renewable energy sources enhance their productive capacity and in turn increase trade. The successful transition from brown energy to green one is closely associated with the quality of institutions, regulatory framework, and access to finance. Opeyemi, Uchenna, Simplice & Evans (2019) mentioned that the renewable energy consumption improves the trade outcomes through the intervention of the government that implements policies and regulations in favor of firms that adopt renewable energy sources. Authors found that access to financial support plays a pivotal role to adopt renewable technologies in order to improve firms' performance.

The contribution of renewable energy sources to primary energy consumption is supported by different renewable energy mechanisms that EU members have been employed. Thus, the outcome from those different policies seems similar across main EU countries. As it is stated by Berk, Kasman, & Kılınç (2018), the energy mix in the core EU members seems to be similar in the long-run since the share of renewables in primary energy consumption converge to the average level. The highest speed of conditional converge is achieved by controlling other factors such as Carbon Dioxide emissions, FDI inward stock and electricity prices that have positive influence on share of renewables.

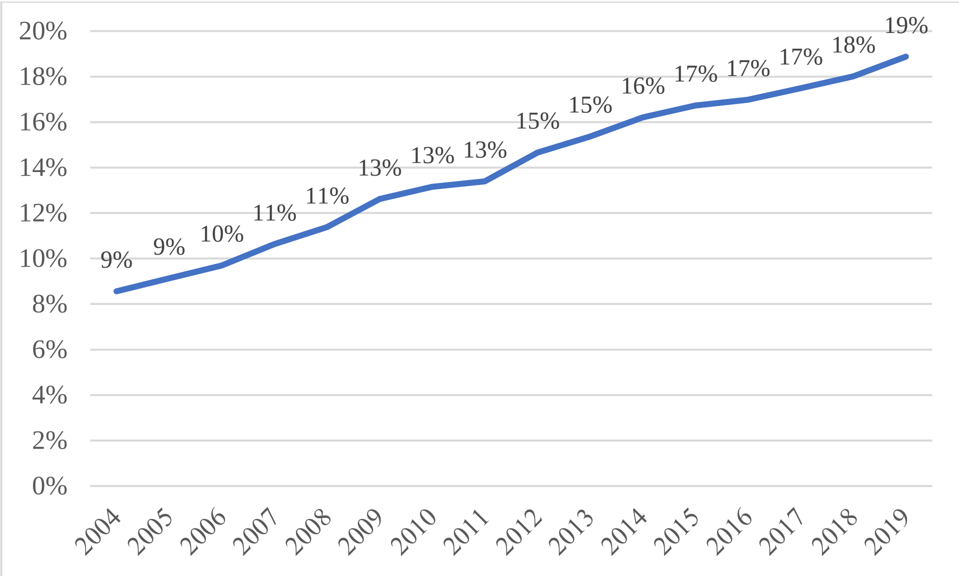


Figure 1.7 Overall share of energy from renewable sources, 2004-2019 (%)

Source: Eurostat

The share of renewable energy sources increases continuously from 2004 till 2019, more precisely from 9% in 2004, to 19% in 2019.

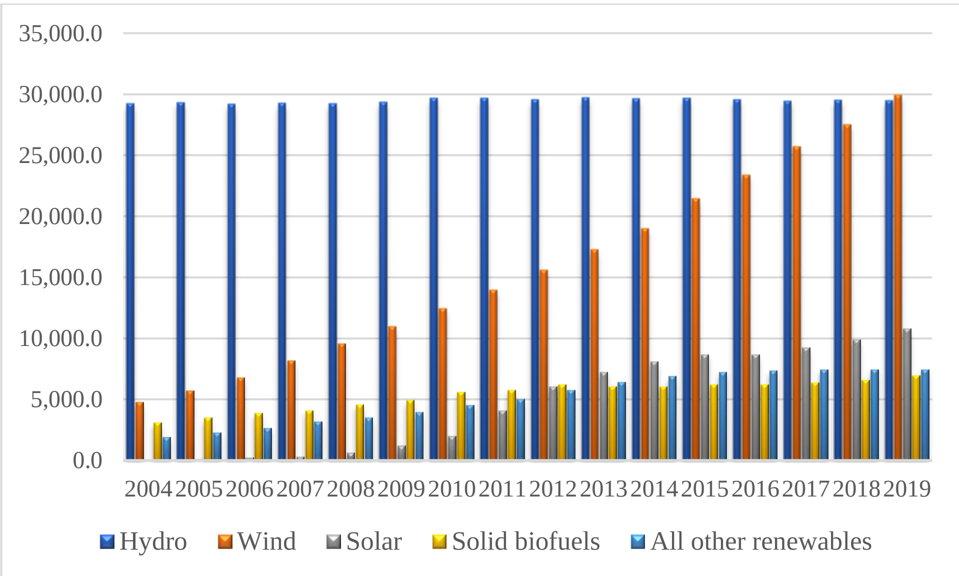


Figure 1.8 Electricity generation from renewable energy sources ktoe

1.4 Motivation

Living in an era of fossil-fueled economies, global warming as a phenomenon is still causing ice melting, storms, droughts and hunger, therefore, there is a need to find alternative sources and put an end to the age of fossil fuels. But this process of replacing traditional energy with renewable energy is a transition phase that is accompanied by fuel substitution in order to resilience climate changes.
The deployment of renewable energy technologies has been impeded by democratic procedures. In order to develop and to implement new renewable energy system companies are faced with conflicts that create conditions to favor specific installation.

Energy democracy can be understood as a contemporary expression of decentralized grassroots movements of the 1970s, the 1980s and before.
Megaprojects on Renewable Energy require large capital intensity and these systems will implement in different countries. They need not only physical capital but also, they require qualified and trained staff, financial funds, regulatory systems and so on. The renewable energy system, according to the prime source, will be affected by both centralized and decentralized energy politics. Decentralized renewable energy projects provide benefits for the community by creating an ecological environment and a new economy. In the hence, the small and medium renewable energy system that is installed in a village reduces the capital and administrative costs, and reduces the distance between power generated source and point of use by creating the possibility to sell energy.

The world is faced with an increase in energy demand considering the technology and economic development. Countries that face a rapid increase in domestic energy demand, when they have not enough resources to fulfill, there is an increase of demand on foreign energy suppliers. For too long, the main drivers of electrical energy production were fossil fuels, which means that a shortage of fossil fuels is expected to cause problems in the replenishment of energy demand.

Renewable energy received considerable attention due to the concern on both environmental issues and energy supply security, since the energy industry is one of the large air polluters in EU. Energy security supply is the main problem in European Union (EU) because they are highly dependent on imports from other countries, and they have shortage in energy reserves. Asian Pacific Energy Research Centre APERC(2007) defines energy security as the ability of an economy to guarantee the availability of resources to produce energy with the price that does not negatively affect the performance of the economy. Also, they conclude that the components of energy security supply are *availability, accessibility, affordability,* and *acceptability*. The availability refers to the physical existence of divergent energy sources that reduce import dependency.

Accessibility of available energy resources faces many obstacles such as economic, political, and technological constituents. The costs related to energy security are defined as affordability. Acceptability is related to environmental awareness related to energy sector by placing obstacles for companies using fossil fuel to generate energy (APERC, 2007). As a result, fossil fuels replacement with renewable resources is a transitional phase that will take time. Nonetheless, energy is being produced by using local resources, which are continuously replenished and environmentally friendly. Thus, having these advantages make this energy source more available, accessible and acceptable worldwide.

In this way, renewable energy sources are very important as an alternative of providing energy for future generations. The use of renewable sources creates public benefits such as environmental improvement, increases the diversification of sources, reduces negative effects on the economy of energy price fluctuation, and increases the GDP through more efficient production processes. Thus, the environmental awareness force firms paying attention to the environmental problems and generate profits from the view of business and economics perspective. The economic prosperity is related to production of not only good outputs that are useful goods but also bad outputs such as pollution that affect the environment. Firms increase the production of output that is associated with damage on ecological protection.

Sueyoshi & Goto, (2009) conclude that the relationship between ecological problems and economic prosperity is ambiguous. In this sense, this study is relevant for understanding the drives of profitability for renewable energy companies and the outcomes of the support schemes adopted for this sector. Also, in the literature there is a lack of studies that analyze the period of financial crises and recovery periods. While, searching for the relevant literature only few publications related to this topic were found, especially in China or specific countries. Previous studies did not distinguish renewable energy companies from traditional energy companies. They studied the financial performance of energy companies without checking the share of green energy that they are producing. Therefore, filling the gap in the existing literature and discovering the factors that shape profitability of renewable energy firms contributes to the validity of the objective of the thesis. Also, examining the factors that affect profitability of renewable energy companies is fundamental to help the energy sector to achieve the goal of carbon emissions reduction by 50% by 2030.

1.5 Objective of the Study

The main objectives of this study are:

1- To determine whether the profitability of Renewable Energy (RE) companies in European Union countries is affected by past realization.
2- To examine the relationship of firm specific factors as critical drivers of RE companies' profitability.
3- To investigate the role of industry-specific factors on RE companies' profitability.
4- To examine the role of support schemes on RE companies' profitability.
5- To examine the role of macroeconomic factors on RE companies' profitability.
6- To recommend an optimal strategy for RE companies' owner to generate profits and to be sustainable in the market.

1.6 Research Question

The study tackles the following research questions:

1- Does the profit persist on Renewable Energy companies?
2- What is the effect of firm's characteristics on RE companies' profitability?
3- What is the effect of industry-specific factors on RE companies' profitability?
4- What determines the RE companies' profitability considering the different support schemes and types of renewable energy utilization?
5- Do macroeconomic factors determine RE companies' profitability?
6- What is the optimal strategy that RE companies' owners should adopt to generate profits and to be sustainable in the market?

To answer the RQs the following hypotheses for each research question are formulated
To the Research Question 1

H1. There is a persistence of profit for RE companies.

To the Research Question 2

H2.a There is a positive relationship between firm size (market capitalization) and firm profitability of renewable energy companies.

H2.b There is a positive relationship between risk and firm profitability of renewable energy companies.

H2.c There is a positive relationship between age and firm profitability of renewable energy companies.

H2.d There is a positive relationship between capital intensity and firm profitability of renewable energy companies.

H2.e There is a positive relationship between growth and firm profitability of renewable energy companies.

To the Research Question 3

H3.a There is a positive relationship between electricity price and firm profitability of renewable energy companies.

H3.b There is a positive relationship between market concentration and firm profitability of renewable energy companies.

To the Research Question 4

H4. RE companies that have adopted Tradeable Green Certificates (TGC) support schemes perform better than RE companies that have adopted Feed-in Tariff (FIT).

To the Research Question 5

H5.a There is a positive relation between GDP growth and RE companies' profitability.

H5.b There is a negative relation between inflation and RE companies' profitability.

H5.c There is a negative relation between financial crises and RE companies' profitability.

1.7 Significance and Expected Outcome of the Study

In a nutshell, this research contributes to the existing literature in three ways. Firstly, the European renewable energy industry is considered, using data between 2004 and 2020. Thus, to the best of my knowledge, no previous study has addressed the financial performance of public renewable energy companies in the context of European Union countries. In addition, a comprehensive framework of macroeconomic, industry-specific, and firm-specific determinants and support schemes of renewable companies' profitability is investigated. Analyzing renewable energy industry makes a valuable contribution to the literature since the impact of different policies followed by member countries have been so far ignored. Secondly, this study attempts to extend determinants of RE firms' profitability by examining the outcome of risk and financial crisis by using the appropriate econometric methodology (GMM). Thirdly, using electricity price to attain a wider range of factors shaping RE companies' profitability. In particular this research makes a substantial contribution to policy implications for the energy sector and more specifically for renewable energy firms in the European Union to ensure sustainable energy. Also, this study investigates the relationship between sustainability and profitability in the renewable energy sector, that helps in the concern and challenges that arise form climate change. All previous studies are focused mostly in one country such as China, developed countries (USA), or in the case of the European Union the financial performance of energy firms is investigated, but they do not distinguish them from renewable firms. The estimation results show that large firms perform better in the market in the short-run and long run by generating higher profits. In renewable energy companies the share of risk is significant because they depend highly on external financial sources due to high capital costs. Profit persists over years, meaning that RE company's profitability depends on past fulfilments. Capital intensity has a negative effect on profitability. Related to support schemes, there is a difference in the profitability between firms that operate under Feed in Tariff (FIT), or Tradeable green certificate (TGC). In the short-run companies that have adopted FIT support, perform better than other companies that have adopted TGC, the contrary happens in the long-term ones. Economic conditions are fundamental in the development of clean energy. Countries that have higher income improve the profitability of such companies. Financial crisis has a negative effect that is associated with a cut of support schemes during 2012 that has affected negatively firm's profitability. This study contributes filling the gaps in the existing literature, on factors that shape renewable energy profitability, since this is the first study that analyzes RE companies for a long period now, by using the robustness estimation methods. Policy implications to owners, stockholders, policymaker, energy sector are given.

1.8 Organization Structure of Research

1.8.1 Analytical Framework

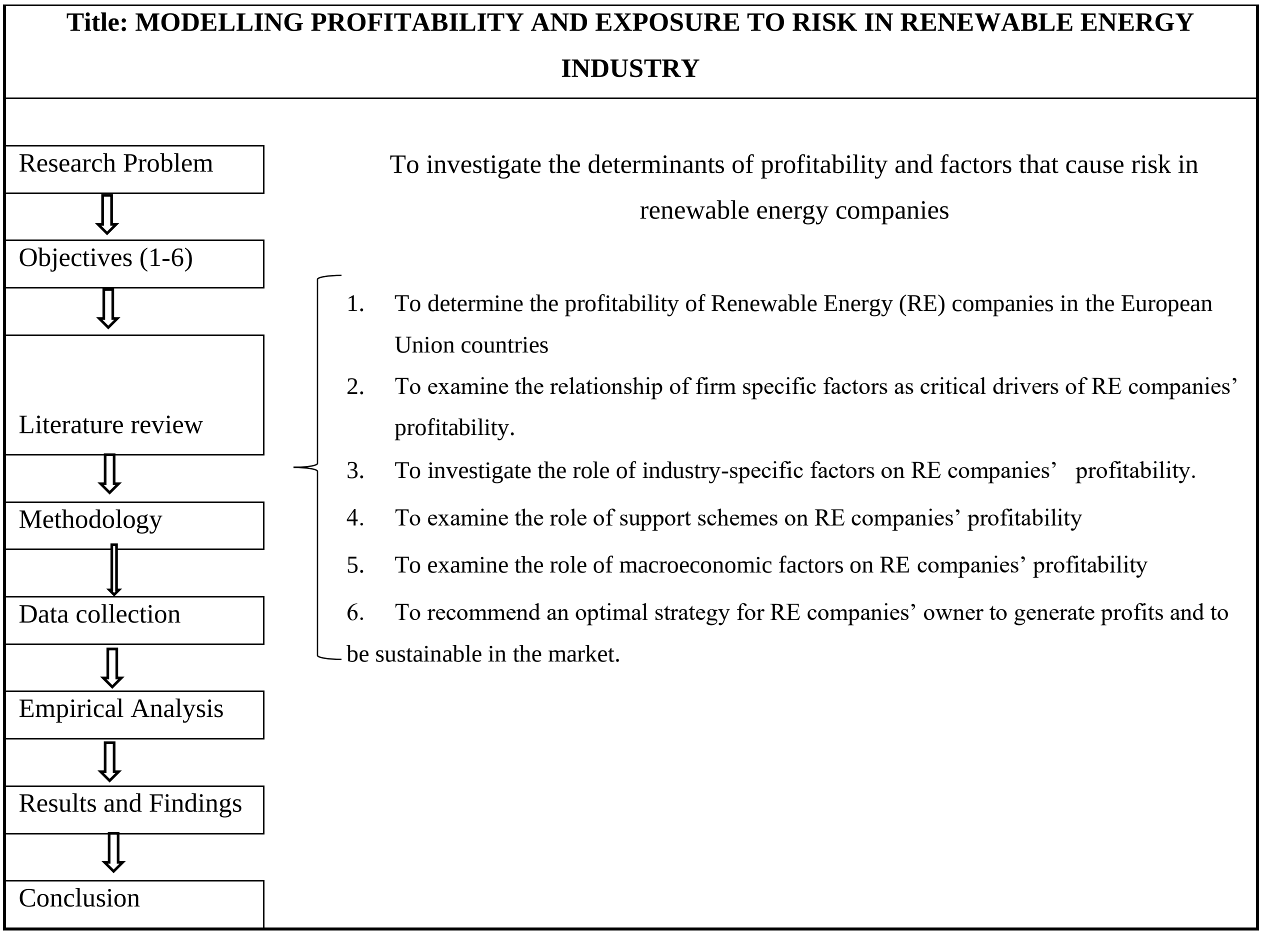


Figure 1.9 Analytical framework

1.8.2 Literature Review Flowchart

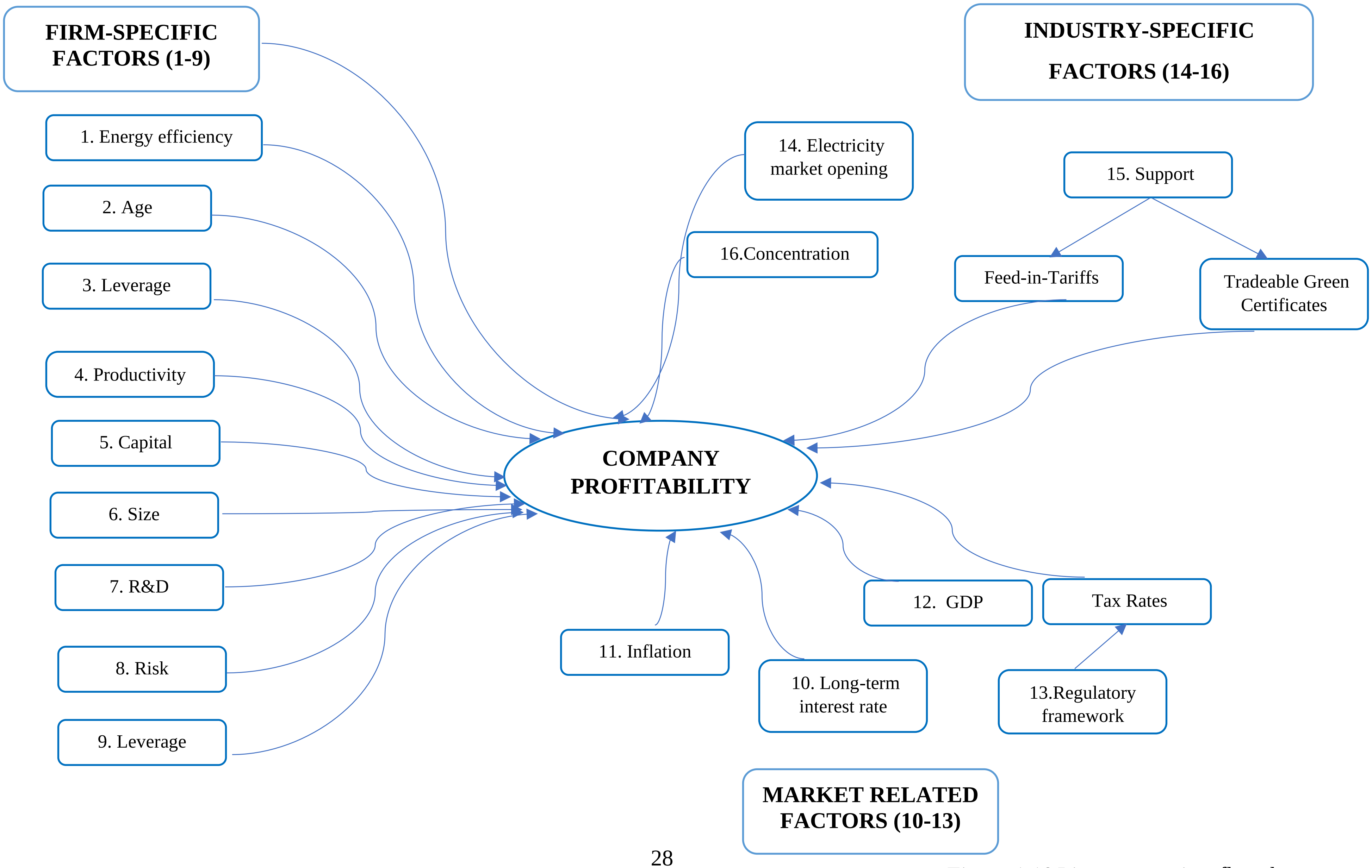


Figure 1.10 Literature review flowchart

1.8.3 Methodological Framework

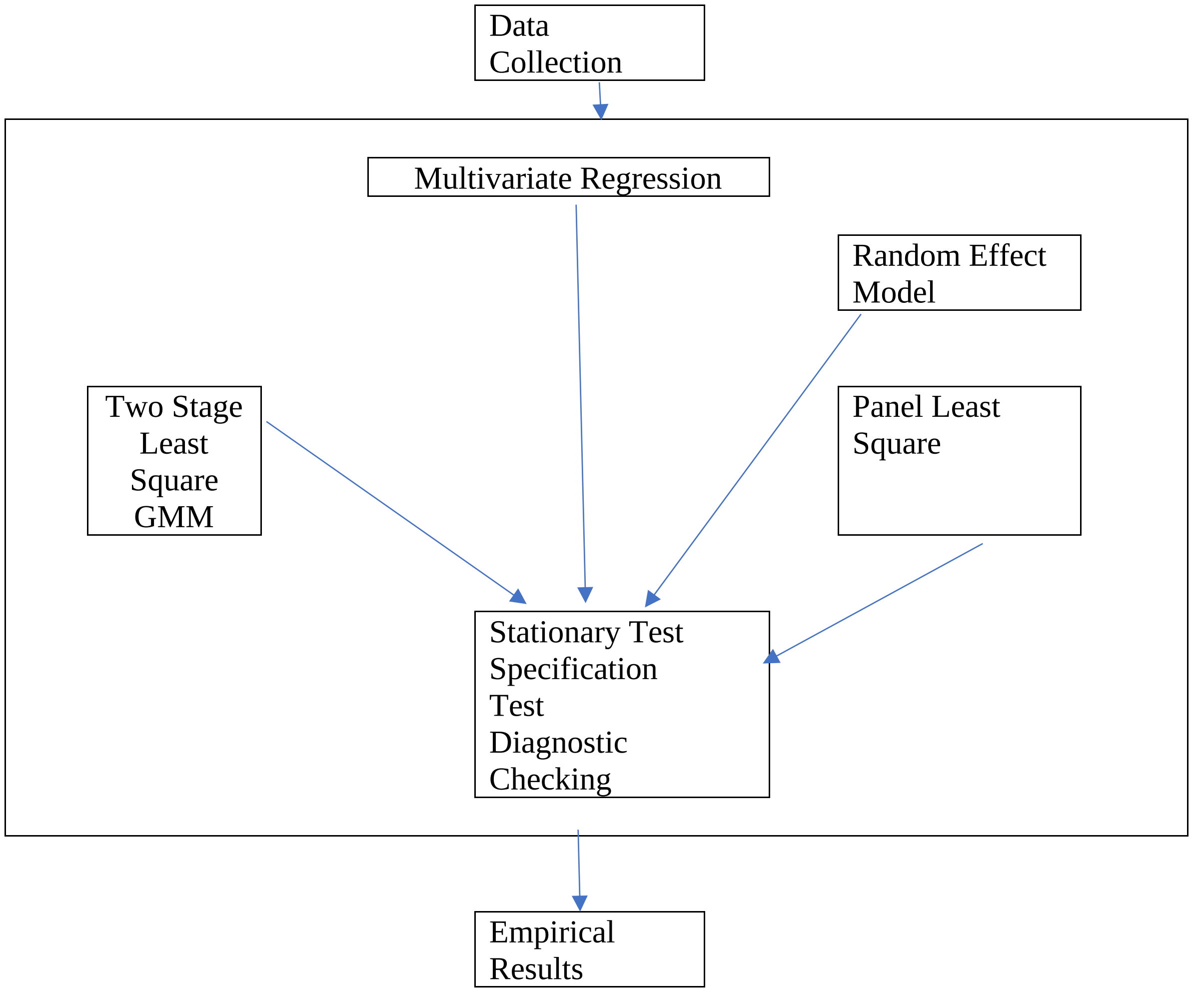


Figure 1.11 Methodological framework

1.8.4 Research Model

Research Model

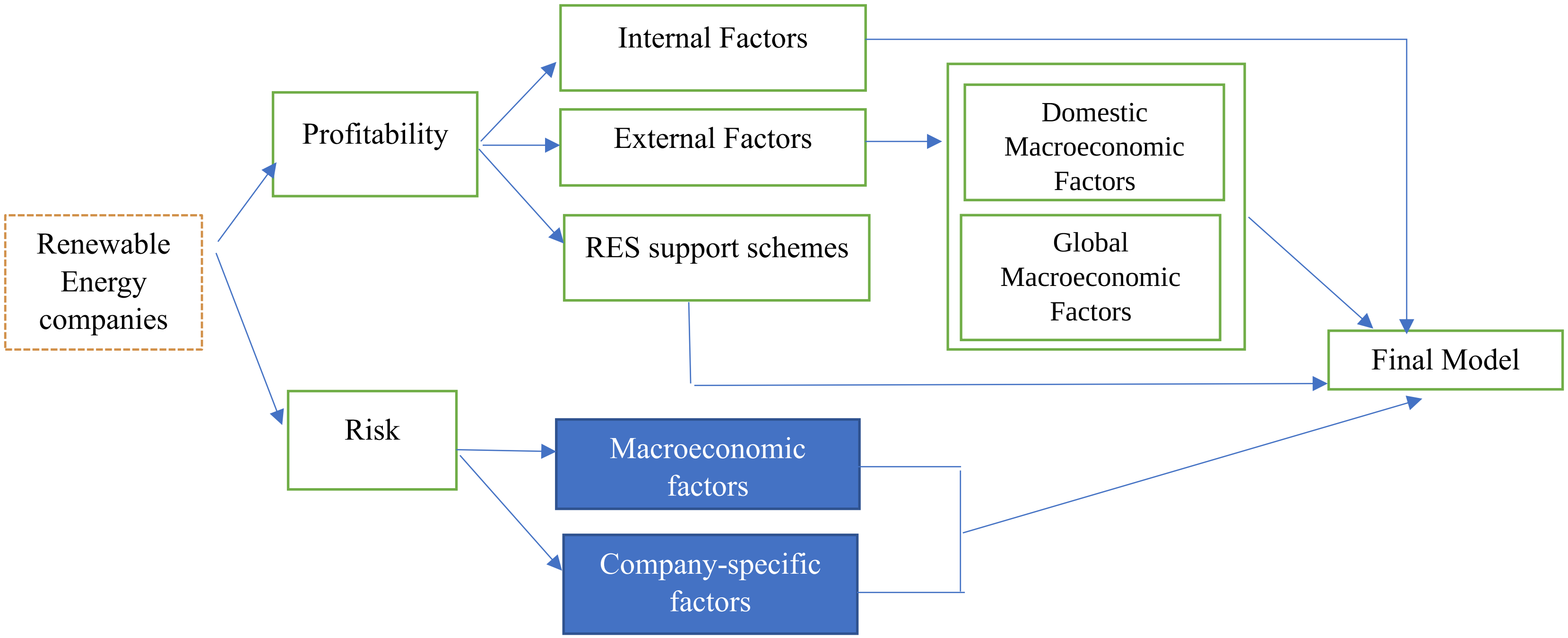
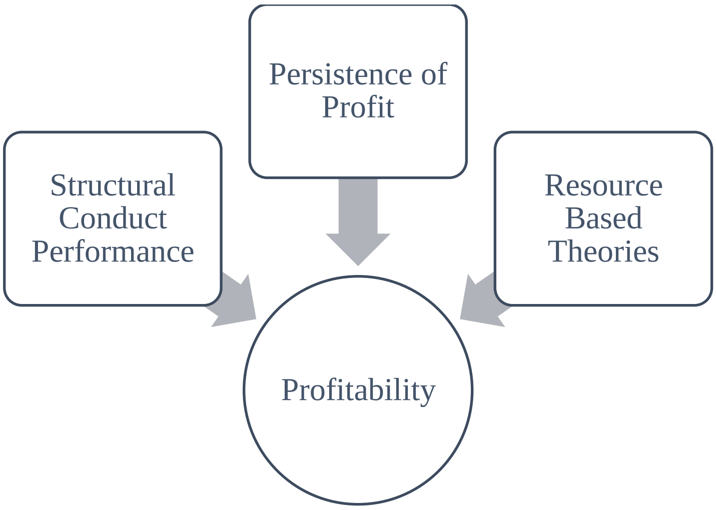


Figure 1.12 Research model

1.8.5 Theoretical Framework

Profitability



Risk

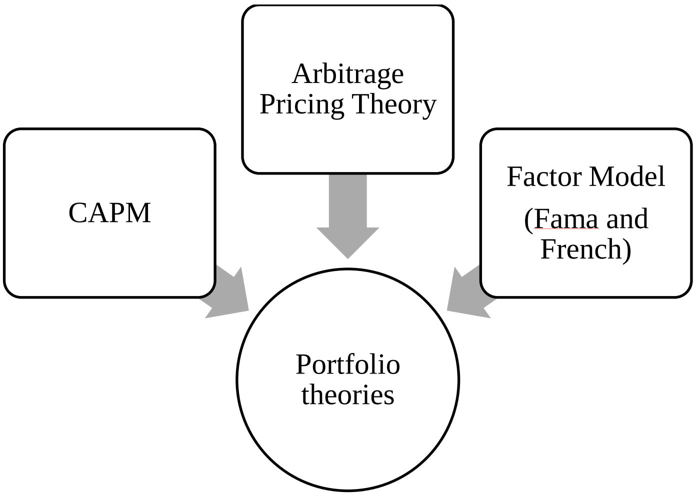


Figure 1.13 Theoretical framework

1.9 Summary

To iterate, the importance of renewable energy companies has increased during recent years, and it is becoming an important issue that is related to climate changes. Thus, the attention to clean energy is related to the restriction that are settled by EU Energy Policy towards emissions in the environments. Therefore, investments in renewable energy production will be beneficial and help to achieve the target of carbon reduction of 55%, by 2050. In the hence, EU countries have boosted the usage of renewable energy in order to achieve the objective of climate. The 2020 set target related to the share of renewable energy to gross energy consumption is exceeded by 1.3%, showing that the government is supporting the development of the renewable investment.

The profitability of renewable energy companies is important for owners, stakeholders, government, and energy companies. Sustainable energy producers' profitability is important so as to mitigate the import dependency of energy for EU countries and providing clean energy for future generation. The development of renewable energy industry contributes to the economic growth by providing new job opportunities, ensuring clean energy with less emissions that protect the environment and contribute to sustainable development.

This is the first study that is based only on renewable energy companies that operate in EU during a large period from 2004-2020 and provide theoretical and practical contribution. To the best of my knowledge no prior studies have included firm-specific, industry-specific, macroeconomic and support scheme factors that cause profitability.

The link between firm size, leverage, age, capital intensity, growth with short-term and long-term profitability is investigated. In addition, the causes of industry factors and macroeconomic factors with profitability is examined. The difference in profitability between countries that adopt different support schemes is investigated.

This thesis provides insight for investors, policymakers, owners, stakeholder related to factors that shape profitability, and by understanding the drivers of profitability to be able to decide for the appropriate model that enhance profits.

CHAPTER 2

2. THEORETICAL BACKGROUND

2.1 Introduction

Theories related to firm profitability are elaborated in line with criticism. There is a long debate about the determinants of profitability, if it is caused by business effect, or it is in line with average industry level that is called as industry effect. Following, there is a detailed background to the theories related issues.

2.1 Firm Profitability- Theoretical Perspectives

Several factors influence corporate profitability, and it is essential to recognize and understand some theoretical frameworks that are helpful in explaining the relationship between firm characteristics, industry characteristics, macroeconomic factors, and corporate's profitability. The process of the identification of the sources of variation in the firm-level profitability has been studied by many researchers in industrial economics, strategic management, and accounting and finance.

2.2.1 Structure Conduct Performance Paradigm

In many textbooks, papers and articles in strategic management there are a broad competing approaches and views related to the profitability, and these views directly or indirectly are related to the question why some firms perform better than others and how can their performance improve in order to survive in the market, and achieve a sustainable competitive advantage among other firms.

In the early development of strategic management, the study of internal firm characteristics was the focus for many authors that identify the firm's best practices that contribute to financial performance. After that, a shift happened from internal factors to external ones, that foster a move towards industrial organization (IO) economics. IO economics considers structural aspects of an industry, and therefore, the bounders between firms and markets. According to early work of Mason (1939) and the modification by Bain (1956) the firm performance is affected by industry structure and competitive position in the industry. However, Hoskisson, Hitt, Wan, & Yiu (1999) compare the evolution of the theory of strategic management to a swinging pendulum that creates new theories and new methodologies. Its emphasis swings between firm internal strengths and weaknesses and its external opportunities. In this regard, if the performance of firms is explained by internal or external factors, there are two opposed concepts: market-based view and the resource-based view.

In IO economics, the most important theory that explains the determinants of profitability is the Structure -Conduct-Performance paradigm. This approach is used to explain the causal relationship between the structure of an industry, the industry conduct, and economic performance. Structure describes the environment of a particular market within which a firm is operating. It is referred to the number and size of firms that operate in the market, entry and exit barriers, and economies of scale. On the other hand, industry conduct refers to the behavior of the firms in the market related to decision firms make and the way in which decisions are taken. The traditional SCP approach argues that the industry structure determines the behavior and strategies of firms that operate in the industry. The industry conduct (e.g., pricing behavior, research, and innovation investment) on the other hand affects firms' performance.

Based on SCP paradigm the difference between firms in their performance is explained through the structure of the industry that is an external factor of the firm (Ferguson & Ferguson, 1994).). Although, the performance of the firm and more particularly the industry conduct affects the structure and it becomes a more complex relationship between structure, the industry conduct, and performance but still the causality flows from the structure (Figure 2.1).

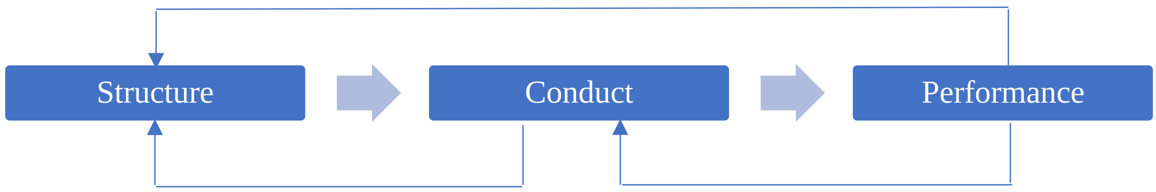


Figure 2.1 Structure-Conduct-Performance Paradigm

The main criticisms against the SCP approach are that it relies on the neoclassical theory that assumes that markets are in equilibrium, and all producers and consumers have perfect information. Also, this approach emphasizes that strategies followed by the industry drive firm's performance and neglect the firm-specific strategies, that are difficult to derive from industry strategy. However, according to the work of Porter (1989), the performance of firms depends on the environment of the industry and the firms' positioning against competitors. The decision to be part of one industry is related to how attractive the industry is. Porter (1989) explains that there are five forces that affect the industry' attractiveness:

1) Threat of entry
2) Bargaining power of buyers
3) Bargaining power of suppliers
4) Threat of substitute products or services
5) Competitive rivalry

The key to growth and to sustain long-term profitably is to analyze industry competition and take benefits in the formulation of strategies in response to competition.

2.2.2 Persistent of Profit (POP)

Profitability is a key indicator in economic analysis and every industry and individual firm are interested in understanding it. The theory of "persistence of profits" explains the successful long-run profitability and learning from failures. This theory takes its formal name from Mueller's (1990), who analyzes the process of competition. According to Mueller , exist two views of competition. The first considers the competition as a process of allocating resources to their optimal use and equilibria will be achieved when prices are equal to marginal costs or when it malfunctions. Equilibria exists with some prices above marginal costs. The second view sees it as a process of using a given stock of resources for

introducing new products or techniques. Firms that use new ideas and techniques have some monopolistic features, but they disappear when other firms imitate and improve upon the new product. The presence of some monopolistic attributes within firms and industries in perfect competition explains why these firms or industries get profits above the norm.
The theory of "persistence of profits" is explained by Mueller (2009) , who builds two models of competition process considering monopoly as a passing stage:

a) *The static model.* This model has its roots in the work of Adam Smith (1976) and Agustin Cournot (1938). The inference of the research is that the correlation between profitability and concentration is positive, under the assumption that the divergence between price and costs is greater in concentrated industries.

b) *The Schumpeterian perspective.* This model comes from Joseph Schumpeter's idea that entrepreneurs introducing new products or technology have temporary monopolistic competitive advantages over other competitors until this product will imitate by other firms that in turn make profits back to zero. The Schumpeterian perspective underlines more informal arguments and unregulated market that means it has little impact on the development of formal models of market behavior.

Furthermore, a vast amount of literature considers business cycle factors as deterministic on the variability of profits. The fluctuation of profits as a response to the business cycle is related to industry characteristics such as concentration and capital intensity.

2.2.3 Recourse-Base View

The resource-based view has its roots in the 1980s and becomes the dominant theory in strategic management in the 1990s, that emphasizes the importance of firm-level strategies. The proponents of resource-based view (RBV) suggest that firm's performance depends on firm resources. These resources are defined as tangible and intangible assets, tied semi-permanently to the firm. The availability of distinctive resources makes each firm take competitive advantages in the market. In order to analyze the sources of competitive advantages this model built on two assumptions. Firstly, this model assumes that firms are heterogeneous within an industry due to strategic resources they have. Secondly, this model assumes that the heterogeneity among firms can be long-lasting because resources cannot be perfectly distributed across firms. As it is mentioned by Barney (1991) the four characteristics of resources that generate sustained competitive advantages are value, rarity, imitability, and substitutability.

- *Value*. A firm resource must be valuable in the sense that it discovers opportunities and/or neutralizes threats. The value of resources enables firms to implement strategies that improve their effectiveness and efficiency.

- *Rarity*. In order to have competitive advantages in the market, valuable firm resources should not be possessed by a large number of firms. Firms that have unique valuable resources and include in a value creating-strategy, and is not implemented by a large number of other firms generate competitive advantage.

- *Inimitability*. Firms that possess valuable and rare organizational resources that cannot be obtained by other firms are considered as imperfectly imitable resources. The inimitability of resources depends on historical conditions, causal ambiguity, and social complexity of resources.

- *Substitutability*. Firm resources being a source of sustained competitive advantages must not be equivalent to a valuable resource, that is at the same time rare or inimitable. There are two forms of substitutability: substitution of similar resources, such as imitating high-quality top managers team and substitution of different firm resources, such as copying from other companies the strategic planning process.

The main concern to RBV is that strategies followed by firms based on the prediction of their entirely impersonal prediction of 'wants', neglecting the responsibility that producers should forecast the customers wants. It means that the concept of "value "remains outside the resource-based view RBV. Priem & Butler (2001) conclude that the contribution of RBV in strategic management would be more important through complementary and integrated use of the RBV together with demand-oriented perspectives. Knecht (2013) explains that firms' specific resources and capabilities influence performance because the resources that firms have in their disposal differ among firms and these resources and capabilities would make a firm to take advantages due to its inimitability. In addition, there are many authors that support RBV theory, who have identified that one or more internal factors may influence firm performance. However, limitations of resource-based view of the firm are discussed by many authors.

The natural resource-based view (NRBV) theory was proposed to fill the gap of RBV theory. Hart (1995) proposed that the existing Resource Based View (RBV) theory has many problems. While in the RBV theory were identified potential resources to explain competitive advantages, it was neglected the interaction between an organization and environment. Although, such a release may have been understandable in the past where pollution problem was not a threaten for companies. Today, the natural environment can create a serious constraint on firms ‘efforts to create competitive advantages in the future. According to Hart (1995), the competitive advantages of the firm are interlinked with the natural environment. Attention is being paid to environmental protection which has required that companies publicly disclose their emission levels caused in the environment.

Therefore, managers have understood that pollution stems from inefficient use of material, and human resources. *Pollution prevention, product stewardship* and *sustainable development* are three key strategic capabilities for the NRBV theory. Each strategic capabilities have a different source of competitive advantage that influences environment protection. The pollution prevention aims more to prevent waste and emissions, rather than cleaning them up, that in turn reduces costs. Thus, removing pollutants from the production process increases efficacity by reducing the inputs required, simplifying the process, and reducing liability and compliance costs. Product stewardships contribute to pollution prevention through internal strategies that companies could build, this way creating the potential for competitive advantages such as using green raw materials.

Lastly, a sustainable development strategy attempts not only to have fewer negative effects on the environment, but it sustains the actual production to be maintained indefinitely into the future. Therefore, a sustainable strategy is focused on economic and social concerns. In this theory it was crucial to discover the link between pollution prevention and firm profitability. Thus, sustainable companies can gain an advantage over non-green companies. Therefore, as it is mentioned by Hart & Dowell (2011) , companies and management scholars today are looking for new strategies that can be implemented in companies that are more oriented toward environmental and social problem' solutions, rather than reducing their negative effects caused by their activities. The performance of sustainable firms has been the focus of multiple studies and the NRBV suggest that green companies can outperform non-green companies.

2.2.4 Random Walk Model

Random walk theory implies that the stock prices in the market evolve according to a random walk. In a meaningful way, the past history of stock prices cannot be used to predict the future prices and the successive price changes are independent (Fama, 1995). Thus, the analyst that have neither insight nor information about a stock, can choose securities by some random selection procedure. It means that in an efficient market the actual price of individual securities reflects the effects of information based both on events that have already occurred and on events that will take place in the future.

2.2.5 Capital Asset Pricing Model

In modeling and measuring firm profitability, financial economists have emphasized that returns to investing in assets by firms depends, on firm-specific characteristics. But the decision to invest could be influenced by systematic risk that what affects the overall market, and it is not diversifiable. Consequently, investors require higher return for risky investment. The prediction about risk and expected return is developed in the capital asset pricing model (CAPM) by Sharpe (1964) and Linter (1965). The CAPM model was based on the model of portfolio selection developed by Harry Markowitz (1952), who assumes that investors are risk averse and they care only for mean and variance of their investment. According to the CAPM model, economic agents undertake the optimal decision to invest in jth assets only if the expected return from this asset is equal to the risk-free rate of return, r_j, plus risk premium of a given assets (Sharpe, 1964). Risk premium refers to the difference between the rate of return on the market portfolio, r_m , and the risk-free rate.

$$r_j = r_f + \beta_j(r_m - r_f) + \mu_j \qquad (1)$$

Equation (1) shows the tradeoff between risk and returns and the opportunity of investors to have efficient portfolios if the asset market is to clear.

2.2 Conclusion

Firms' profitability is affected by internal, or external factors. How these factors affect their profits depends on the size of the firm. Since, authors conclude in different findings, some of them show that resources firms have available are more important than the industry factors. Hence, firm profitability is not only influenced by the resources available, but also by the way firms react to these market features

CHAPTER 3

3. LITERATURE REVIEW

3.1 Introduction

This chapter reviews empirical studies related to profitability in the renewable energy industry. The aim of the systematic literature review is to give a comprehensive overview of the existing studies in this field and to identify the gap of the literature. To find the gap, empirical studies are classified based on the factors that they have identified and also to the sector that the study is conducted. Therefore, the chapter is divided into five parts to find out the factors that are relevant for our study and to build the hypothesis. The first session discusses empirical studies related to internal factors that affect profitability. The focus is to investigate the impact of firm size, age, leverage, on firm profitability in renewable energy companies. The second session explores all industry specific factors that are important for firms to ensure profits. The political and regulation framework is discussed in the third session. In the fourth session are addressed macroeconomic factors that affect profitability of firm. Lasty, all the risks that firms are exposed are elaborated in the last session.

3.1 Literature on Firm-Specific and Profitability

In general, there is a quite diverse literature on firm performance. Many scholars have identified different factors that shape companies' profitability. The increased attention of scholars related to determinants of profitability is because firms' first objective is to be profitable and to survive in the market. Engagement in innovation activities is a feature of profitable firms that create opportunity jobs that in turn contribute to economic growth (Vithessonthi & Racela , 2016; Chakrabarty & Wang, 2012). Authors have used several proxies or measures that represent financial performance.

In most cases, firm performance is measured by using accounting-based measures, such as return on assets (ROA), return on equity (ROA), return on investment (ROI), return on sales (ROS) (Asimakopoulos, Samitas, & Papadogonas, 2009; Gallego-Álvarez, Segura, & Martínez-Ferrero, 2015; Goddard, Tavakoli, & Wilson, 2005; L. Wang, Li, & Gao, 2014). Accounting-based measures represent the capital management and operating performance of the firm. While, other financial performance' proxies include market-based measures such as earning per share (EPS), Tobin's *q* that take into account market expectations and financial risk (Inoue & Lee, 2011; L. Wang et al., 2014). For public firms that are listed on the stock exchange the Tobin's *q* proxy for financial performance is the appropriate one. Furthermore, Delen, Kuzey & Uyar (2013) argue that the Earnings before Tax-to-Equity Ratio and Net Profit Margin are the two most essential financial ratios that define a company's performance. These financial ratios measure profitability and reveal how a corporation handles expenses and benefits. They use financial ratios to analyze the financial performance of Turkish firms listed on the Istanbul stock exchange in order to reach this conclusion. Using Explanatory Factor Analysis and a decision tree, financial success is quantified in terms of ROE and ROA.

Size

The relationship between business size and profitability has been extensively researched, and various conclusions, such as a positive or negative association, have been reached. It is the firm's size that enables enterprises to apply various data management strategies to attain market competitive advantages, hence contributing to governmental profitability and benefits. Larger, more prominent companies pursue techniques to lessen the company's environmental impact. Small businesses, on the other hand, are more concerned with market survival. Large corporations' commitment to environmental initiatives is linked to access to capital and better resources. Small businesses, on the other hand, have financial constraints that limit green investment. Baumol (1959) stated that whereas large organizations are capable of increasing investment possibilities that result in higher profit rates, smaller firms are unable to take advantage of them due to financial constraints. Furthermore, large firms have an edge over small firms since they may enter a variety of product lines, giving them a competitive advantage, the advantage of scale and size. As a result, large firms extend their activity by investing in new technologies, access to finance, and rising capital.

Hawawini, Subramanian, & Verdin (2003) examine the researcher from the past to evaluate whether the firm's performance is influenced by industry or firm-specific characteristics. Instead of ROA, performance is judged using market-based measurements (economic profit or residual income and market-to-book value). Taking into account the outliers, the authors found that the performance of the market leaders and destroyed is influenced by firm-specific characteristics, but for other firms that do not outperform or underperform, industry-specific is dominating. In the same line, Lee (2009) argue that firm size matter to firm’s performance. He conducted a study for 7000 public companies in United States during the period of 1987-2006 and reveal that company size has a positive relation to profit rates. Similarly, Nanda & Panda (2018) examine the effect of internal factors on profitability for manufacturing companies that operate in India during the 2000-2015 period. They infer that the size of the company is determinant for a firm’s profitability. The findings related to size show the same results as profitability that is measured by using proxies such as, ROA, Net Profit Margin (NPM).

Large companies that invest in green investment face high costs at the beginning but enjoy long term financial performance. The implementation of green investment strategies could raise the cost in the short term in the early stage but result in advantages in long term. Based on resource-based view, investment in intangible assets make firms to take competitive advantages due to its rare, inimitable and valuable. The firm size has a significant influence on green investment and on other hand this influence moderate the association among green investment strategies and corporate financial performance (Lin, Cheah, Azali, Ho, & Yip, 2019). Firm size is an important indicator that needs to be accounted for measuring firm’s financial performance. It is well known that large companies are more likely to be attractive to the public and to take care about emission reduction and ensure sustainable development. In case of renewable energy companies, the number of employees cannot be used as indicator of firm size, because most of renewable energy sources are controlled by software and the energy generated is directly transmitted to the grid, in which the distributors are buying. In addition, using data from the Bloomberg database, Tsai & Tung (2017) evaluate the factors of profitability for 93 RE firms located in 34 different countries. Return on assets, gross profit margin, and interest coverage are the variables used to assess the success of RE companies from 2008 to 2013. The findings demonstrate that energy consumption and renewable energy shares have a negative impact on ROA, whereas market capitalization has a beneficial impact. In addition, market capitalization improves interest coverage. The gross profit margin is influenced by capital intensity. In the same line, the study by Fareed, Ali, Shahzad, Nazir, & Ullah (2017) in 16 energy firms that operate in Pakistan shows that the size of the firm is a determinant factor of profitability. In addition, the effect of external factors is investigated, and the effect of crisis is significant, and it has a positive effect on performance of energy sector. However, Gallego-Álvarez et al. (2015) investigate the link between environmental and financial performance using data from 89 firms from 2006 to 2009. They argue that reducing emissions has a favorable influence on financial success, while the size of the firm reduces financial performance.

Risk

Electricity generation companies are capital intensive companies since their activity is strongly related to fixed assets and in order to develop their activity, those companies use external and internal funds. Since the sources of financing may differ in various stages of renewable energy development, the fundamental question is whether capital structure matters for renewable energy firms. Furthermore, the capital structure is related to risk and reward, it is one of a company's first major choices. In traditional financial theory, according to Modigliani & Miller (1958) theory, there is no link between capital structure and company value, implying that the source of funding has no effect on the firm's worth. However, this conclusion is predicated on a number of assumptions, such as a perfect market and no taxes, which are not attainable in the real world. Goddard, Tavakoli, & Wilson (2009) testify that corporate group effects and firm-specific are the primary contributors to profitability. They support prior empirical research indicating that the organization structure and various management practices of firms, or being integral of a bigger corporate group, are the key sources of alteration in a firm's profit by employing variance decomposition analysis of firm-level profitability. Consistent with Modigliani & Miller (1958), the study by Zhang, Cao, & Zou (2016) conclude that capital structure does not matter for renewable energy companies where as a measure is used debt-to-asset ratio. They used a different indicator of capital structure based on the source of financing in order to obtain better results and conclude that commercial loans and short-term loans seem to be relevant to the renewable energy sector.

Capital structure is found to be more important and to have a positive influence on the profitability of renewable energy firms that are engaged in the generation and final users. It means that renewable energy generation firms require financial support that the government can provide through corporate bonds, commercial loans or long-term loans. Similarly, Corsatea, Giaccaria, & Arántegui (2014) identify that three main sources of financing for the development of renewable energy technology, focusing on wind energy are public research, development and demonstration (RD&D) investment, the support schemes such as subsidies and feed-in-tariffs to promote the generation of green energy and the access to credit. They conclude that the development of wind technology is tightly related to access to loans from banks, but the role of regulatory risk in the development of wind technology seems to be stronger than financial risk.

As stated by Coto-Millán, de la Fuente, & Fernández (2018) the electricity firms require high weigh of capital, and those companies are highly depended on external funds and to achieve technical efficiency it is needed restructuring capital structure. In this way, in the improvement of energy efficiency, the role of firm decision and authorities is fundamental. Adopting financial behavior and strategic management by firms can promote electricity firms' efficiency and settling regulation to extend renewable energy not only contribute to environmental improvement with less pollution but also has a positive influence on energy efficiency. However, Halkos & Tzeremes (2012) analyze the financial performance of renewable energy firms that operate in Greece during the period 2006-2018 and they find that their performance is influenced by ROA and ROE and from lower levels of debt to equity because the efficiency of green energy companies in Greece market have not significant differences and they operate in a highly competitive market.

According to Ramli, Latan, & Solovida (2019) firm leverage influence firm financial performance but the level of leverage indirectly influence the asset structure, growth opportunities, liquidity, non-debt tax shield and interest rate. Therefore, the source of financial risk is the debt structure, then affected by the recurring changes of the monetary policy and management decision related to the financing source. The size of the external financial premium is affected by monetary policy changes and as a result expected future profits are reduced. The renewable energy firms' decisions on their capital structure and financial constraints are affected by such changes then. Due to having liquid assets, renewable energy firms can pay debts, which makes them eligible to borrow in commercial banks, therefore, acquiring external funds. Renewable energy firms having high tangible assets, can mitigate the effect of financial constraint on their financial performance, during certain contractionary monetary policy periods (K. Chang, Zeng, Wang, & Wu, 2019).

Capital intensity

Berman, Wicks, Kotha, & Jones (1999) conducted a study in top 100 companies that operate in different industries in U.S during the period between 1991 and 1996 and reveal that capital intensity impair firm's financial performance. Jin, Chen, & Luo (2019) argue that capital intensity has a negative effect on profitability for private and state listed companies in China. In the same line, Zhou, Qiu, & Wang (2021) mentioned that the new amended Environmental Protection Low has greatly improved the profitability of severely polluting industries, which is attained through the consolidation of enterprise cost management and the removal of tiny firms with high compliance costs. The study was conducted using data from China's listed firms from 2010-2018. Furthermore, the findings show that capital intensity reduces firms' financial performance.

Growth Rate

In theory and empirical studies, the tangible influence of the growth on profitability has provided inconsistent results. Asimakopoulos et al. (2009) examines the factors that determine the profitability of Greek firms that are listed in Athens stock exchange over a time between 1995-2003. They found that the growth of the firm enhances profitability of the firm. Furthermore, they found that other factors such as the size of the firm has a positive effect on firm's profit, while the profit is negatively influenced by leverage. Akben-Selcuk (2016) examined firm competitiveness for 359 public companies for the period of 2005-2014 and found that growth of the firm is fundamental for their competitiveness. The improvement of financial performance is affected by the firm's growth. Moussa (2018) investigate the effect of growth sales on profitability. He found that there is a highly substantial positive association between growth sales and firm valuation meaning that firms that have a higher market value have more growth changes. In contrast, the study by Jang & Park (2011) argue that both current and prior growth rates influence negatively on profitability. They found that profitability will drive expansion, but profitability will reduce while firm growth is increased.

Energy efficiency

Environmental awareness is becoming a key issue for companies because it is mandatory to disclose corporate social responsibility. Energy intensity industries are paying attention to carbon emission by implementing sound programs amplifying their energy efficiency that may bring better value of total assets. The financial performance of firms would improve when firms produce the same output with less energy (Fan, Pan, Liu, & Zhou, 2017). In addition, Martí-Ballester (2017) investigate the effect of sustainable energy management system on financial performance for 574 large companies for the period between 2008 and 2013. He found that financial performance in short-term (ROA) is enhanced while the sustainable energy systems are implemented, while the effect in long term in terms of Tobin's *q* is not significant. Firms can contribute to decrease environmental effect while maintaining company financial performance by using sustainable energy systems. According to Gökgöz & Güvercin (2018) the most RE efficiency leaders in EU are countries such as Sweden, Germany, Spain, Belgium and Romania while in France and United Kingdom the development of RE is limit from conventional energy producers. In order to enhance efficiency and productivity growth of RE the development of technological diffusion and knowledge spillover is fundamental. A study by Halkos & Tzeremes (2012) in Greek renewable energy sector show that due to high competitiveness between firms, there is no difference on firm's efficiency levels. The analysis was carried out for 78 companies between 2006 and 2008, using a bootstrapped DEA formulation, and it revealed that sustainable development is directly tied to renewable energy sources and their usage.

To sum up, companies that implement sustainable energy systems lead to pollution reduction and long-term growth for firms. An empirical study conduct by Ruggiero & Lehkonen (2017) for 180 electricity production firms that operate in 26 different countries show a negative relationship between renewable energy production and utilities 'financial performance both in the short and long-term. According to this view, firms that want to be successful in both in the short and long-term they need to balance the challenging task of shifting from fossil fuels to renewable energy. In addition, the study by Dallinger, Schwabeneder, Lettner, & Auer (2019) in Austrian hydro storage power plants shows that the Central Europe's need for reserve capacity and investment in peaking units diminishes while maintaining a high degree of supply security. The shift to renewable energy generation reduced the environmental damage expenses by up to 1300 MEuro/a. Also, the profitability analysis shows that lowering the minimum load or improving the hydro reservoir storages with a pump mode increased the number of hours spent participating in market balancing and machine utilization. Adopting the most effective business model where energy storage technologies that increase the flexibility of the electrical grid will be profitable in long-run and they don’t need any support from government in different ways such as grant, subsidies etc. The simulation models shows that the appropriate business model will contribute to reduce the import dependency of Austrian’ electricity.

Age

The impact of the age of the firm on profitability is investigated in the literature, but authors have extended in different results such as negative impact, positive impact, and no impact. The age of a firm represents a firm’s level of experience in the market, and it is a crucial factor that affects profitability. Young firms face financial constraints that restrict they activity in terms of assets since they have lack of resources and difficulties to borrow compare to large firms (Sung, 2019). Regardless, the study shows that new firms by investing in more efficient technology, will result in better earnings, comparing to older firms in renewable energy sector that have the ability to borrow and to increase assets without receiving a good profit in return (Jaraite & Kažukauskas, 2013). Furthermore, renewable energy companies are technology intensive that require higher capital investment and the age of the firm reflects the electricity sector’ experience.

Capital

The study by Hirth & Steckel (2016) show that electricity generation through renewable energy sources require higher capital investments compare to fossil fuel power stations. This can be explained by the fact that upfronts costs of renewable energy companies at the beginning of the lifetime are still significantly higher than fossil fuel plants. On the other hand, higher variable costs are typically for fossil fuels plants, while for renewable these costs tend to be zero.

R&D

Staying profitable and competitive in the market requires investment in various activities within firms but investing in building new knowledge and capabilities are essential tasks.

Knowledge-based view theory emphasizes that knowledge is a unique resource that is difficult to imitate by other firms and is heterogenous among individuals. The importance of knowledge is related to the application of the knowledge rather than knowledge creation that aids on good corporate governance (Grant, 1996). Vithessonthi & Racela (2016) conduct a study of listed firms in US for the period of 1990-2013 and find that companies that invest in knowledge have competitive advantage in the market and the promotion of performance will happen in the long-run. In contrast, the financial performance in terms of return on sales (ROS) is impaired in short-run when the R&D investment are increased. Paun (2017) studied the financial performance among different energy producers in Romania. He wanted to investigate whether there is any difference in performance between conventional and renewable energy producers. The study shows that companies that operate in the energy sector have poor financial performance and the performance of conventional producers seems to be better than renewable energy producers. Thus, to improve the financial performance it is needed investment in innovation and constructing sustainable business strategies.

Board size

The performance of the firm is affected also by the decision making by the board. Board composition has the duty to monitor and to protect shareholders' interests and to maximize the firm's value. A broad literature has investigated the effect of corporate governance on firm performance, decisions, financing etc.

To sum up, Adner & Helfat (2003) pointed out that after accounting for other factors that affect the profitability of the firms, they found that strategic decision increase the share of variance in profitability. Coto-Millán et al. (2018) studied the effect of diversification in energy sector for public companies in China and some companies in Western Europe for the period of 2009-2015. The authors found that by using a univariate analysis the financial performance of renewable energy firms is greater than traditional companies. Conversely the results do not confirm the same findings in the case of a multivariate analysis. The financial performance of companies decreased with higher diversification.

The reviewing process related to firm-specific factors leads to the following hypothesis with respect to profitability:

H2.a There is a positive relationship between firm size (market capitalization) and firm profitability of renewable energy companies

H2.b There is a positive relationship between risk and firm profitability of renewable energy companies

H2.c There is a positive relationship between age and firm profitability of renewable energy companies

H2.d There is a positive relationship between capital intensity and firm profitability of renewable energy companies

H2.e There is a positive relationship between growth and firm profitability of renewable energy companies

3.2 Literature on Industry Specific and Profitability

Global economic development has intensified competition among businesses, forcing industries to become more strategic in order to provide value. To achieve long-term competitive advantages, every enterprise should invest in innovation and rethink its business strategies. However, all industries confront problems as a result of rapid changes in customers, technology, and competition in the business environment. The product and service life cycles have a substantial impact on the company's profitability and growth. The most challenging stage for a product is when it reaches maturity, which is accompanied by a moderate growth, and cost efficiency becomes then the core predictor of cost-effectiveness.

Pätäri (2010) analyzes and then identifies industry-level and national elements stirring value creation potential, bioenergy profitability, and the energy and forest industry's forecasted impact. The Delphi approach was utilized in the second half of 2006, due to the difficulty in finding data, financial and historical, regarding the forest energy issue, which consisted of face-to-face interviews with specialists in the field. He then adds that the bioenergy sector has gotten greater attention since raw material prices are rising, and investors are seeking for other sources, which means that industry-level changes occur faster than the company-level ones. Collaboration between the energy and forest industries is more beneficial for the growth of bioenergy businesses since it allows firms to make use of existing infrastructure and knowledge.

The quality of home country institution should be taken in consideration by analyst because companies' earnings are heavily influenced by country specifics (Cherchye & Verriest, 2016). They discover that simple entrance regulations, a higher-quality legal system, and a good political system have a negative impact on profitability due to increased competition. Policymakers are interested in building strength legal and political institutions and when they want to increase competition, they keep barriers of entry low. The improvement of institution's quality and enhance level of competition are both beneficial to well-functioning of economy. Similarly, Gonenc & Scholtens (2017) point that various factors of industry specific create a trade-off between financial and environmental performance in the fossil fuels firms. Environmental outperformance has a negative impact on the financial performance of coal firms, but this relation varies based on subsectors that have their industry specific. Bolarinwa, Akinlo, & Onyekwelu (2021) examine the factors that influence profitability of a large sample of 896 firms that operate in Africa for the period of 2005-2017. The study found that macroeconomic factors are not significant, whereas the competition seems to enhance profitability because in Africa there are no anticompetitive policies that have control on the market.

Goddard et al. (2005) for the period of 1993-2001 investigate determinants of profitability in manufacturing and service enterprises in five developed European Union countries. Even after the establishment of the European Union's Single Market for Goods and Services in early 1991, anomalous profits remain inter annual, and fierce competitiveness takes time to return to normal, not even within a year time frame. They posit that it is the exposure and the magnitude of a firm's default that have a considerably negative impact on cost-effectiveness. The last one is accelerated by market share and liquidity. However, using a time-varying methodology Gschwandtner & Cuaresma (2013) probe deep by looking into 151 US manufacturing, and finding the causes of profit persistency in a long and short run period, from 1950 to 1999. A new methodology was developed that serves to accurately measure the profit and then identify the factors affecting the persistence parameter that varies over time. Contrary to older studies that past profits affect current ones over a 20-year period of time. They suggest that industry characteristics such as concertation, has a favorable impact on profit persistence, but industry characteristics such as market share and risk have a negative impact.

The fluctuation of oil prices can affect the economy in many ways such as directly can affect the production cost and consequently affecting supply. But this effect is a high burden for countries that are an oil import country such as European markets expect Norway that is an oil exporting country. The study by Bjørnland (2009) shows that higher oil prices increases stock returns for an oil exporting country by increasing aggregate wealth and demand. The opposite effect is for countries that are highly oil import dependency.

In the same line Apergis (2019) finds that the oil price has a negative effect on high yield bonds in case of energy firms. Spread is the difference between yields of a corporate bond and Treasury bond at the same maturity that is affected by fluctuation of oil prices in the market. Some expected oil prices fluctuation can be absorbed easily by the market and did not affect the spread, but drastic changes in oil prices may be harmful for financial markets that directly affect real stock returns. In contrast, Wattanatorn & Kanchanapoom (2012) investigate the effect of crude oil prices on financial performance of 11 sectors and they reveal that the crude oil prices promote both financial performance and stock returns in energy sector. Bamiatzi & Hall (2009) find that the profitability of firms is affected by the size of the firm, but also the interaction of firm and industry effects is significant. Anton (2021) analyzes the effect of temperature changes on profitability of energy firms that operate in Europe during the period of 2009-2016, while controlling for the effect of market related factors and firm-specific factors. Contrary to previous studies, he found that electricity price and market concentration are determinant factors for profitability of energy and gas sectors.

Hypothesis constructed related to industry-specific determinants are as below:

H3.a There is a positive relationship between electricity price and firm profitability of renewable energy companies

H3.b There is a positive relationship between market concentration and firm profitability of renewable energy companies

3.3 Literature on Political, Regulatory framework and profitability

Many authors have investigated the factors that influence firm’s profitability in different sectors, but current research suggests that institutional quality plays an important role in explaining profitability variance. The usefulness of remuneration schemes in increasing the performance of renewable energy firms has gotten a lot of attention in recent years by academics, policymakers, and governments. The support schemes by the government enhance the development of technical innovation and production cost that in turn affects financial performance of those firms. The study by P. Wang, Zhang, Zeng, Yang, & Tang (2021) conclude that technology innovation enhance performance of renewable energy companies in China, but the effects becomes weakened when the subsides toward the RE companies exceeds the threshold level.

In a liberalized energy market, the government support for green energy is a key element. It developed a tradeable green certificate system in 2001 in the European Union to allow consumers to choose their preferred green provider. A long-term sustainable development for society and environment is created when government fiscal policies intervene. Since 1996, Netherlands' regulated energy tax encourages the use of renewable energy by providing zero tariffs for green energy. As funds are needed to buy renewable energy equipment, the capital cost for these companies is greater. Green funds, accelerated depreciation, and tax credits are three programs that may be used to encourage investments in the green industry (Kwant, 2003)

The promotion of renewable energy from the power generating system in case of EU is enabled by the two market-based mechanisms like Feed in Tariffs and Tradeable Green Certificates.

FIT policies set a guaranteed price on renewable electricity to drive renewable energy sources deployment.

TGC policies introduce a quantity restriction that determines a market price of renewable electricity.

Since 2005, EU ETS (Emissions Trading Scheme) was implemented as the main pillar of policies toward climate changes. The aim of this scheme is to reduce the level of emission in industries that produce higher levels of CO2-emission such as aviation activities, energy sector, mining etc. Therefore, "cap and trade" is the main principle in which EU ETS function, by imposing companies to limit the level of pollution in the environment. Companies can buy allowances related to the level of emissions that they can produce. At the same time companies have the possibility that this EU ETS to trade among companies that operate in EU countries. The question is, does implementing environmental regulation influence profitability? Researchers debate whether environmental regulation improve or not the financial performance. The findings about the negative effects are related to the fact that if the firm is engaged in environmental regulation will increase cost of production that in turn will be less beneficial for companies that is in line with agency theory. In contrast, the stakeholder and RBV support investment toward environmental regulation since it boosts financial performance by being competitive in the market and by attracting investors. Makridou, Doumpos, & Galariotis (2019) conducted a study in 3952 intensive polluter's firms in EU countries during the period of 2006-2014. They examine the effect of environmental policy implemented on firms' financial performance. The effect of EU ETS schemes was examined in four stages and the study reveals that the environmental policies improve financial performance.

Apart from environmental policies, in the EU are adopted different support schemes toward renewable energy generation. The main policies are Feed-in Tariffs and Tradeable green certificates that differ from each other based on the transaction cost, cost effectiveness and market distortions. TGC is evaluated by many authors as the most effective remuneration scheme that is more market oriented and increases renewable energy markets' competitiveness. TGC reduces the cost of energy generation from customers and the electricity price to customers. Therefore, it was the study by Jaraite & Kažukauskas (2013) who wanted to investigate whether the difference in financial performance between companies is caused by the type of support schemes. The study was conducted in EU countries for the period over 2002-2010 and reveal that TGC support schemes enhance financial performance, compared to FIT.

The market imperfection in TGC support schemes explains the excess profits of firms that operate under this support mechanism. Market imperfection means that other companies to face higher risk, higher capital investment and an increase in transaction costs. Therefore, the financial performance of companies that have adopted TGC can be improved under the EU ETS schemes that are related to environmental performance. The risk in clean energy companies is higher due to higher installation costs that in turn increase uncertainty related to returns. In addition, these companies are exposed to risk since their energy generation depends on climate conditions, the number of sunny days, the wind speed etc. Also, the energy market is affected by competition that is crucial in a liberalized market. Uncertainty price is another risk that those companies will face during their activity, since the making decision of other competitors will cause the electricity price changes. The clean energy market is a new market that has attracted the attention of investors, government, and policymakers that need to create policies that are beneficial for RE companies.

The uncertain climate policy influences the decision of investors for new investment in energy sector whether to invest in conventional or renewable energy. The uncertainty to these investments is related to market power of large energy firms that effect electricity price in the market by increasing obstacles to renewable energy investments. However, the study by Reuter, Szolgayová, Fuss, & Obersteiner (2012) in German market shows that the uncertainty related to renewable loads over years need to be integrated in the strategy of firms since it effect the variability on profitability. In addition, they found that the feed-in tariff is the appropriate scheme for RE investment promotion. Due to the support from government the investment ration between a conventional power plant and a wind farm is 3:1 that has increased investment in this sector. But the question is whether the support from government in terms of FIT will countries in upcoming years and if yes for how many years they will support.

The study by Fagiani, Barquín, & Hakvoort (2013) want to respond to the question whether the support schemes effect the investor’s decision toward RE investment. They examined the effect of support schemes on the risk that investors are included by using simulations related to a hypothetic Spanish power system for the period during 2012-2050. As it is known, the behaviors of investors related to one investment depends on the returns that they are expecting and the desire to undertake risk. The study results show that feed in tariffs contributed to more cost efficiency compared to TGC. On the other hand, TGC are affected by the quotas that are decided by regulations. The influence of renewable energy support schemes was examined by Milanés-Montero, Arroyo-Farrona, & Pérez-Calderón (2018).

They conduct a study on PV solar energy companies in four EU countries for the period of 2008-2012. The estimation results show that, although Germany is the highest polluter compared to Italy, France and Germany it has the highest level of PV installation and capacity that result to be profitable. In addition, the financial performance is affected by the size of the company. Being a large firm in terms of assets contributes to take advantages from economies of scale. Unexpected changes in support schemes damage the performance of clean energy firms. Thus, the support mechanisms need to be revised since a cut in remuneration will result in loss for companies.

In the same line Ibarloza, Heras-Saizarbitoria, Allur, & Larrea (2018) studied the financial performance of photovoltaic (PV) solar energy firms in Spain during the period of 2006-2015. They found that before the financial crises the financial performance of solar PV companies was profitable but after the crises the financial performance remained negative due to a reduction in tariff as well the continuous increase in the cost of finance. As a result, new solar PV plan investments in Spain have declined dramatically.

Some studies such as H. Zhang, Zheng, Zhou, & Zhu (2015); Z. Zhu & Liao (2019) document evidence that the government subsidies do not promote renewable energy firm's performance. The study includes new energy companies listed in Shanghai and Shenzhen Stock Exchanges during the period 2010-2016. The main reason for this result is that the support from the government in the form of subsidies encourages energy production, while a lack of demand caused by a drop-in economic activity has a detrimental impact on those firms' profitability. Also, rent-seeking cost, overcapacity, and asymmetric information have been seen as obstacles for subsidies incentives that weaken financial performance. The screening process ex-ante and monitoring ex-post of enterprises that apply and subsidy by the government should be a continuing process to avoid the asymmetric information between new energy companies and government.

In the same line Sun, Zhan, & Du (2020) used the Difference in Difference approach to investigate the effect of incentives on new energy companies' profitability. The study was based in energy companies that operate in China during the period of 2004-2012. The difference in difference approach is used to distinguish the profitability of firms before and after the implementation of incentives. The estimation results show that the value added tax for new energy firms that operate in wind and solar sector are ineffective and decrease firm

profitability up to 4.7%. The main problem of the VAT incentives is related to the lack of incentives toward technological investment and due to market problems, such as overcapacity and distortion. According to H. Zhang et al. (2015) subsidy policy reform need to be improved in order to provide efficient distribution of grants for renewable energy companies. Government should have detailed information concern the technological level, corporate scale, financial performance evolution of companies to enhance financial performance through subsidy support.
The shift toward green energy electricity generated from renewable energy sources have a positive impact on the environment but does the ecological protection upsurge firms' revenue?

Schabek (2020) study the financial performance of green power producers in 16 emerging markets during the period of 2000-2017. In addition, a comparison analysis related to financial performance between renewable energy companies and fossil fuels companies was investigated for those countries. The study points out that there is an increase in productivity for renewable energy companies during the period 2013-2017. It appears an increase of ROE from 2% to 15%. This increase trend can be explained by the fact that renewable energy firms are using equipment that has increased their efficiency in clean energy production and traditional producers pay a greater price for CO2 emissions. Hassan (2019) explained the effectiveness of support schemes on financial performance of 420 energy companies that operate in OECD countries. He found that traditional energy companies in these nations are expanding the share of renewable energy since it is lucrative. Also, micro-supports in promoting the sustainability of renewable energy sources is more relevant for traditional energy companies.

As it is mentioned by Borozan & Starcevic (2016) firm's performance of conventional energy companies in EU face a decrease in profit during the period of 2012-2013 and, as a result, their assets value decreases . On other hand the financial performance of hydropower and new renewables seems more profitable. This means that energy reforms are required for the sustainable energy goal. Corporate government perspective is an important factor that affects the financial performance of firms. Thus, the difference among countries in the European Union is explained by the type of legal system that they operate. Countries like United Kingdom operate under common law system that is characterized by a system of corporate governance that is more conservative compared to other EU members that operate under civil low system that is based on stakeholder governance model and it is less conservative and timely.

Corporate Social Responsibility (Environmental Regulations)

One of the driving forces of climate change is anthropogenic factors that include the level of CO_2 that is caused by electric utilities that use fossil fuels as raw material. Since pollution has increased rapidly, the government has decided to settle some targets related to clean energy production. Given that electric utilities are under pressure to increase the level of green energy that reduces the emission and improves utilities' environmental performance, a fundamental question is if it also plays on financial performance. The nature of the relationship between environmental performance and financial performance is an important issue that is discussed by many authors. Some authors suggest that firms which operate in clean industries tend to be more profitable. As it is mentioned by King & Lenox (2001), it is worth "being green" but the relationship between environmental and financial performance is ambiguous since it is subject of firm characteristics.

For many years, there was a huge debate about the question, whether it pays to be green? While companies are engaged in green investment, which is the effect to the financial performance of those companies? Does Corporate Environmental Performance (CEP) improve corporate financial performance (CFP)? Which is the current state for renewable energy companies? An extensive literature survey on environmental regulation and financial performance nexus is examined, but still remain inconclusive. The sustainable issues and corporate social responsibility for renewable energy firms are of vital importance requiring organizations to include CSR practices in their business strategies to take competitive advantages and to have business opportunities. Sustainability in the energy sector is related to finding sources that have low emission in the environment and on social level providing access to energy supplies that are reliable and affordable.

The phenomenon of environmental degradation caused by corporate activities is considered as a problem that needs measures to mitigate pollution and negative effects in the atmosphere. Thus, it is required that companies in their Annual or Semi-annual Reports to disclose pollution information. Renewable energy companies can reduce the level of pollution in the environment by using RES instead of fossil energy, but in the process of renewable energy development process they may be still a level of pollution. The linkage of CSR and financial performance is studied by many authors that conclude in different findings such as positive, negative or not statistically significant. The paradox related to environmental pollution and performance is that from the first view emission reduction is a cost burden to firms, while others support the view that reducing pollutant increase efficiency and saves money that reduce the cost of production to the firm, enhancing their competitive advantages. Hart et al. (1996) were interested to give a solution to this paradox and they conduct a study on S&P 500 public companies. The study shows that the effect of emission reduction increases costs for the current year and after one year this strategy enhances financial performance. King & Lenox (2001) studied the relationship between performance and sustainability for 652 U.S firms in manufacturing sector. The authors found that this relationship is not obvious, and firm's specific factors can cause the CEP and CFP nexus. Nevertheless, the effect of pollution reduction becomes more beneficial for the biggest polluters.

According to Nakao et al. (2007), environmental performance is not anymore a cost for companies but it is an important strategic factor. The study conducted in 300 Japanese firms that operate in different sectors show that financial performance measured by ROA, earning per share and Tobin's *q* is influenced positively by environmental performance. In the energy sector there is a lack of studies related to the impact of CSR investment on financial performance. Brzeszczyński et al. (2016) examined socially responsible investment (SRI) and market performance for energy and resource companies in developed countries for the period of 2005-2015. They found that alternative energy companies perform better than benchmark FTSE ET50 index.

The study by Pätäri, Arminen,Tuppura , & Jantunen (2014) in 14 energy companies during the period of 1991-2009 reveal that the bidirectional causality between CSP and CFP do not exists. Different form previous studies they consider CSR concerns and strength separately and find that CSR concerns Granger-cause financial performance and market value, while CSR strength that are actions undertaken from company that may have a positive impact on society seems to effect only market value that result in increasing shareholder value. Also, Kruse, Mohnen, Pope, & Sato (2020) investigate the impact of green revenues on financial performance in different sectors during the period of 2009-2016 and reveal that green electricity is the most contributor on global green revenues. They investigate that for the utilities sector the policy intervention toward green goods and services are enhancing firms' financial performance and their market valuation by creating a "win-win". Firms that follow strategies toward low carbon technologies by producing environmental goods and services are able to obtain higher profits. Energy companies must be both profitable and responsible at the same time, not only to focus on deriving value of its shareholders (Streimikiene, Simanaviciene, & Kovaliov, 2009). Similarly, Okafor, Adusei, & Adeleye (2021) investigate the relationship between CSR and financial performance for technology companies that operate in U.S for the period of 2017 and 2019. The authors found that public companies in tech sector that are more engaged in environmental issues see increase in sales and profitability. Contrary to earlier research, the findings revealed negligible evidence to indicate a link between CSR and Tobin's *q*.

According to Horváthová (2010) the variation on the relationship between EP and FP is strongly related to the time coverage since environmental regulation takes time to establish a positive relationship between EP and FP. Also, he found that developed countries under common law system have lower level of pollution compared to developed countries under civil law systems. Chen & Ma (2021) investigated the link between green investment and financial performance of energy firms that operate in China during the period of 2008-2017. The study's findings demonstrate a strong and positive relationship between green investment and firm performance. In addition, the innovation in technology, support from government and environmental tax have moderating effect on the improvement of the influence of green investment on financial performance. The effect of green investment seems to be more significant in long-run since it reduces the environmental damage and in turn enhances financial performance. According to the study by Zhang, Chiu, & Hsiao (2022) the effect of subsidies moderate the negative effect of country risk on profitability of clean energy companies in China.

H4. RE companies that have adopted Tradeable Green Certificates (TGC) support schemes perform better than RE companies that have adopted Feed-in Tariff (FIT)

3.4 Literature on Macroeconomic Determinants and Profitability

Macroeconomic variables, which are beyond management's control and include inflation, unemployment, GDP, stock market index, corporation tax rate, and interest rate, are the last group of factors that impact profitability (Broadstock, Shu, & Xu, 2011). Authors have used various proxies and estimation methods to examine the effect of macroeconomic factors on profitability. According to Issah & Antwi (2017) firm performance is significantly influenced by macroeconomic factors. They conclude that although the impact of economic and business cycles throughout time cannot be eradicated, the negative consequences can be mitigated by establishing measures to deal with economic downturns.

Inflation

Inflation is the most common indicator of macroeconomic factors that is studied by many authors. Since inflation will affect the prices of goods and in turn it reduces the purchasing power, firms are expected to incur increased costs. Vatavu (2014) examined the effect of inflation and financial crises on firm performance for 126 Romanian firms during the period of 2003-2012. In order to obtain robust results, GMM estimation is used, and the study reveals that inflation and financial crises impair financial performance of companies. In contrast, the effect of inflation may be positive if the increased incomes are greater than the increased costs that in turn makes firms more profitable.

According to Gupta (2017) the financial performance of alternative energy firms vary across countries due to economic and societal factors. They conducted the study in 26 developed and developing countries and revealed that when country level technology and innovation is well developed, the financial performance of alternative energy firms is positively influenced.

GDP growth

Many researchers around the world are interested in filling the gap in the literature on linkage between renewable energy usage and economic constraints. Therefore, there is an ongoing process in this field that is examining the relation between RES and national growth that is attributed to Gross Domestic Product (GDP). The global financial turmoil that broke out in

2008 has significantly impacted the electricity sector. The spillover effect of economic crises of US affected several European countries that faced many difficulties to have access to capital market. Institutions such as the International Monetary Fund, European Commission, and the European Central Bank support states through various economic adjustment programmes, to combat financial crisis. Furthermore, the study by Eyraud, L., Wane, A., Zhang, C. and Clements (2011) conclude that macroeconomic indicators such as interest rate, economic growth, and profit are the drivers for energy policies. In order to achieve this conclusion, they study the determinants and the trend of green investment (GI) for 35 developed and emerging countries during 2004-2010. They conclude that a high level of income and the increased price of oil and carbon pricing scheme followed by countries promote green investment. The level of investment in green technologies is higher in countries that use feed-in-tariffs mechanism. In the same line, Eyraud et al. (2013) examined the effect of macroeconomic indicators and the trend of green investment during 2000-2010 for 35 developed and emerging countries. The results reveal that the link between green investment and economic growth, low-interest rate, and high fuel prices are positive. Carbon pricing schemes and feed-in tariff support schemes boost green investment.

In addition, authors reveal inconclusive results for the linkage between renewable energy consumption and economic growth due to different methodologies and dataset. According to Pao & Fu (2013); Bekhet, Matar, & Yasmin (2017) , actual technology development doesn't make a competitive advantage for renewable energy but it implies economic costs. Support schemes from government will be a solution to bring innovative investment in energy sector through local project investment. Kasman & Duman (2015) emphases that energy consumption and economic growth have a bidirectional linkage. The study used European member and candidate countries for the period of 1992-2010 and concluded that in case the economic output is going to increase, the level of carbon emission will not decrease. Thus, renewable energy is an alternative way to reduce emission in the environment.

According to Kim & Park (2016) the deployment of renewable energy depends on the financial development of the country. They studied the effect of financial development on renewable energy deployment for 30 countries during the period of 2000-2013 and reveal that for Solar PV that rely on external financing the financial development is crucial for the sector. Ntanos, Skordoulis, Kyriakopoulos, Arabatzis, Chalikias, Galatsidas, Batzios, &

Katsarou (2018) investigate whether the economic level of a country determine the energy generated by RES. The study was conducted in 25 European countries during 2007 to 2016 and they found that the energy produced by RES is greater in countries with higher income level compared to countries with lower GDP. The latter rely more on energy consumption from non-renewable energy sources. The economic development of a country is tightly related to the renewable energy sector. Economic growth boost investment in clean technologies that in turn promote renewable energy industry development (T. H. Chang, Huang, & Lee, 2009; Kumar, Managi, & Matsuda, 2012). They pointed out that nations with strong economic growth use more renewable energy, compared to countries that do not have enough resources to invest in renewable energy, to offset the drawbacks of rising energy prices, which as a result impact the economic growth. In the same line Malik, Siyal, Bin Abdullah, Alam, Zaman, Kyophilavong, Shahbaz, Baloch, & Shams (2014) investigate whether renewable energy consumption is affect by macroeconomic factors in Pakistan between 1975 to 2012. They conclude that GDP enhances renewable energy consumption, and the role of government is to implement policies toward the energy mix to reduce reliance on oil. Shah et al. (2018) posit that in countries with limited renewable energy sources, macroeconomic considerations have a greater impact on investments for renewable energy. When oil prices are low or the economy is in a slump, financial support for these countries should be enhanced to ensure the long-term growth of renewable energy. RE usage is related with adopted energy policies toward clean energy with low level of emission.

In contrast, Zhu (2012) examines the effect of macroeconomic factors in energy companies that are listed in Shanghai stock exchange over a period of 2005-2011 and reveal that economic growth and inflation are insignificant with regard to financial performance.

Barakat, Elgazzar, & Hanafy, (2015); Rashid, (2013) reviews various macroeconomic factors and their effect on performance. They conclude that the effect of macroeconomic factors becomes more severe related to capital structure rather than the effect of firm-specific factors. Macroeconomic factors are crucial to explain the variation in firm profitability, where the market-based measure is used as a proxy for financial performance (Vieira, Neves, & Dias, 2019). These findings can be explained by the fact that investors' decision-making to public companies is influenced by the economic level of the country. Investors believe that the economic development of a country enhances firms' performance.

The following hypothesis are developed based on a survey of the literature on macroeconomic issues and the profitability nexus:

H5.a There is a positive relation between GDP growth and RE companies' profitability
H5.b There is a negative relation between inflation and RE companies' profitability
H5.c There is a negative relation between financial crises and RE companies' profitability

3.5 Literature on Exposure to Risk and Profitability

Capital market risk is the risk of financial loss associated with the decision to keep or to sell securities when the price in the market is decreased. Since public companies have their securities listed on the stock exchange, their prices change constantly meaning that the prices of securities are volatile. Factors that influence the security prices include not only their fundamentals but and broad market factors such as regulatory changes, exchange rate, political developments etc. According to Schiereck & Trillig (2014) the regulatory changes are fundamental for solar energy companies in Germany. They found that capital market risk in solar energy in German firms is mainly affected by uncertainty of political support. Moreover, stock returns for solar companies are higher in case that in the market there are favorable political news, and the volatility response is decreased. Companies in the energy sector that are tightly related to the support scheme seem to have high volatility response for an increase in uncertainty concerning public policy.

Sadorsky (2012) examined the factors that shape the risk of renewable energy companies. The study was conducted in 52 clean energy companies that are part of ETFs index for the period of 2001-2007. He modified the traditional model of CAPM that measures the relationship between risk and return by including additional information related to firm specific factors. The estimation results measured by OLS method shows that renewable energy companies are exposed to risk. Furthermore, unexpected price changes in the market increase twice the risk exposure for RE companies, while internal firm factors such as sales growth mitigate the negative effects to risk exposure for RE companies. Industry factors such as oil price increase the risk for renewable energy companies. Thus, government intervention is fundamental, to reduce the exposure to risk and to enhance sustainability in the existing market. The government can create planification of clean energy demand by buying directly from producers or to increase the customer demand for clean energy through policy design. Developed countries compared to conventional energy, have set long-run targets regarding the level of consumption of energy produced by renewable resources. These targets promote the development of renewable energy companies and boost the use of renewable energy.

In the same line Inchauspe, Ripple, & Trück (2015) investigate the effect of oil price, technology stocks and MSCI index on the stock returns of renewable energy companies that are part of New Energy Global (NEG) index by using a state-space approach. The study was conducted over the period of 2001 to 2014 and reveals that stock returns of renewable energy are mainly affected by technology stock and MSCI index. However, the effect of oil prices on stock return is relatively weak. The positive and significant correlation between stock return of clean energy with stock return of technology is explained by the fact that renewable energy companies require higher investment that are related to technology investment. Global recession impairs the financial performance of clean energy companies that increased the uncertainty among investors to renewable investment. Furthermore, changes in the technology sector will be reflected directly in renewable energy sectors, since they are tightly related.

Oberndorfer (2009) examines the determinants of energy sector's stock pricing in the Eurozone for the period between 2007-2007. He finds that changes in energy stock returns in European countries are not affected by the systematic risk in the overall market of energy, but an important contribution play macroeconomic factors. Changes in oil prices have a positive impact on oil and gas returns, and the volatility of oil prices seems to be negative. On the other hand, the role of the gas market does not seem to play a role in Eurozone energy corporation's stocks at all. Cortez, Andrade, & Silva (2022) used four factor model to investigate the financial and environmental performance of portfolios for conventional energy firms versus green energy firms that operate in EU for the period between January 2008 – November 2018. The study shows that there is not a statistically significant difference between fossil fuels and green energy stocks, but overall, the portfolio that consist by green energy stock seems to have abnormal returns compared to the market. Therefore, having information related to financial implications of investing in renewable energy sector is helpful for investors. Investors are the main contributors that promote the transition from fossil fuels to clean energy.

In addition, the interest of European nations to invest in community renewable energy projects is greater than investment in utility electricity. The study by Cohen, Azarova, Kollmann, & Reichl (2021) shows that such investments are attractive due to favorable condition and competitive interest rate provided. In addition, the probit model shows that young, educated and employed people are most likely to invest in renewable energy projects. Job creation is another factor that fosters the desire to invest in renewable energy rather than environmental protection. The study supports the contribution that the development of renewable energy has on local economic benefits.

3.6 Concluding Remarks

In summary, previous studies with regard to profitability are conducted in different industries by using cross-sectional data or panel data and reveal in different factors as determinant. Furthermore, most studies decide as the most significant factors “growth of sales “and “total assets” with both effects, positive or negative. Furthermore, growth sales and growth in total assets have a statistically significant effect on profitability. The effect of risk that is related to external finance resources in most studies is found to have a positive effect on profitability, while in the case of renewable energy firms the effect is ambiguous. Capital intensity is found to have positive or negative effects as an internal factor. Furthermore, the effect of market concentration was found to have been positive in most studies in different industries. Related to the effect of support schemes there are different opinions, but most of the studies reveal that Feed-in Tariff support schemes have a statistically significant effect on profitability. The performance of RE companies is highly dependent on managerial decision toward technology innovation. Investment in new technologies facilitates the activity of RE companies that in turn boosts their profitability.

3.7 Research Gap

The survey of the literature revealed a research gap related to renewable energy sector. In particular, the most relevant studies that narrow the determinants of profitability and risk in RE companies are investigated and most of the studies in green energy relay on the impact of support schemes rather than on the profitability of these companies, indicating that empirical works on Renewable Energy company’s profitability is scarce over time because green energy is a relatively new field that has generated attention during recent years. The model that is suggested in the renewable energy sector incorporates firm-specific factors, industry factor, macroeconomic and support schemes that contribute to the existing literature. No previous study has incorporated firm- specific factors, industry-specific, macroeconomic and support schemes in renewable energy companies in the EU. The purpose of this study is to narrow this research gap and to give answer to the following questions:

Which are Research Question and Hypothesis not answered in previous studies?

Resource based view theory can be implemented for Renewable Energy industry?

CHAPTER 4

4. METHODOLOGY

4.1 Introduction

Methodological framework and data set used for this study is covered in this chapter. The data used and how it has been collected, is presented, by including the selection of the variables. In addition, the difference between three types of estimation methods used in the study and theoretical background of the empirical mode employed is explained. The data is collected in order to test hypotheses build on the review of the literature. Furthermore, we are interested in investigating whether our findings are consistent with previous studies. Three empirical models are used in this study. The first model includes only firm-specific factors, while the second model adds country-specific factors and support schemes. The last model includes firm-specific factors, country-specific factors, support schemes, and macroeconomic factors. Using longitudinal secondary data over a period between 2004-2020 a quantitative non-experimental analysis of renewable energy companies that operate in the European Union is conducted. A combination of time series and cross-sectional data are called panel, or longitudinal data, used to investigate how a firm's profitability changes over time. The two-step system Generalized Method of Moments (GMM) is used as the best estimator to overcome the problems of endogeneity in the model.

4.2 Sample

One of the greatest challenges of this research is to determine the population of renewable energy companies that operate in the European Union. In addition, the sample that is a subgroup of the population should represent the population in order not to have sample errors. In case the sample represents the population, inferences on the conclusions are made from the sample to the population. In this study, quantitative data has been used, collected from different databases, that are considered reliable sources.

The reason why renewable energy companies are considered for this study is related to the fact that clean energy sector has seen fast expansion in European Union, especially the Solar PV and wind power sectors are the most important. The sample comprises 43 renewable energy firms that have headquarters located in EU countries between 2004 and 2020. Thomson Reuters Eikon database is used to select firms from the database referring to some steps. First, firms belong to Renewable Energy Industry and Electric Utilities & Independent Power Producer (IPPs). It means that in the analysis are included firms engaged not only in electricity production from renewable energy sources also in Renewable Energy Equipment and Services and Renewable Fuels. Thus, the classification code for electricity sector that are used in this study are based on the activity that companies are engaged such as: electricity production (NACE[1] code 35.11), transmission of the electricity (NACE code 35.12), and electricity distribution (NACE code 35.13). NACE code 35.14 is used for companies that trade electricity, and NACE code 35.19 for other types of electricity power production.

The selection of companies is based on TRBC economic sector available in Thomson Reuters Eikon, the business description for each company to determine where a company's stock should be classified as a renewable energy stock, is investigated. Meaning that, business description as a filter should include the different technology sub-sectors such as Solar, Wind, Wave & Ocean, Hydropower, Biomass and Geothermal. The first step in constructing the sample gives a total of 442 firms. Second, within the Renewable Energy Industry in European Union only fourteen countries are considered: Belgium, Denmark, France, Germany, Greece, Hungary, Italy, Luxembourg, Netherlands, Poland, Portugal, Spain, Sweden, United Kingdom, because in these countries there is installation of renewable energy firms listed in stock exchange, for other countries it was not able to acquire data. European Union member countries were part of the study since providing environmentally friendly future energy is a crucial task in the EU, since they depend highly on energy imports. From the total sample, firms with less than three firm-year observations are excluded, as are firms with zero values for sales deleted from the sample. Also, companies that during this period of study are delisted are not taken into account. Third, in

[1] NACE code is referred to National Classification of Economic Activities.

the analysis annual data retrieved from the financial statements of each firm is used. Thus, for each company balance sheet, income statement, cash-flow, and key ratio matrix, is obtained. Thomson Reuters Eikon is used to retrieve the data and it is considered a reliable source. All financial data are annualized and standardized in US dollars and thousands. Annual data used for regression analysis consist of market capitalization, total debt, total equity, total revenues, capital expenditure, and total assets over the period of 2004-2020.

In addition, data related to country-specific factors such as market concentration and electricity price are collected from Eurostat. Information related to the renewable energy support mechanism implemented in each country of the EU countries is gathered by the report of the Renewable Energy Sources country profile (CEER, 2017). Lastly, data related to macroeconomic factors are collected from the World Bank DataBank. Unbalance panel data for 43 renewable energy companies during the period of 2004-2020 are employed including the period of financial crises. It means that this period covers the pre crises, during it and postcrises which is important to investigate whether this sector is affected by it. Related to financial crises a dummy variable equal to 1 for three years (2007-2009) is used, that indicates the pre-crisis period and it is assigned 0 for the remaining years. For the period (2010-2012),dummy variable equal to 1 is used, that represents the post-crisis period and 0 is assigned for the remaining years. For the list of renewable energy companies refer to Appendix A.

The sustainable development of the country is related to renewable energy deployment since they play a crucial role in it. It is the first study that includes a large time dimension compared to prior research which may result in different findings.

4.3 Variables

4.3.1 Response Variable

In order to survive and extend their activities firms should generate profits. Profit is seen as a crucial aim of companies in this manner, but profitability is the best sign that an organization is doing things correctly, as well as the primary measure of organizational success (Megginson, Nash, & Van Randenborgh, 1994). The ability to generate income by using available resources in the market is referred to as profitability, and when the generated profits are higher, firms have the opportunity to grow faster (Mukhopadhyay & AmirKhalkhali, 2016). Profitability is an indicator of management quality that affects the decision to finance new investments, extend their activity, and also to pay dividends to shareholders.

Academic research has used different measures of firms' profitability that can be categorized into two groups: accounting-based measures and market-based measures. In order to apprehend current profitability, a wide range of accounting-based variables such as return on assets (ROA), return on equity (ROE) or either by using average values as the denominator are used to measure profitability (Earnhart & Lizal, 2006; Goddard et al., 2005; Hawawini et al., 2003; Milanés-Montero et al., 2018; Tsai & Tung, 2017). Furthermore, current profitability measures can be divided into two groups: those variables that capture operating profit margins and those capturing return on investments. The former group includes information related to the profit that is being produced per dollar of sales and variables such as Returns-on-Sales (ROS) or operating margins (EBIT or EBITDA) are typically used. The latter group evaluate firms' efficiency at using their assets and equity to generate earnings given that capital investment decisions are entrusted to it. Among variables that are used for this group, Return on Assets (ROA) and Return on Equity (ROE) are mentioned.

In this thesis the dependent variable return on assets is defined as follows:

$$ROA = \frac{Income\ after\ tax}{Average\ total\ assets}$$

Return on Assets (ROA) is used as a measure of profitability since it represents the way that companies are utilizing the assets and how a company's profits respond to various managerial approaches (Lee, 2009). Only a few studies have employed market-based measures such as Tobin's q, market capitalization and stock return that capture market expectations (Dowell, Hart, & Yeung, 2000; Fan et al., 2017; Ruggiero & Lehkonen, 2017). Investors and the public are more interested in value of Tobin's q that represent the market value of the firms. Most previous studies that estimate the linkage between environmental and financial performance used Tobin's q as a measure that represents the financial performance of firms. Tobin's q has some drawbacks concerned with different computation procedures that result in different Tobin's q estimates. Furthermore, many electric utility firms due to mergers and acquisitions can change their financial structure but also the name and their equity shares change also. It means that the Tobin's q is an inconsistent estimator in case the financial performance is measured for subsidiaries of a holding company. The importance of Tobin's q as a measure of a firm's corporate values is for electric utility firms at the holding company level.

$$Tobin's\ q = \frac{Enterprise\ value}{Book\ value\ of\ total\ assets}$$

Tobin's q for these companies is calculated as enterprise value divided by the value of total assets in the balance sheet. Enterprise values comprise the market capitalization of the firm that is the value of number of a common shares outstanding times share price at the last accounting year, the liquidity value of the firm's outstanding preferred stock and total debt (short-term and long-term liabilities). The investment decision making process is tightly related to Tobin's q value. It gave information related to investment opportunities since it compares the market value of the firm with its replacement cost. The incentive to invest for a firm will happen when Tobin's q value exceeds a unity of 1, meaning that those firms have a competitive advantage in the market since they possess unique products, and unique factors of production (Lindenberg & Ross, 1981). Tobin's q is an indicator of the future cash flows that the firm is expecting for each dollar invested in assets. This value is higher in case that the price of the stocks are overvalued and they are expected to be less risky. Therefore, this study investigated, whether there is any difference in factors that shape RE companies' profitability in short-run (ROA) or long-run (Tobin's q). Using Tobin's q as a measure of profitability is an important variable that gave information related to the future performance of firm that effect investors' decision.

List of dependent variables and description is as below:

Table 4.1

List of Response Variables

Code	Variable name	Description	Source
ROA	Return on Assets	Indicator of profitability which is measured as a ratio of income after tax against average total assets expressed in decimal	Thomson Eikon (Annual financial statement)
Tobin's q	Tobin's q	Indicator of market profitability which is measured as a ratio of enterprise value against the book value of total assets	Thomson Eikon

4.3.2 Explanatory Variable

4.3.2.1 Firm-Specific Variables

Through the review of the literature, firm-specific variables are identified as the main drivers of profitability. Most of the authors show that firm size, age, growth, risk are the main indicators that affect profitability. Profitability of the firm represents the ability of the firm to generate earnings, or to reduce operating costs by being more efficient. In addition, exposure to risk in RE reflect the decision related to capital structure and the ability of the firms to repay obligations. In most theoretical studies it is emphasized the relationship between risk and return. Higher risk investments are associated with higher return. In this study, the ratio of debt to total assets is used as a proxy for risk.

Firm size

As a determinant factor for financial performance firm-size has often been considered. This is due to firm growth, they take advantages since their economies of scales that make these firms to produce with less costs and generate high profits. In organization literature is common to use natural logarithm of firm assets as a proxy for firm size (Goddard et al., 2009; Sueyoshi & Goto, 2009). Several studies (Nishitani & Kokubu, 2012) use natural logarithm of the number of employees to measure firm size, while Pätäri et al. (2014) use annual sales as a proxy of size. Market capitalization for firms that are publicly and listed in stock exchange is the suitable proxy for size (Ruggiero & Lehkonen, 2017). Market capitalizations represent the total market value of the company based on year end price and number of shares outstanding converted to U.S dollars using the end year exchange rate. The size of the company is crucial for renewable energy companies that foster their financial performance since it helps companies to achieve economies of scale advantages over other companies. The expected sign is positive, meaning that firm size upsurge profitability. Natural log transformation of the variable market capitalization is performed.

Firm risk

It is well known that systematic risk affects financial performance. Several studies have used firm' Beta as a proxy for risk. Renewable energy companies face different risks, but in this study financial risk is accounted. Leverage expressed as a ratio of debt to total assets is used as a proxy for risk. Authors have different patterns related to leverage and financial performance nexus. According to the studies, the leverage has a positive influence on performance, since it can be explained by the fact that taking more risk should increase the expected return. Opposite views show that leverage has a negative effect.

Capital intensity

Capital intensity is measured as capital expenditure divided by sales in accordance with Wang et al. (2014). It is an indicator for industries that require a large amount of investment to produce a good or service like renewable energy firms. The increasing capital intensity reduces direct costs, and it is a proxy for entry barriers, as it is difficult for markets that require higher capital investment. The natural logarithm of capital intensity is used in the model.

Age

Firm age in electricity sector is included to account for the level of experience. In the literature, the link between age and profitability is ambiguous but since the renewable energy companies are relatively young it is suspected to have a positive effect on profitability. Older firms have more facilities to borrow funds and have lower resource constraints than young firms. However, new firms that operate in the renewable energy industry might invest in new technologies that are more efficient in sequence enhancing financial performance.

Growth

Most of the literature has considered firm growth so relevant to profitability. The growth of the firm is related to a specific stage of its development, and can be regarded as an influential indicator on financial performance. Regarding firm growth proxy it is used the annual growth rate of sales. The demand for energy and revenue management efficiency is represented by the growth of total revenues that has a positive effect on financial performance (Iwata & Okada, 2011).

4.3.2.2 Industry-specific Variables

Annual change in electricity price

Power producers are subject to different changes in fuel prices. Based on the sources that electric utilities firms use to produce energy, variation in fuel prices affect the level of power demand and firm profitability. Since providing data related to multiple fuel prices across different member countries of EU and for firm-level are not available, the non-household electricity price is used as proxy. This indicator presents electricity prices without taxes charged to final consumers. The lagged natural logarithm of electricity prices for each country is used to account for the effect of electricity price on profitability. Anderson, Di Maria, & Convery (2011) suggested a similar strategy to use as a proxy for electricity price.

Market concentration

The electricity market differs among EU members in terms of regulation and market structure although a common EU energy policy exists. Market share of the largest generator in the electricity market, as a percentage of the total electricity generation, describes the electricity market for each country.

4.3.2.3 Macroeconomic Variables

GDP growth

The effect of income on the development of renewable energy is estimated using GDP growth as a proxy. In the literature the effect of income on the promotion of renewable energy is studied by many authors that promote a positive impact on. There are three reasons that explain the positive effect of GDP on the promotion of RE. Firstly, countries that characterized by a high income level provide regulatory programs for sustainable development and are commitment to environmental protection (Lester & Lombard, 1990). Secondly, it is known that installation costs of renewable energy are higher compare to conventional energy but developed countries can overcome this costs and investment in innovation (T. H. Chang et al., 2009). Thirdly, high income-economic growth countries are more able to support the development of policies and regulation towards RE and can meet the costs of these policies.

Several studies show that countries' economic performance has a significant effect on companies' financial performance.

Inflation

Firm investment decisions depend on macroeconomic factors. Inflation is one of the most important factor that firms have to consider when undertake investment decisions as the capital projects and production scale are affected. The expected effect of inflation on profitability is investigated by many authors, who conclude in different findings such as positive, negative or insignificant effect. The effect of inflation on the performance of renewable energy companies depends on how mature an economy is to make predictions about the expected inflation and consequently firms begin the process of managing their operation costs. The Consumer Price Index (CPI) is used as a measure of inflation that reflects the annual percentage change.

Financial crisis

Financial risk and financial stability are crucial factors that affect the sustainability of renewable energy companies over time. In the existing literature there are few studies that investigate the effect of financial crises on profitability of renewable energy industry, however the literature supports that domestic stock returns are affected by financial turmoil. Investigating the effect of financial crises on profitability for the clean energy sector is essential because undertaking investment during crises is very difficult for this sector that requires huge investment. As a proxy for financial crises is used a dummy variable equal to 1 for years 2007, 2008, 2009 that represents the pre-crises period. Also, the post-crises effect is estimated by using a dummy variable equal to 1 for years, 2010, 2011, 2012. The renewable energy sector will suffer as a result of financial crises in the long-run (Bohl, Kaufmann, & Stephan, 2013; He, Mishra, Aman, Shahbaz, Razzaq, & Sharif 2021).

In table 4.2 is given the definition of independent variables and the measurement scale.

Table 4.2

List of Explanatory Variables

Code	Variable name	Description	Source
		Firm-Specific Variables	
lmkt	Logarithm of market capitalization	Indicator of size of the firm measured as factor of number of shares outstanding and year end price expressed in $	Thomson Eikon
Leverage	Leverage ratio, debt to total assets	Indicator of exposure to risk that firms are involved. It shows the capability of the firm to pay off liabilities on time. Leverage is calculated as a ratio of total debt over total assets expressed in decimal	Thomson Eikon (Balance sheet)
lcapitalintensity	Logarithm of capital intensity	Indicator of capital investment that firms undertake during the period. It is calculated as a ratio of capital expenditure against sales	Thomson Eikon (Income statement, Cash Flow)
Age	Age	Indicator of experience in the market. It is measured based on the year of foundation of the firm	Thomson Eikon
Growth	Sales growth	Indicator of firm's growth which is measured as annual growth rate of sales.	Thomson Eikon (Income statement)
		Industry-specific Variables	
lelectricityprice	log of electricity price	Indicator of electricity market regulation which is measured as non-household electricity price without taxes and levies charged to final consumers.	Eurostat
mk	Market concentration	An indicator of electricity market which is measured as a market share of the largest generator in the electricity market as a percentage of the total electricity generation	Internationa l Energy Agency (IEA)
		Macroeconomic Variables	

GDPgrowth	Real GDP growth	Indicator of economic growth which is measured as the annual percentage growth rate of GDP at market prices based on constant local currency. Based on constant U.S. dollars	World Bank data
Inflation	Inflation	Inflation is measured as consumer price index that represent the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services	World Bank data
D1	Pre crises	Indicator of financial crises which is used as dummy variable that is equal to 1 for year the 2007, 2008, 2009 that represent pre crises period.	
D2	Post crises	Indicator of financial crises which is used as dummy variable that is equal to 1 for the year 2010, 2011, 2012 represent after crises period.	
	Support Schemes Variables		
TGC	Tradeable Green Certificate	This is a dummy variable that is equal to 1 if countries in which these companies operate apply a Tradeable Green Certificate for firms	Council of European Energy Regulators report (CEER 2017)
FIT	Feed in Tarif	This is a dummy variable that is equal to 1 if countries in which these companies operate apply a Feed in Tarif for firms	Council of European Energy Regulators report (CEER 2017)

4.3.2.4 Support Schemes Variables

Promoting renewable energy is a key incentive that is supported by the government. This study uses dummy variable related to support schemes. It is assigned equal to one for countries which adopted the TGC support mechanized, otherwise zero for other countries.

4.4 Regression Model and Estimation Methods

4.4.1 Econometric Model

The following econometric model is used to build the research design for this study as it is suggested by (Athanasoglou, Brissimis, & Delis, 2008). This econometric model includes internal and external factors that affect firm profitability.

$$\Pi_{it} = c + \delta\Pi_{i,t-1} + \sum_{j=1}^{J} \beta_j X_{it}^{j} + \sum_{l=1}^{L} \beta_l X_{it}^{l} + \sum_{m=1}^{M} \beta_m X_{it}^{m} + \sum_{n=1}^{N} \beta_n X_{it}^{n} + \varepsilon_{it} \quad (1)$$

Where the dependent variable Π_{it} indicates firms' profitability that is measured by using ROAA (return on assets average) or Tobin's q of each Renewable Energy company *i* at time *t*, with *i*=1…., N, *t*=1,…,T. N indicate the number of cross-section included in the model and T denotes the length of the sample period. As it can be seen in equation (1), c is the intercept, X_{it}'s are the explanatory variables that are grouped into firm specific, industry specific factors, support schemes and macroeconomic factors and ε_{it} is the error term in the model. The error term in this model is assumed to follow a one-way error component where v_i denotes unobserved firm-specific effects and μ_{it} denotes an idiosyncratic error.

$$\varepsilon_{it} = v_i + \mu_{it}$$

The unobserved firm effect v_i is time-invariant and represents any individual specific effect that is not included in the model while μ_{it} can be considered as a usually disturbance term that varies with individuals and time. Both $v_i \sim \mathrm{IID}(0, \sigma_v^2)$ and $u_{it} \sim \mathrm{IID}(0, \sigma_u^2)$ are independent of each other and among themselves. Accounting for the profit that persists over time, a lagged dependent variable is included among regressors. This dynamic panel model has two sources of persistence over time, firstly including lags in the model that can result in autocorrelation among regressors, and secondly individual-specific effects that show the heterogeneity between firms.

4.4.2 Endogeneity Bias

The objective of the studies is to obtain a good estimator for parameters that means unbiased (the expected value of the estimate is the true parameter value) and efficient (the parameter has a minimum variance with the least variance) estimator. Also, to provide consistent estimates that are trend to the true population value as the sample size increases indifferently

(Wooldridge, 2013). Oftentimes, the problem of endogeneity is ignored by researchers leading to inconsistent and biased estimates that provide misleading conclusions and wrong policy recommendations. Ketokivi & McIntos (2017) state that sometimes researchers might not get the correct sign of the coefficient due to endogeneity bias. Thus, in the model specification, it is fundamental to pay attention to possible endogeneity. For decades researchers of various fields have struggled with the problem of endogeneity, and there is no way to statistically ensure that the endogeneity problem is solved. As it is mentioned by Ketokivi & McIntos (2017), endogeneity is not a problem that asks for solution, but a dilemma that requires better choices. In order to decide between choices, it is needed to know the source of endogeneity and how to deal with endogeneity bias. It is known that there is no direct test for endogeneity but there are many indirect tests that can help with decisions and conclusions. The sources of endogeneity problems can be classified as a common-method variance, measurement errors, omitted variables and simultaneity (Ullah, Akhtar, & Zaefarian, 2018).Common-method variance is related to measurement methods that can produce biased results since this method is interconnected with the source of biased measurement. This source of endogeneity may occur in case the collected information comes from similar respondents. Measurement error is a problem that occurs in case imprecise measure of an explanatory variable in the regression model is used, since the variable of interest cannot be measured perfectly. Thus, the measurement errors result in inconsistent estimates since errors have influenced other variables in the regression. The last sources of endogeneity are omitted bias and simultaneity. Omitted bias occurs in case an important variable is excluded from the regression, while simultaneity arises when one or more explanatory variables simultaneity affects the dependent variable. Therefore, to deal with endogeneity problems the best choice is to use an instrumental variable (IV). Two-stage least square is a method that uses external variables as an instrument to handle endogeneity in panel data but finding these instrument variables is difficult to identify. Arellano & Bond (1991); and Blundell & Bond (1998) use internal instrument variables to overcome the endogeneity problems in dynamic panel models.

4.4.3 Ordinary Least Squares

Various research has been conducted by using Ordinary Least Squares estimators in which differences between actual and estimated value are minimized in terms of the sum of squared. Under certain assumptions, the method of least squares has been the most influential and popular method of regression analysis. To provide an unbiased and consistent estimator this model should satisfy the assumptions underlying the method of least squares. The purposed model in the equation that includes the lagged dependent variables likely violated the classical assumptions. First, the OLS estimator requires normal distribution of 'error' term with zero mean and the same variance to give OLS unbiased, consistent and efficient estimators. The data used in financial studies have numerous large outliers that make this data not normally distributed and one big outlier can seriously affect OLS estimates. Second, another assumption for OLS estimator is zero conditional mean and homoscedasticity assuming that independent variables are exogenous and not correlated with error term and the error term has the same variance. The violation of this assumption may occur in the model of equation 1 since some explanatory variables may suffer from endogeneity. The pooled OLS regression may give biased and inconsistent estimators under the presence of endogeneity and autocorrelation problems.

4.4.4 Random Effects Model

The model that is based on within-transformation of the variables such as Fixed Effects model does not allow for the estimation of time-invariant variables, such as TGC or dummy variables for a financial crisis. Hence, using Fixed effects model that takes the first difference of variables will omit dummy and time-invariant variables from the model. Thus, Random effects model allows to including time-invariant variables in the model. Random effects model assumes that individual effects are not correlated with independent variables in all time periods whether the regressors are time-invariant, or not.

4.4.5 Generalized Method of Moments

In the model, the lagged dependent variable to examine the persistent effects of profitability is included. The system-GMM estimation overcomes the problem of firm-specific time-invariant unobservable factors (uj), that are likely to be correlated with other independent variables that under ordinary least squares (OLS) estimation can result in biased estimates. Also, including lagged of the dependent variable in OLS estimation can produce inconsistent and upward biased estimates because of the correlation of ROA(-1) or Tobin's *q* with u (error term). Another drawback of OLS estimator is that OLS assumes strictly exogenous explanatory variables and homoscedastic. But this assumption could not hold in models with lagged dependent variables because some independent variables can suffer from endogeneity. These models that include lagged dependent variables among the regressors are considered dynamic panel models. Arellano & Bond (1991) suggest taking the first difference for all regressors to eliminate individual effects in a dynamic panel model that results in a consistent estimator of **δ**. This model builds on transforming all regressors through differencing, but this is a weakness in an unbalanced panel data that lead to large gaps. The efficiency of the instrumental variable estimator in a dynamic panel is developed by (Arellano & Bover, 1995). This GMM estimator recommends introducing more instruments to improve efficiency and transform instruments to make them uncorrelated with individual effects. The first difference in GMM estimator is although it controls for endogeneity problems yields both a biased and inefficient estimator of **δ** parameter due to poor instruments. Blundell & Bond (1998), revisit the early models and develop a system GMM that provide more efficient estimator by using a unique difference transformation process that eliminates the problem of time-invariant country specific characteristics. The advantage of the GMM system estimation technique by Blundell and Bond (1998) is that it allows to include in the model non-country specific time-invariant regressor such as dummy variable for a financial crisis that in difference GMM estimation techniques will disappear. The system GMM estimator includes lagged differences of dependent variables as instruments for equations in levels and a lagged level of dependent variables as instruments for equations in the first differences that result in generating additional instruments. Thus, allowing more instruments yields not only more efficiency in the estimated coefficients but also more consistent over the basic first difference GMM technique.

Recent research academics toward profitability suggest a generalized method of methods (GMM) estimator to overcome possible endogeneity problems and measurement error. GMM estimator is used in case of 1) short time-periods and a great number of individuals; 2) the dependent variable depends on past realization; 3) independent variable may be correlated with past and current error term; 4) heteroskedasticity and autocorrelation within individuals. In the dynamic panel model, GMM controls for the endogeneity of the lagged dependent variable when there is a correlation between explanatory variables and error term in the model, omitted variable biased, unobserved panel heterogeneity.
The general model of the data that generate the System GMM estimator is given below:
:

$$y_{it} = \alpha y_{i,t-1} + \theta X'_{it} + \mu_{it}$$

$$\mu_{it} = \eta_i + \upsilon_{it}$$

where X'_{it} is the vector of explanatory variables, μ_{it} is the disturbance term that include time-invariant unobserved firm effect η_i and error term that varies with individual and time υ_{it}.

The following model is used to analyze the indicators that affect the renewable energy firm's profitability.

$$\begin{aligned} profit_{it} = {} & \beta_0 profit_{i,t-1} + \beta_1 size_{it} \\ & + \beta_2 risk_{it} + \beta_3 age_{it} + \beta_4 capitalintensity_{it} + \beta_5 growth_{it} + \beta_6 TGC_i \\ & + \beta_7 lelectricity_i \\ & + \beta_8 marketconcentration_i + \beta_9 GDP_i + \beta_{10} inflation_i + \beta_{11} D1_i \\ & + \beta_{12} D2_{i+} \mu_{it} \end{aligned}$$

There are three main reasons that this thesis uses the system GMM as a superior estimation model rather than OLS and Random Effects. Firstly, System GMM deal with endogeneity problems caused by including the lag of the dependent variable in the model, and this regressor is expected to be correlated with the error term. Secondly, System GMM is useful since it allows to include in the model time-invariant variables such as TGC policy that is dummy variables. Thirdly, System GMM is the most appropriate model for unbalanced panel data with gaps in which the number of companies (N=43) is greater than the time periods (t=17). In addition, the system GMM does not require any restrictive assumptions related to the distribution of the data.

The consistency of system GMM relies on key assumptions:

1. Second order

SGMM estimators in order to be efficient should satisfy the autocorrelation assumption. It is important to provide evidence of the absence of autocorrelation in the residuals for the second order. The probability value of the AR (2) is expected to be greater than 0.05 to satisfy the autocorrelation assumption.

2. The Hansen test

The validity of the instruments is another additional test to check the efficiency of the SGMM. Instruments that are used in the GMM method should be exogenous in order to provide valid results. The expected probability of the Hansen test is greater than 0.05 to reject the null hypothesis of instrument over-identification. The system GMM estimator is valid in case the AR (2) and Hansen test show that the model does not suffer from autocorrelation in the residual and instrument proliferation.

4.5 Descriptive Statistics

4.5.1 General Discussed on Variables' Characteristics

Since there is an unbalanced panel data, the number of observations changes for some variables. Summary statistics of the main variables used in the model are shown in table 4.1. The results show that renewable energy companies are characterized by lower financial performance during the period 2004-2020, but if they continue to keep this upward trend sustained their future financial performance will increase. The profitability of renewable energy firms measured by ROA varies between -0.669 to 0.271, which means that the minimum value is -66.9%, while the maximum value is 27.1%, while the mean value of ROA is -0.018 or -1.8%. Tobin's *q* as an indicator of profitability, in the long run, shows that the maximum value achieved is 8.278, while the minimum value is 0. The results show that the interest in investment in these companies is increased, this is reflected in the mean value that is 1.007. Therefore, the mean value of Tobin's *q* is greater than 1, which means the market value of a firm is higher than the book value of its assets. The results indicate that the market is overvalued the companies in this industry. Therefore, having a value of Tobin's *q* greater than 1, represents that firm's worth in the market is greater than the book value of its assets. As it is mentioned by Wilbur G.Lewellena & Badrinath (1997), market financial performance of firms is overvalued in case of a higher Tobin's *q* ratio. The mean value for the logarithm of market capitalization or size of the company is 12.69 and the maximum value is 0. 271. The risk of the company that is measured as debt to total assets varies between 0 – 0.747, shows the structure of the company which is the percentage that is covered by equity and the remaining that is financed by external sources. As it can be seen around 30.5 % is the average leverage ratio for companies. Age as an indicator of experience in the market shows that these companies are new in the market. The average age of these companies is 19.9 years. The mean value of the logarithm of capital intensity is -2.105 and the maximum value is 5.005. Growth sales show that the values vary between -0.91 and 38.245, meaning that the minimum value is a 91% decrease in the growth, while the maximum value is a 382.45% increase in the level of sales. The mean value of the logarithm of electricity price is -2.234 and the maximum value is -0.417. Furthermore, summary statistics regarding GDP growth shows that the maximum growth in these countries is 5.7%, while in the recession period the minimum growth is -0.098%. Data values related to leverage, growth sales, market capitalization, GDP growth and inflation are in decimal.

Table 4.3

Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
TobinsQ_w	644	1.007	1.212	0	8.278
ROAA_w	679	-.018	.142	-.669	.271
lmkt_w	628	12.695	2.818	4.204	18.18
Leverageto~w	703	.305	.207	0	.747
age_w	702	19.932	16.735	0	76
lcapitalin~w	655	-2.105	1.997	-7.092	5.005
Growthsale~w	659	.892	4.651	-.918	38.245
TGC	703	.188	.391	0	1
lelectrici~w	692	-2.234	.303	-2.777	-.417
mk_w	595	.373	.197	.112	.916
GDPgrowthd~w	703	.009	.03	-.098	.057
inflation1_w	703	.016	.012	-.008	.047
D1	703	.178	.383	0	1
D2	703	.183	.387	0	1

Figure 4.1 shows the average profitability over year in terms of ROA that provide mixed results such as positive and negative. The average ROA was negative during 2004 (-2.9%), 2009 (-1%), 2010 (-0.8%), 2011 (-4.8), 2012 (-6.7%), 2013 (-4.3%), 2014 (2.8%), 2015 (-2.8%), 2016 (-2%), 2017 (-0.5%), 2018 (-1.3%), 2019 (-1.8%), 2020 (-0.77%). While average ROA was positive over the period 2005-2008 respectively in 2004 (1.9%), 2005 (1.7%), 2006 (0.33%), and 2008 (0.91%). Hence, checking the summary statistic of profitability (ROA) provides that the highest return on assets is 27.11%, the minimum ROA is -66.8% and the mean value of (-1.7%). Therefore, the average ROA was more often negative than positive during the overall period of the study. The average profitability (ROA) in 2012 was relatively low around (-6.719%) that reflects the effect of post-financial crises. As it can be seen from statistics the effect of the Great Recession has contributed to negative returns during 2009 but not during the period of great recession since the ROA from 2007-2008 was positive.

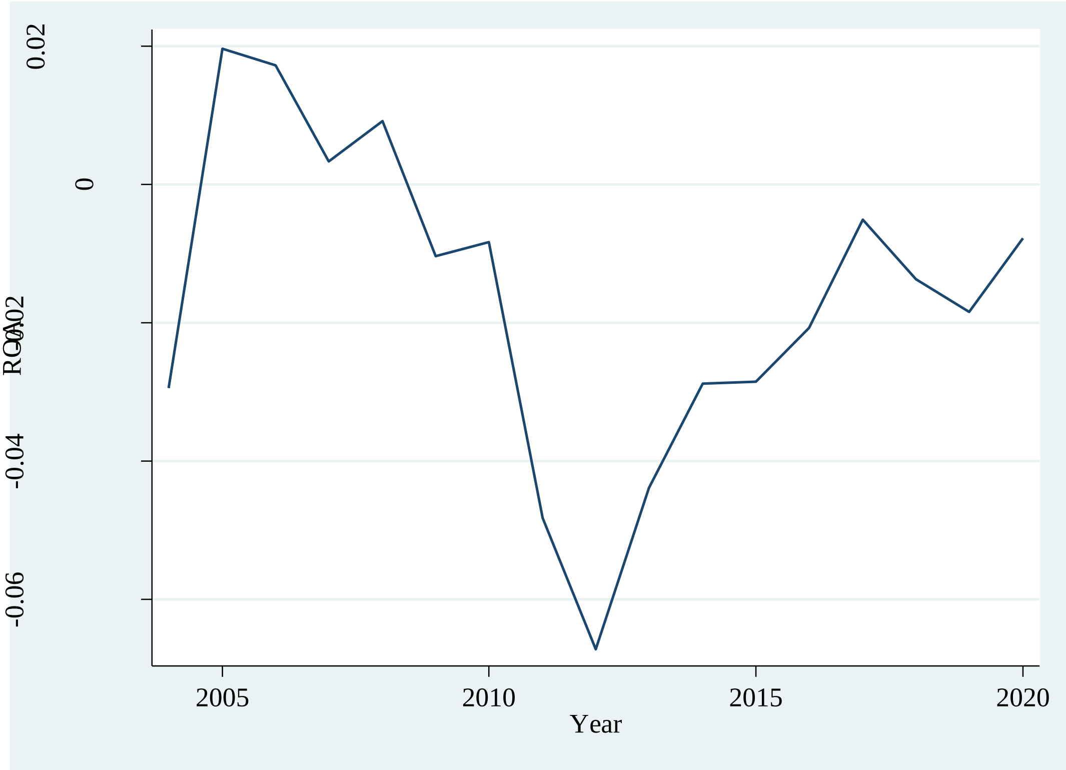


Figure 4.1 Average ROA over years

Source: Author's own elaboration

Similarly, figure 4.2 shows the average Tobin's *q* over the years, as an indicator of profitability measured as (Enterprise value / Book value of total assets). As it can be seen the average Tobin's *q* is predominantly near to 1 or greater than 1. The lowest value of Tobin's *q* occurred in 2005 (0.67) that represents the market value of renewable energy companies that during this period they were in the initial stage of their activity. Overall, the market value of renewable energy companies is greater than 1, which shows that investors are interested in these companies, and they have overvalued RE companies. The highest value occurred in 2007 (1.527), and in 2020 Tobin's *q* is (1.51) meaning that the prices have not influenced the profitability of RE companies. In addition, the health crisis has boosted the interest in RE companies as indicated by the statistical data.

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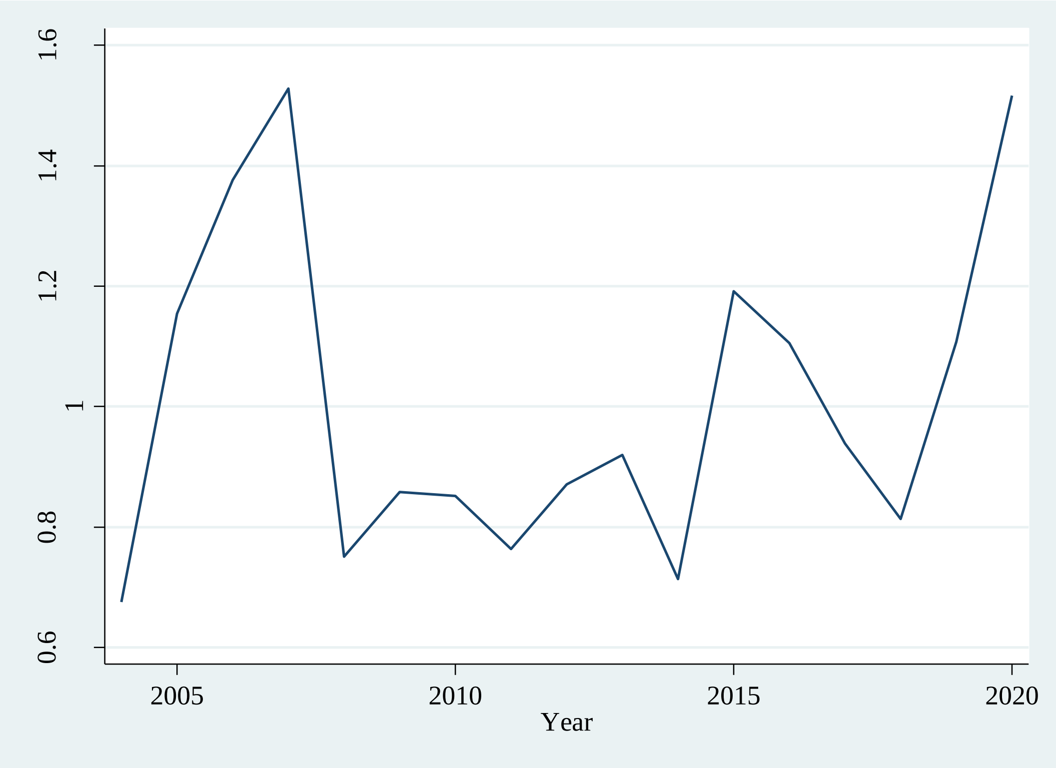

Figure 4.2 Tobin's *q* Average over years

Source: Author's own elaboration

4.5.1 Correlation Matrix

Table 4.4 shows the correlation matrix between variables used in equation (1). The results indicate that the study is not exposed to the multicollinearity problem, since all correlation coefficients are less than the threshold of 0.8. Further the maximum correlation between the key variable of interest and other control variable is -0.412 between ROA and TGC. There is a significant negative correlation between Tobin's *q* and the size of the company, leverage, and age, while electricity price, market concentration, GDP growth, inflation and financial crises are not correlated with Tobin's *q*. Simultaneously, there is a positive and significant correlation between Tobin's *q*, capital intensity and growth sales at 1% level of significance. Conversely, ROA is positively correlated with size of the company, leverage, and age of the company at 1% level of significance. Capital intensity, growth sales and TGC are negatively correlated with ROA at 1% level of significance. The lagged dependent variables (L.ROA and L. Tobin's *q*) are positively correlated with each respective depended variables in level at 1% level of significance.

Table 4.4

Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) TobinsQ_w	1.000															
(2) ROAA_w	-0.474*	1.000														
(3) L.TobinsQ_w	0.646*	-0.478*	1.000													
(4) L.ROAA_w	-0.450*	0.752*	-0.472*	1.000												
(5) lmkt_w	-0.044	0.281*	-0.079	0.270*	1.000											
(6) Leveragetotald~s	-0.196*	0.191*	-0.203*	0.192*	-0.071	1.000										
(7) age_w	-0.110*	0.140*	-0.113*	0.145*	0.047	0.039	1.000									
(8) lcapitalintens~w	0.253*	-0.294*	0.241*	-0.222*	0.052	0.053	-0.225*	1.000								
(9) Growthsalescha~w	0.139*	-0.087*	0.102*	-0.094*	-0.042	-0.040	-0.140*	0.048	1.000							
(10) TGC	0.346*	-0.412*	0.344*	-0.408*	-0.318*	-0.213*	-0.229*	0.123*	0.089*	1.000						
(11) lelectricity_w	-0.035	-0.061	0.026	-0.041	0.014	0.108*	0.073	0.090*	0.041	-0.076*	1.000					
(12) mk_w	-0.014	-0.016	-0.007	-0.032	-0.069	0.039	-0.013	0.152*	0.024	-0.094*	-0.224*	1.000				
(13) GDPgrowthdec_w	-0.003	0.009	0.055	0.001	-0.135*	-0.052	-0.078*	-0.030	0.082*	0.139*	-0.289*	-0.057	1.000			
(14) inflation1_w	0.034	-0.044	0.144*	-0.018	-0.112*	-0.060	-0.144*	0.153*	0.104*	0.105*	0.113*	0.039	0.207*	1.000		
(15) D1	0.009	0.059	0.083*	0.091*	0.032	-0.145*	-0.123*	0.144*	0.079*	0.005	0.183*	0.054	-0.201*	0.206*	1.000	
(16) D2	-0.072	-0.081*	-0.062	-0.015	-0.068	0.058	-0.046	0.105*	0.042	-0.002	0.230*	0.097*	0.032	0.326*	-0.220*	1.000

**** p<0.01, ** p<0.05, * p<0.1*

Market capitalization is positively correlated with current short-term profitability (ROA) and the lag of ROA. It is a positive correlation between leverage and Tobin' s *q*, suggesting that firms perform better while they are engaged in leverage activities. While the opposite correlation is between leverage and ROA, suggesting that firms with high leverage tend to perform better in the short run. On the other hand, age is positively correlated with ROA, while negatively correlated with Tobin's *q*. This suggest that investors are more attracted towards the new firms in the market, instead of years ago established firms. While, about ROA, as an accounting measurement, seems to be influenced by the age of the firm. Better experience in the market is more efficient for the company to decide for those strategies that in turn tend to increase performance. Overall, the correlation coefficient between variables in this study are reasonable and consistent with prior studies.

CHAPTER 5

5. EMPIRICAL RESULTS AND DISCUSSION

5.1 Introduction

This chapter covers the estimation results from three different estimation techniques as described in the methodology part. Ordinary Least Square (OLS) and Random Effects (RE) estimation method is used for the static model, where the lagged depended variable is not included. While the dynamic model is estimated by using Generalized Method of Moments (GMM), in which the lagged depended variable is included in the model.

Pooled OLS estimation technique was the first attempt to interpret the results. Additionally due to drawbacks of OLS, Random Effects (RE) is used as an estimation technique to overcome the problems of OLS. In addition, the appropriate model for our dataset that has a high number of cross sections (N =43) compared to time period (t=17) is a Two-step system GMM. As a results, when examining the data with small T and large N, the model is described as a dynamic panel model with a lagged dependent variable and endogenous variable, the Generalized Method of Moments (GMM) estimator is the preferred one. As it is suggested by Roodman (2009) the Generalized Method of Moments (GMM) estimator results are obtained by using the xtabond2 estimate command through STATA14 software. Estimated results of the three estimation methods are interpreted. Furthermore, post estimator test for each model is performed to show the consistency and unbiased estimation of the parameter. Interpretation of the coefficients are shown for all models and a discussion of the results is conducted, to argue whether the findings are consistent with the previous studies.

5.2 Empirical results

Initially, Pooled Ordinary Least Squares (OLS) method of the regression in which the parameters are estimated by using the method of least squares, is performed. The OLS method is based on minimizing the sum of squared errors in order to interpret the regression coefficients. Thus, as there is more than one independent variable, this is considered as a multiple regression model. It can be considered that the model estimated by OLS method is unbiased, in case that the regression satisfies Gauss Markov Assumptions (1-4). Therefore, if the regression model satisfies and the 5th condition related to heteroskedasticity it can be considered as BLUE (Best Linear Unbiased Estimator). OLS estimators require for the model to fulfill zero conditional mean, the expected value of error term for each value of independent variable should be equal to zero, and the expected value of error term is zero, $E[\mu] = 0$. In order to have unbiased estimator it is required to test whether the regression model satisfies assumptions. Therefore, random effects (RE) is performed for the data set. System GMM estimator is used to account the persistence of the profit through years.

5.2.1 Ordinary Least Square (OLS) Estimation Results

In this section the results of three regressions by using OLS method are presented, where the dependent variable is ROAA. In addition, all the models are estimated by using vce (robust) command in STATA 14, in order not to have problems with heterogeneity, serial correlation and cross-sectional dependency. Due to unusual cases, or when the model does not satisfy certain assumption, the statistical model can be biased, additional examination are necessary. It is known that the effect of outliers will affect the mean value of the data, and it can provide spurious results, thus needed to check the presence of outliers. Overcoming the problem of outliers, the data are winsorised to 99 percentiles as it is suggested by (Nicklin & Plonsky, 2020).

In order to have unbiased results, before estimating the regression, all of the data are checked for unit root. Levin, Lin & Chu (2002) and Im, Pesaran and Shin (2003) tests for stationarity are used as the most appropriate test for panel data. In Appendix **C** the results of unit root are shown and for both tests we reject null hypothesis presence of unit root in favor of alternatives that the data are stationary. An important assumption is multicollinearity among independent variables that shows the strength of correlation between two independent variables. In case that the correlation between independent variable is greater than the threshold of 0.8, the presence of multicollinearity is shown in the data. Variance Inflation Factors (VIF) are used to test multicollinearity with regard to independent variable. As it is shown in table 5.1, the VIF values are less than 10, which means that multicollinearity is not a problem for the data. As a rule of thumb, for VIF is a value equal to 10. Variables that have a VIF greater to 10 need further investigations.

Table 5.1

Multicollinearity among Independent Variables

Variable	VIF	1/VIF
D1	1.65	0.604933
D2	1.62	0.616951
lelectrici~w	1.55	0.643668
GDPgrowthd	1.41	0.70828
inflation	1.37	0.732079
TGC	1.33	0.752347
lmkt	1.29	0.777474
mk	1.26	0.793128
Leverageto	1.19	0.838688
age	1.17	0.85346
lcapitalin	1.17	0.854267
Growthsale	1.05	0.955006
Mean VIF	1.34	

5.2.1.1 Estimation Results for the Return on Average Assets

Table 5.2

OLS Results with Return on Assets as a Dependent Variable

Explanatory variables	(1) Pooled OLS	(2) Pooled OLS Robust	(3) Pooled OLS	(4) Pooled OLS Robust	(5) Pooled OLS	(6) Pooled OLS Robust
	Depended Variable ROAA					
lmkt	0.0157***	0.0157***	0.0103***	0.0103***	0.0101***	0.0101***
	(0.00175)	(0.00191)	(0.00189)	(0.00175)	(0.00185)	(0.00166)
Leveragetotaldebttotalassets	0.150***	0.150***	0.0859***	0.0859***	0.107***	0.107***
	(0.0237)	(0.0324)	(0.0242)	(0.0291)	(0.0242)	(0.0295)
age	0.000419	0.000419	0.000169	0.000169	0.000433	0.000433*
	(0.000294)	(0.000256)	(0.000309)	(0.000244)	(0.000309)	(0.000243)
lcapitalintensity	-0.0223***	-0.0223***	-0.0165***	-0.0165***	-0.0177***	-0.0177***
	(0.00264)	(0.00393)	(0.00261)	(0.00425)	(0.00258)	(0.00419)
Growthsaleschanges	0.000394	0.000394	0.000758	0.000758	0.000145	0.000145
	(0.00116)	(0.00212)	(0.00102)	(0.00193)	(0.00101)	(0.00179)
TGC			-0.0650***	-0.0650***	-0.0702***	-0.0702***
			(0.0143)	(0.0184)	(0.0141)	(0.0185)
lelectricity			-0.0197	-0.0197	-0.0249	-0.0249
			(0.0176)	(0.0177)	(0.0203)	(0.0201)
mk			-0.0244	-0.0244	-0.0313	-0.0313

			(0.0242)	(0.0209)	(0.0250)	(0.0213)
GDPgrowthdec					0.618***	0.618**
					(0.234)	(0.251)
inflation1					0.0859	0.0859
					(0.436)	(0.418)
D1					0.0649***	0.0649***
					(0.0147)	(0.0169)
D2					0.00694	0.00694
					(0.0145)	(0.0173)
Constant	-0.320***	-0.320***	-0.230***	-0.230***	-0.272***	-0.272***
	(0.0265)	(0.0403)	(0.0492)	(0.0479)	(0.0551)	(0.0544)
Observations	589	589	483	483	483	483
Number of firms	43	43	42	42	42	42
R-squared	0.231	0.231	0.237	0.237	0.278	0.278

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5.2 presents the β_j coeffects and standard errors in bracket for each regression using OLS estimator. Therefore, in column (2), (4), and (5), robust results are obtained by using robust command. The first model results presented in column (1) and (2) estimate the financial performance and their determinants by checking the internal factors, or firm-specific factors. As shown, the effect of market capitalization that represent the size of the company is statistically significant at 1% level of significance. Leverage calculated as a ratio between total debt to total assets, that represents exposure to risk for these companies, has a positive effect on profitability. While the effect of capital intensity for renewable energy companies is negative and statistically significant at 1% level of significance. The overall test of the significance of the model where $F(5, 583)= 35.01$ and p-value < 5%, indicate that the model is significant. R^2 shows the explanatory power of the model, that in this case the variation in dependent variable (ROA) is explained 23.1% by the independent variable. Also, it was investigated, whether any condition of Gauss Markov assumptions was violated. In table 5.3 the robustness test of the model (1), (3), and (6) is presented. In model (1), null hypothesis that no heteroskedasticity problems are present in the model, is rejected. Likewise, null hypothesis that no serial correlation is presented in the model, is rejected. Moreover, the cross-sectional dependence is presented in the model. Since the model violated conditions related to heteroskedasticity, serial correlation and cross-sectional dependency, the results are biased and inconsistent. In column (3), and (4) results related to firm-specific and industry factors are presented. The robustness results show that size of the company and leverage, have a positive effect on profitability at 1% level of significance. Also, capital intensity has a negative effect on profitability. Related to industry specific factors, TGC has a negative effect on profitability at 1% level of significance. Again, the model 2 is suffering from heteroskedasticity, serial correlation and cross-sectional dependency problems. In addition, in the third model, macroeconomic factors and the effect of financial crises are included. Positive effect of size and leverage is found on profitability in the third model, column (6), while statistically significant negative effects are identified for the capital intensity and the effect of support mechanisms such as TGC. OLS estimator is a good one as it fulfills all the criteria. Otherwise, biased results are shown in column (5) in which some of variables become significant, and also the magnitude of the coefficients changes. Age becomes statistically significant at 10% level of significance, and has a positive effect on profitability, while the pre-crises seems that for renewable energy companies has a positive effect. What is more, the significance level of the GDP growth changes from 1% to 5%. The robust results of the model three in column (6) show that the economic growth of the country influences positively the financial performance of renewable energy companies.

To sum up, the regression results show that profitability of renewable energy companies measured as ROAA is explained by the size of company, leverage and capital intensity in model (1). In model (2) the effect of TGC is negative and is a determinant of profitability. In model (3) the level of income of the country seems to be statistically significant and to have a positive effect on profitability. While other variables such as electricity price and market concentration are not statistically significant in all models. As it is seen from table 5.3, the results of diagnostic test show that in all three models estimated by using pooled OLS, the problem of heteroskedasticity, autocorrelation and cross-sectional dependence is present. Heteroskedasticity test for three model shows that p-value=0.000 < 0.05, indicating that null hypothesis is rejected, and error term is homoscedastic in favor of alternative hypothesis, that error term is heteroskedastic. This shows that the model has more than one variance. Therefore, for mode (1), (3) and (5), null hypothesis related to no serial correlation is rejected. Cross sectional dependency test in model (1), (3) shows that null hypotheses on cross-sectional dependency is rejected, whereas in model (5), there is a rejection failure at 10% level of significance.

Table 5.3

Robustness Tests

	(1)	(3)	(5)
Heteroskedasticity Test			
Breusch-Pagan / Cook-Weisberg			
	chi2(1) =364.48	chi2(1) =350.77	chi2(1) =318.5
	p-value = 0.000	p-value = 0.000	p-value = 0.000
Serial Correlation Test			
Wooldridge test			
	F (1, 42) = 12.770	F (1, 42) =10.961	F (1, 40) =12.147
	p-value = 0.0009	p-value = 0.0020	p-value=0.0012
Cross-sectional Dependence Test			
Pesaran CD test			
	p-value = 0.000	p-value = 0.000	p-value=0.056
Model F test	F (5, 583) = 35.01	F (8, 474) =18.37	F (12, 470) = 15.06
	p-value = 0.0000	p-value = 0.0000	p-value=0.0000

In both profitability measurements the importance of internal factors seems more significant than industry-specific factors.

5.2.1.2 Estimation Results for Tobin's *q*

Tobin's *q* as a measurement of profitability represents the marked-based measures that reflects the investors' expectation related to the price of stocks in the market. By using multiple regression model, the relation between one or more regressors is estimated with the dependent variable in order to define the factors determinant for profitability in renewable industry. The OLS regression method is used as the first method and all the assumption related to Gauss Markov are tested in order to provide unbiased results. Due to the fact that some companies have missing data on some years or in the information related to market concentration, unbalance panel data regression is used. In column (1), (3), and (5) are represented multiple regression results that may be biased since robustness test are not examined. Thus, the unbiased results that satisfy certain assumptions are represented in column (2), (4), and (6). In column (1) are presented the results related to firm-specific factor that influence long-term profitability in terms of Tobin's *q*. The diagnostic test with respect to heteroscedasticity reject the null hypothesis that error term is homoscedastic. Nonetheless, Wooldridge test shows that the model does not suffer from serial correlation. In addition, this thesis fails to reject the null hypothesis related to cross-sectional dependency. Thus, to control heteroscedasticity, robust standard errors is used. The regression results presented in table 5.5 show that market capitalization rendering the size of the company, negatively influence profitability (Tobin's *q*) at 1% level of significance. These results are consistent with the findings of authors Westerman, De Ridder, & Achtereekte (2020). Thus, this indicator is tightly related to managerial decisions and governance issues. Such a problem could be related to the fact that managers are not interested to increase the size of the company and they do not take risk. Thus, the negative coefficient of size (-0.0258) shows that 1% increase in the size of the company, will decrease profitability by 0.0258 point. The influence of risk on profitability (Tobin's *q*) is negative and statistically significant at 10% level. At 10% level of significance, capital intensity for clean energy has a negative effect on Toobin's *q*. Furthermore, the coefficient of sales' growth becomes insignificant with robust standard errors. Growth sales has a positive effect but not statistically significant. Age has a negative effect but not statistically significant.

Column (4) shows the results of the model, adding some industry characteristics. To fit the model, a series of diagnostic test are conducted. The Breuch-Pagan test is performed to check the heteroscedasticity, while Wooldridge test is performed to check the serial correlation. Peasaran (2004) test is conducted to identify the presence of cross-sectional dependence in panel data. As it is suggested by Hoechle (2007), Driscoll and Kraay robust standard errors are used since in model (4) to overcome the presence of heteroscedasticity and serial correlation which produce inconsistent results. The results show that capital intensity has positive effect at 10% level of significance. While in model (4) the effect of growth becomes positive and the coefficient is (0.0375), that's increased profitability by 0.0375 percentage points, for 1 percentage-point increase in growth sales. Using market value as an indicator of profitability shows that profitability in the long-run is higher for companies that operate in countries where TGC has been adopted. The effect of electricity price is negative but remains insignificant. The effect of market capitalization and real GDP growth are positive but again not statistically significant. In column (6) are represented the regression results, in which macroeconomic factors are added. As it is seen, the effect of capital intensity is still positive and the significance level is 5%. Growth sales, again has a positive effect on profitability, at 1% level of significance. TGC has a positive effect on profitability. The financial crises has a negative effect on profitability.

Table 5.4

OLS Results with Tobin's q as a Dependent Variable

Explanatory variables	(1) Pooled OLS	(2) Pooled OLS Robust	(3) Pooled OLS	(4) Pooled OLS Robust	(5) Pooled OLS	(6) Pooled OLS Robust
	Dependent Variable Tobin's *q*					
lmkt	-0.0258*	-0.0258*	0.0141	0.0141	0.0140	0.0105
	(0.0152)	(0.0150)	(0.0149)	(0.0161)	(0.0148)	(0.0169)
Leveragetotaldebttotalassets	-0.980***	-0.980***	-0.368*	-0.368	-0.367*	-0.379
	(0.206)	(0.300)	(0.191)	(0.296)	(0.194)	(0.419)
age	-0.00324	-0.00324	-0.00180	-0.00180	-0.00199	-0.00207
	(0.00255)	(0.00244)	(0.00244)	(0.00200)	(0.00248)	(0.00258)
lcapitalintensity	0.136***	0.136***	0.0970***	0.0970**	0.0976***	0.101**
	(0.0229)	(0.0371)	(0.0205)	(0.0450)	(0.0207)	(0.0435)
Growthsaleschanges	0.0352***	0.0352	0.0375***	0.0375**	0.0362***	0.0374*
	(0.0101)	(0.0229)	(0.00807)	(0.0162)	(0.00808)	(0.0210)
TGC			0.476***	0.476***	0.458***	0.425*
			(0.112)	(0.121)	(0.113)	(0.238)
lelectricity			-0.0365	-0.0365	0.130	0.178
			(0.139)	(0.191)	(0.163)	(0.308)
mk			0.0361	0.0361	0.176	0.175
			(0.191)	(0.117)	(0.200)	(0.313)
GDPgrowthdec					2.848	3.378
					(1.876)	(3.399)
inflation1					5.952*	8.538
					(3.492)	(5.694)
D1					-0.0249	-0.632**
					(0.118)	(0.297)
D2					-0.243**	-0.462**
					(0.117)	(0.202)
Constant	1.949***	1.949***	0.856**	0.856	1.106**	1.322
	(0.230)	(0.338)	(0.388)	(0.653)	(0.443)	(0.815)
Time fixed effect	No	No	No	No	No	Yes
Observations	590	590	484	484	484	484
Number of firms	43	43	42	42	42	42
R-squared	0.122	0.123	0.163	0.163	0.180	0.234

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.5

Robustness Test

	(1)	(3)	(5)
Heteroskedasticity Test Breusch-Pagan / Cook-Weisberg	chi2(1) = 514.78 p-value = 0.000	chi2(1) =905.16 p-value = 0.000	chi2(1)= 934.15 p-value = 0.000
Serial Correlation Test Wooldridge test	F(1, 42) = 1.786 p-value = 0.1886	F(1, 42)=12.070 p-value = 0.0012	F(1, 40)=14.368 p-value=0.0005
Cross-sectional Dependence Test Pesaran	p-value = 1.000	p-value = 1.001	p-value=1.000
Model F test	F(5, 583)= 4.65 p-value = 0.0004	F(8, 475)= 18.37 p-value = 0.0000	F(12, 471)= 8.63 p-value=0.0000

5.2.2 Random Effects Estimation Results

5.2.2.1 Estimation Results for the Return on Average Assets, Random Effects model

Random effects (RE) model has the advantage to be used for time-invariant regressors that yields estimated of all coefficients and their marginal effects. Also, the Breusch-Pagan Langrage multiplier (LM) test in Appendix D, is performed to test for the presence of random effects where the chibar2(01) = 370.31 and *p*-value=0.000 for model (1), Appendix D. So, the null hypothesis that the variance among companies is zero is rejected, in favor of alternative hypothesis that the difference among companies is significant. The test shows that Random effects (RE) model is the preferred one instead of OLS model. Diagnostic panel data tests related to heteroskedasticity, serial correlation and cross-sectional dependence are conducted for Random effects model, as are reported in table 5.5. The results show that the variance of error term is not constant in all three models. Serial correlation test shows that the data are serially correlated. Related to Pesaran test for cross sectional dependency it is shown that in all three model is not present. To deal with serial correlation and heteroscedasticity robust cluster standard errors is employed.

In table 5.4 are presented the regression results for three models estimated by using Random Effects and Random Effects Robust results. Related to, the size of the company there is a positive effect on profitability at 1% level of significate for model (1), (3), (6). For capital intensity there is a significant coefficient at 1% level and its sign is negative in all models. In model (6) the significant level becomes 5% for capital intensity, in which standard errors are robust and clustered. For TGC, there is a significant coefficient at 10% level for model

(6) with a negative sign of (-0.113), which indicates that renewable energy companies perform better in countries that are implemented FIT support mechanisms. Furthermore, the coefficient of GDP growth is positive and significant at 1% level, which indicates the economic level enhances financial performance for these companies.

Table 5.6

Random Effects Estimates with ROAA as a Dependent Variable

Explanatory Variables	(1) Random Effects	(2) Random Effects Robust Errors	(3) Random Effects	(4) Random Effects Robust Errors	(5) Random Effects	(6) Random Effects Robust Errors
	Dependent Variable ROAA					
lmkt	0.0225***	0.0225***	0.0182***	0.0182***	0.0161***	0.0161***
	(0.00325)	(0.00453)	(0.00344)	(0.00454)	(0.00351)	(0.00376)
Leveragetotaldebttotalassets	-0.0351	-0.0351	0.00631	0.00631	0.0277	0.0277
	(0.0275)	(0.0311)	(0.0300)	(0.0365)	(0.0306)	(0.0414)
age	0.000128	0.000128	3.35e-05	3.35e-05	0.000738	0.000738
	(0.000584)	(0.000793)	(0.000618)	(0.000852)	(0.000665)	(0.000827)
lcapitalintensity	-0.00826***	-0.00826***	-0.0084***	-0.00842**	-0.00896***	-0.00896**
	(0.00232)	(0.00317)	(0.00248)	(0.00356)	(0.00248)	(0.00364)
Growthsaleschanges	0.000712	0.000712	0.00134	0.00134	0.000940	0.000940
	(0.000854)	(0.00148)	(0.000848)	(0.00110)	(0.000838)	(0.00103)
TGC			-0.112***	-0.112	-0.113***	-0.113*
			(0.0312)	(0.0703)	(0.0319)	(0.0672)
lelectricity			-0.0133	-0.0133	-0.0114	-0.0114
			(0.0161)	(0.0201)	(0.0181)	(0.0174)
mk			-0.0119	-0.0119	-0.0280	-0.0280
			(0.0408)	(0.0346)	(0.0420)	(0.0335)
GDPgrowthdec					0.546***	0.546***
					(0.191)	(0.204)
inflation1					-0.238	-0.238
					(0.367)	(0.317)
D1					0.0479***	0.0479**
					(0.0130)	(0.0203)
D2					0.00310	0.00310
					(0.0120)	(0.0139)
Constant	-0.314***	-0.314***	-0.273***	-0.273***	-0.269***	-0.269***
	(0.0458)	(0.0700)	(0.0651)	(0.0703)	(0.0694)	(0.0664)
Observations	589	589	483	483	483	483
Number of firms	43	43	42	42	42	42
R-squared	0.1049	0.1049	0.1802	0.1802	0.2205	0.2205

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Wald test for the significance of the model confirm the goodness of the Random Effects in model (1), (3), and (6).

Table 5.7

Robustness test

	(1)	(3)	(5)
Heteroskedasticity Test			
Modified Wald ($\chi2$)			
	chi2 (43)= 15293.13 p-value = 0.000	chi2 (42) = 35983.40 p-value = 0.000	chi2 (42)=7306.57 p-value = 0.0000
Serial Correlation Test			
Wooldridge test			
	F(1, 42) = 12.770 p-value = 0.0009	F(1,40)=10.961 p-value =0.0020	F(1,40)=12.147 p-value = 0.0012
Cross-sectional Dependence Test			
Pesaran	p-value = 1	p-value = 1	p-value= 1
Model Wald test	Wald chi2(5)= 61.59 p-value = 0.0000	Wald chi2(8)=71.13 p-value = 0.0000	Wald chi2(12)= 92.28 p-value = 0.0000

5.2.2.2 Estimation Results for the Tobin's *q*, Random Effects model

Random effects model is used to examine the determinants of profitability in terms of Tobin' s q that represent long-term profitability. Column (2) represent the effect of external factors on profitability (Tobin' s *q*). In order not to provide inconsistent and biased results a series of diagnostic tests are conducted. The robustness test in table 5.9 shows that model (2) satisfies the assumption related to serial correlation and cross-sectional dependency, but the heteroskedasticity problem is still present. Thus, robust standards errors are used to overcome this problem. The results in column (2) show that the coefficient of market capitalization that represents the size of the company is (0.200) and statistically significant at 10% level. Similar results are obtained by Butt, Baig, & Seyyed (2021) , who conducted a study in 196 non-financial firms in Pakistan that operate in different sectors and reveal that Tobin's *q* is effected positively by market capitalization. The findings, therefore, support Hypothesis 1. The coefficient of sales growth is positive (0.0266) and statistically significant at 1% level. These results confirm hypothesis 5 that increasing sales' growth will increase market value of the firm. In column (3) the regression results support Hypothesis 1, 5 meaning that there is a strong positive relation between market capitalization, growth sales and Tobin 's *q*. Regarding industry specific factors, there is a strong positive relation between TGC and Tobin's *q*. The coefficient estimate is 1.828 and it is statistically significant at 10% level. As the effect of age in the regression results with robust standard errors becomes statistically significant at 1% level, the association between age and Tobin's *q* is negative. Electricity price is negatively affecting Tobin's *q*. The estimated coefficient is -0.283, and statistically significant at 1% level. Tobin's *q* seems to be statistically unrelated to leverage, capital intensity and market concentration. In column (6), runs the Random Effects for the full specification, and it shows that market capitalization is positively related with Tobin's *q* at 10% level. It is a negative relation between age and Tobin's *q* at 10% level of significance. Growth sales, again, has a positive effect on profitability. Related to support schemes TGC it is statistically significant, and has a positive effect on Tobin's *q*. Since TGC is a dummy variable, the estimated coefficient of 1.727, indicates RE companies that have adopted TGC have a market value higher, than RE companies that have adopted FIT mechanism.

Table 5.8

Random Effects estimates with Tobin's q as a dependent variable

	(1)	(2)	(3)	(4)	(5)	(6)
	Random Effects	Random Effects Robust Errors	Random Effects	Random Effects Robust Errors	Random Effects	Random Effects Robust Errors
Explanatory variables	Dependent Variable Tobin's *q*					
lmkt	0.200***	0.200***	0.249***	0.249***	0.213***	0.213***
	(0.0302)	(0.0559)	(0.0291)	(0.0678)	(0.0293)	(0.0567)
Leveragetotaldebttotalassets	-0.0462	-0.0462	0.186	0.186	0.179	0.179
	(0.249)	(0.404)	(0.223)	(0.298)	(0.231)	(0.276)
age	-0.00623	-0.00623	-0.0172***	-0.0172*	-0.0138**	-0.0138***
	(0.00545)	(0.00797)	(0.00568)	(0.00925)	(0.00595)	(0.00420)
lcapitalintensity	0.0330	0.0330	0.0298*	0.0298	0.0377**	0.0377
	(0.0209)	(0.0270)	(0.0175)	(0.0303)	(0.0181)	(0.0334)
Growthsaleschanges	0.0266***	0.0266*	0.0200***	0.0200*	0.0198***	0.0198***
	(0.00767)	(0.0148)	(0.00593)	(0.0112)	(0.00606)	(0.00530)
TGC			1.828***	1.828**	1.727***	1.727***
			(0.343)	(0.793)	(0.312)	(0.360)
lelectricity			-0.283**	-0.283*	-0.147	-0.147
			(0.114)	(0.161)	(0.132)	(0.131)
mk			0.179	0.179	0.274	0.274
			(0.343)	(0.506)	(0.344)	(0.298)
GDPgrowthdec					2.076	2.076*
					(1.387)	(1.146)
inflation1					2.963	2.963
					(2.663)	(3.925)
D1					0.0475	0.0475
					(0.0964)	(0.109)
D2					-0.187**	-0.187*
					(0.0868)	(0.0945)
Constant	-1.306***	-1.306*	-2.834***	-2.834***	-2.177***	-2.177**
	(0.426)	(0.753)	(0.529)	(0.943)	(0.554)	(0.823)
Observations	590	590	483	483	483	484
Number of firms	43	43	42	42	42	42
R-squared	0.0029	0.0029	0.0698	0.0698	0.0851	0.0851

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5.9

Robustness Test

	(1)	(3)	(5)
Heteroskedasticity Test			
Modified Wald (χ2)			
	chi2 (43)= 46295.60	chi2 (42) = 8.1e+29	chi2 (42)=7306.57
	p-value = 0.0000	p-value = 0.000	p-value = 0.0000
Serial Correlation Test			
Wooldridge test			
	F(1, 42) =1.786	F(1,40)=12.070	F(1,40)=12.147
	p-value = 0.1886	p-value = 0.0012	p-value = 0.0012
Cross-sectional Dependence Test			
Pesaran	p-value = 1	p-value = 1	p-value= 1
Model Wald test	Wald chi2(5)= 66.00	Wald chi2(8)=136.20	Wald chi2(12)= 142.87
	p-value = 0.0000	p-value =0.0000	p-value = 0.0000

5.2.3 Two-step System GMM Estimation Results

5.2.3.1 Two-step System GMM Estimation Results for the Return on Average Assets

GMM method provides robust estimates compared to OLS and Random Effects estimates. Since OLS and Random Effects analysis fail to capture endogeneity problems, this thesis proceeds with GMM model. In our model, there are three source of endogeneity : (1) there may be a bidirectional relationship between dependent and independent variable such as support schemes (TGC or FIT), or time varying firm specific factors such as size of the firm and age of the company are likely to be correlated with the manger's ability that is unobserved heterogeneity; (2) including the lag of dependent variable could be correlated with the error term and cause serial correlation problems; (3) the third source of endogeneity is the country specific effect, that reflects the time invariant characteristic of a company that could be correlated with response variables, and they lead to unobserved heterogeneity bias. The problem of unobservable individual heterogeneity arises form differences in unobserved managerial concerns, and attitude toward market opportunities and support schemes, which influence managers 'investment behavior and in turn firm's profitability. Furthermore, the GMM estimator provides valid and efficient estimates of coefficients and the problem of endogeneity is solved. As it is stated by Roodman (2009), Generalized Method of Moments (GMM) estimator is more efficient because this method use internal variables as instrument to overcome the endogeneity problem where the independent variable affects the dependent and when the dependent affects dependent variable. To confirm that estimation results of

OLS and Random Effects are consistent, an endogeneity test is performed. The Durbin-Wu -Hausman test is performed to detect endogeneity bias in the regression results. All regressors are tested in order to classify if they are endogenous or exogenous variables. Each response variable is estimated by using OLS on each other independent variable and after that is predicted the residual. Now this independent variable is included as dependent variable as a function of other independent variables. In addition, the regression equation (1) is estimated by using ROAA as dependent variable and other independent variable in which the variable that we expect to be endogenous, is included as residual. Now, Durbin-Wu-Hausman tests the statistical significance of residual.

Obviously, it is recommended to use a superior estimation technique rather than OLS. This so to provide a consistent estimator, if a variable that is endogenous in the model is identified, meaning that the independent variable is correlated with error term. By using the lag of dependent variable as independent variable, the two-step system dynamic GMM model proposed by Roodman (2009) overcomes endogeneity problems and is more efficient and robust than GMM in difference. Since, in current firm's profitability is influenced by previous profitability the dynamic model is the appropriate to use. Using GMM model as a superior estimation technique, which provides consistent and efficient results rather than OLS method.

Accounting-based measures of financial performance such as ROAA represent the internal firm organization efficiency, which reflects the managerial strategies followed by firm that affects the tangible costs and revenues that in turn influence firm's profitability (Endrikat, Guenther, & Hoppe, 2014). Table 5.7 represent estimation results using dynamic system GMM. In column (1), (3), and (5) are represented results without robust command. In column (2), the estimation results of short-term profitability estimated by ROAA which includes firm-specific factors shows that, the past financial performance affect the current financial performance at 10% level of significance. The model expressed in column (2) that includes 569 firm-year observations shows that the size of the company for renewable energy sector, measured by market capitalization is determinant for renewable energy companies. Consistent with Ruggiero & Lehkonen (2017); Hassan (2019), large firms generate higher profits and their size contribute to increase their profits. There is a positive and statistically significant relationship between size and ROAA at 1% level of significance. Meaning that 1% increase in the size of the company, increase ROAA by 0.009 percentage point.

Consistent with prior studies, this thesis confirms that large firms have greater opportunities to extend their activity and to generate higher profits (Asimakopoulos et al., 2009; Yazdanfar, 2013; Ruggiero & Lehkonen, 2017). Leverage that represents the risk taken by the company has a positive effect on profitability (ROAA). In column (2) the coefficient of risk is 0.096 and statistically significant at 10% level. Nonetheless, in the model we have added industry specific factors in column (4) the effect of risk on profitability is still positive but not statistically significant. Furthermore, in the column (6) that represents the full model the coefficient of risk in relation to profitability is 0.069 and it is statistically significant at 1% level. These findings can be supported by the fact that these companies need higher capital investment and the financial support for those companies is crucial. Companies that invest towards environmental safety can be perceived by investors as lower risk investment and more attractive. In addition, renewable energy companies require investment in new technology equipment that can justify the fact that those equipment's become more quickly obsolete than conventional companies. This is the reason why the increase profitability of companies is caused by the increase of debt to asset ratio. Capital intensity with a negative coefficient indicates that short-term financial performance is decreased by increasing capital intensity. Capital intensity reflects firm's decision to invest, while the results show that 1% increase in capital intensity, decrease the economic strength by 0.0147 percentage points of renewable energy companies at 1% level of significance. The effect of sales growth has a negative effect on ROA, but statistically insignificant. In column (4),variables that represent industry firm characteristic are included, such as TGC that is a dummy variable, market concentration and electricity price and find that the coefficient of this variables is negative, but not statistically significant. In column (6), variables that represent industry characteristic and macroeconomic factors are added. The estimation results show that the lag of ROAA has a positive coefficient (0.304), and it is statistically significant at 10% level of significance. This means that firms with high level of profitability are likely to increase profitability in the following period. The size of the company has a positive coefficient (0.00572), and it is statistically significant at 5% level of significance consistent with prior literature. The risk of the firm has a positive coefficient (0.0694) and it is statistically significant at 1% level of significance. It is significantly negative the relation between capital intensity and profitability (ROAA) at 5% level. The coefficient estimate is -0.0127 which shows that 1% increase in capital intensity will decrease the profitability of RE companies by 0.0127 percentage points. The full model specification in column (6) shows that in regard to industry firm specific the only factors statistically significant is support scheme. The dummy variable related to remuneration shows that the profitability of RE companies that have adopted Feed-in Tariffs (FIT) is greater than those having adopted Tradeable Green Certificate (TGC). The estimated coefficient is -0.0649 with a *p*-value= 0.01. Consistent with the findings of previous studies, the economic strength of a country has a strong positive effect in RE companies. The estimated coefficient is 0.499 and statistically significant at 5% level. The effect of the precrisis is affecting positively RE companies' profitability, while it becomes insignificant after crises. Age, growth sales, electricity price, market concentration and inflation are unrelated to RE companies' profitability in terms of ROAA. Two-step system GMM method that is suitable to address omitted variables bias and reverse causality, requires to satisfy the assumption related to serial correlation and valid instruments to provide consistent results. Related to the data, the dynamic models satisfies the assumption related to GMM method. As it is seen, this thesis fails to reject the Hansen test of over-identifying restriction and the number of instruments is less than the number of firms. In model (1) the *p*-value of Hansen test is 0.202, less than 0.05, therefore, this thesis fails to reject null hypothesis Ho*: "Overidentifying restrictions are jointly valid"*. As a result, this thesis hascorrectly identified the valid instruments. Furthermore, to have consistent results, it is recommended for the number of instruments to be less than the number of cross-sections. Therefore, in model (2) the number of instruments is 36, that is less than number of RE companies (43). The results are consistent, since the hypothesis of the second order autocorrelation could not be rejected, as a consequence, there is no serial correlation in the residuals. Model (2) fails to reject the null hypothesis with regard to serial correlation, especially in relation to second order (AR 2). The *p*-value= 0.884 shows that we have no serial correlation in the second order. Furthermore, our model satisfies the assumption, therefore, the estimated results are consistent and unbiased. In the next subchapter, we will represent the stability of the results by using dynamic SYS-GMM method to identify the factors that affect Tobin's *q* is presented.

Table 5.10

Two-step System GMM ROAA as a Dependent Variable

	(1)	(2)	(3)	(4)	(5)	(6)
	SYS-GMM	SYS-GMM Robust	SYS-GMM	SYS-GMM Robust	SYS-GMM	SYS-GMM Robust
Explanatory variables	Depended Variable ROAA					
l.ROAA	0.402***	0.402***	0.361***	0.361***	0.304***	0.304***
	(0.00870)	(0.0736)	(0.00936)	(0.0641)	(0.00772)	(0.0558)
lmkt	0.00907***	0.00907***	0.00520***	0.00520*	0.00572***	0.00572**
	(0.000672)	(0.00300)	(0.00130)	(0.00305)	(0.00112)	(0.00248)
Leveragetotaldebttotalassets	0.0960***	0.0960***	0.0530***	0.0530	0.0694***	0.0694*
	(0.00508)	(0.0345)	(0.00878)	(0.0338)	(0.00833)	(0.0356)
age	-6.09e-05	-6.09e-05	-0.000194	-0.000194	1.49e-05	1.49e-05
	(0.000176)	(0.000485)	(0.000226)	(0.000368)	(0.000225)	(0.000376)
lcapitalintensity	-0.0147***	-0.0147***	-0.0109***	-0.0109*	-0.0127***	-0.0127**
	(0.000644)	(0.00529)	(0.00126)	(0.00566)	(0.00118)	(0.00613)
Growthsaleschanges	-0.00130***	-0.00130	-0.000874**	-0.000874	-0.000749	-0.000749
	(0.000391)	(0.00272)	(0.000425)	(0.00236)	(0.000461)	(0.00202)
TGC			-0.0571***	-0.0571	-0.0649***	-0.0649*
			(0.0129)	(0.0440)	(0.0113)	(0.0367)
lelectricity			-0.0212***	-0.0212	-0.0163**	-0.0163
			(0.00690)	(0.0197)	(0.00706)	(0.0237)
mk			-0.0112	-0.0112	-0.0127	-0.0127
			(0.0105)	(0.0253)	(0.0109)	(0.0268)
GDPgrowthdec					0.499***	0.499**
					(0.0686)	(0.226)
inflation1					0.0262	0.0262
					(0.105)	(0.415)
D1					0.0342***	0.0342*
					(0.00557)	(0.0171)
D2					-0.00404	-0.00404
					(0.00424)	(0.0136)
Constant	-0.184***	-0.184***	-0.140***	-0.140**	-0.159***	-0.159**
	(0.00961)	(0.0548)	(0.0247)	(0.0617)	(0.0249)	(0.0631)
Observations	569	569	464	464	464	464
Number of firms	43	43	42	42	42	42
AR(1)	0.005	0.007	0.017	0.02	0.021	0.023
AR(2)	0.884	0.888	0.816	0.817	0.752	0.755
Hansen	0.202	0.202	0.263	0.263	0.242	0.242
Number of Instruments	36	36	36	36	41	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.2.3.2 Two-step System GMM Estimation Results for the Tobin's *q*

The estimation results of dynamic panel model are shown in table 5.11, where profitability is measured by Tobin's *q*. In column (2), the direct impacts of firm-specific factors on long-term profitability are provided, whereas in column (4) are examined these effects together with industry specific factors. In the last column (6) are reported the estimation results by adding the macroeconomic factors. The coefficient of lagged Tobin's *q* is positive and statistically significant at 10% level of significance (0.567) in model (2). This indicates the future expectations about the company's market value are related to the previous market values. In addition, the coefficient of l.Tobin's *q* in model (4) and model (6) are positive and statistically significant at 10% and 1% level respectively. These findings show that RE companies' performance is heavily influenced by its own prior realization confirming the findings of Cavaco & Crifo (2014) on persistence effect. These companies can create resources due to higher profits that can utilize for Research and Development (R&D), allowing them to provide new investment in technology that will in return, help to produce low-cost energy , as preferred by customers, so improving sales and ultimately companies' profitability.

The link between market capitalization and profitability in the long-term is statistically positive and significant at 10% level for model (1), where the coefficient is 0.247. While in model (2) and model (3) it is statistically significant at 5% level.

Leverage and Tobin's *q* link shows that in RE companies the effect of itis positive on profitability. In model (2) the estimated coefficient associated with leverage is (0.170) but not significant. In model (4) the coefficient of leverage is (0.381) and the link with profitability is significant at 5% level. In addition, the positive link between leverage and Tobin's *q* is reported in model (6), in which the estimated coefficient is (0.252) and statistically significant at 1% level. This finding can be explained by the fact that some stakeholders evaluate companies based on the level of leverage that they are implicated in. Higher leverage in turn is associated with large investments in new technologies, R&D activities, which enhance the reputation of the company in the market and in overall increase long-run profitability in terms of (Tobin's *q*).

The regression results do not support Hypothesis H3 that older firms perform better than younger ones. In all models, the coefficient linked with the variable age has a negative coefficient and it is not statistically significant.

In model (2) the coefficient of capital intensity is 0.0339, while in model (4) -0.0039 and in model (6) 0.0261, but obviously the link between capital intensity and Tobin's *q* is not significant, rejecting hypothesis H4 that companies having a higher capital expenditure, surpass those companies that depend on low capital-investment. The findings suggest that companies with high-capital-intensive like RE companies choose to invest in new technologies, rather than in R&D, so that may create competitive advantage in their process of production. As a result, renewable energy companies may spend in R&D, but they do no support inventing novel technologies.

Table 5.11

Two-step System GMM, Tobin's q as a Dependent Variable

	(1) SYS-GMM	(2) SYS-GMM Robust	(3) SYS-GMM	(4) SYS-GMM Robust	(5) SYS-GMM	(6) SYS-GMM Robust
	Dependent Variable Tobin's *q*					
l. Tobin's *q*	0.567***	0.567***	0.527***	0.527***	0.390***	0.390*
	(0.0105)	(0.156)	(0.0177)	(0.165)	(0.0455)	(0.206)
lmkt	0.247***	0.247***	0.381***	0.381**	0.252***	0.252**
	(0.0148)	(0.0785)	(0.0254)	(0.151)	(0.0227)	(0.109)
Leveragetotaldebttotalassets	0.170**	0.170	1.503***	1.503**	0.820***	0.820*
	(0.0832)	(0.556)	(0.204)	(0.632)	(0.187)	(0.485)
age	-0.00279*	-0.00279	-0.00784*	-0.00784	-0.0127**	-0.0127
	(0.00165)	(0.00981)	(0.00422)	(0.0190)	(0.00494)	(0.0137)
lcapitalintensity	0.0339***	0.0339	-0.00397	-0.00397	0.0261**	0.0261
	(0.0106)	(0.0532)	(0.0117)	(0.0576)	(0.0126)	(0.0445)
Growthsaleschanges	0.0344***	0.0344	0.0315***	0.0315	0.0323***	0.0323
	(0.00601)	(0.0235)	(0.00480)	(0.0322)	(0.00615)	(0.0267)
TGC			1.558***	1.558**	1.113***	1.113**
			(0.149)	(0.695)	(0.117)	(0.486)
lelectricity			-0.122**	-0.122	-0.140	-0.140
			(0.0549)	(0.207)	(0.0966)	(0.204)
mk			0.732**	0.732	0.150	0.150
			(0.302)	(1.051)	(0.306)	(0.608)
GDPgrowthdec					-1.673**	-1.673
					(0.785)	(2.582)
inflation1					2.618*	2.618
					(1.333)	(3.983)
D1					-0.286***	-0.286*
					(0.0409)	(0.170)
D2					-0.172***	-0.172*
					(0.0273)	(0.0882)
Constant	-2.675***	-2.675**	-5.627***	-5.627**	-3.303***	-3.303**
	(0.175)	(1.079)	(0.414)	(2.236)	(0.304)	(1.572)
Observations	556	556	451	451	451	451
Number of companies	43	43	42	42	42	42
AR(1)	0.101	0.101	0.022	0.022	0.03	0.03
AR(2)	0.256	0.256	0.126	0.126	0.198	0.198
Hansen	0.129	0.129	0.353	0.353	0.352	0.352
Number of Instruments	35	35	38	38	40	40

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To confirm that results of the two-step system GMM are consistent, the assumption related to second order serial correlation and in accordance with Hansen test for overidentification of instruments are validated. In all models, this thesis fails to reject the null hypothesis of no serial correlation to the second order, that shows that we have satisfied this criterion in all models. Related to the number of instruments this thesis kept track in line with the number of the companies.

CHAPTER 6

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

In this chapter are presented the results of the dissertation that are related to each research question. A substantial dilemma for policy makers is discussing the problem of fossil fuels for their negative outcomes such as high emission in the environment and on the other hand the lack of fossil fuels that influence the price of the electricity. Since the level of pollution is becoming a concern for all countries and the lack of fossil fuels has increased the interest towards renewable energy sources. This thesis analyzed the real problem of energy security that European countries are facing to provide energy with alternative sources since they are highly dependent by import energy from other countries. This is a concerning problem that in the near future will be a serious issue without a solution. Thus, these countries need to take quick actions in order to enhance the development of renewable energy companies and to give some practical policy solutions.

Although everyone knows the benefits of clean energy and the development that renewable energy will contribute to the society to provide energy for future generation, there are still countries that have decided targets related to renewable energy production from renewable energy sources and at the end the targets are not met. In addition, these results are discussed by the decision-makers of the renewable energy companies and the real impact in practice. Findings will help the decision-making of renewable energy firms related to firm-specific factors and their effect in practice. Recommendations for decision makers of the company and for the policymakers in the energy sector are given based on the results and their real impact in the improvement and sustainable development of renewable energy companies.

Also, a summary of the key findings of the thesis to highlight how these countries can create energy policies that will be beneficial for all countries and to have the opportunity to trade the energy between countries of Energy Union.
Firstly, the chapter discuss the most important findings of the thesis. The chapter continues with implication of the study, by outlining the implication for decision making, policymaker and practical implication. It concludes by discussing the limitation of the study, and what further research in the field is instigated.

6.2 Findings of the Study

To the best of my knowledge this is the first comprehensive theoretical and practical study that considers renewable energy companies that operate in European countries. The novelty of this research is to shed light on factors that cause profitability of renewable energy companies, by including firm-specific factors, industry specific factors and macroeconomic factors, and support schemes. The findings are supported by using advance techniques that controls for potential bias that can be caused by endogeneity issues, heterogeneity, or omitted variable. Using two step dynamic system GMM (SYS-GMM) by Arellano and Bover (1995) and Blundell and Bond (1998), overcomes the problem of serial correlation and heterogeneity, which still remain a weakness in panel data techniques. As it is suggested by Favara (2007), the system GMM technique is the best estimation method if it satisfies the condition related to valid instruments and the absence of serial correlation of the residuals. In addition, this estimation technique is relevant for panel data in which the number of firms in sample is larger than the time periods. Empirical results provide more insight into factors that shape the financial efficiency in the short and long-run, and provide a detailed explanation of the research questions.

RQ 1: Does the profit persist on Renewable Energy companies?

Profitability of RE companies

In this study, the factors that influence on RE companies' profitability are examined, but it is important to investigate whether these companies are performing well during the period of the study. Using descriptive statistics related to RE companies' profitability shows that average ROAA takes negative values. This information confirms the fact that in the short-term the financial performance of firms is worst. Therefore, this type of information is very helpful for the decision-making process conducted by people involved in the corporate governance of RE companies. It is suggested that corporate governance of RE companies formulate objectives and ways to increase financial performance in terms of ROAA. Market-based measure (Tobin's *q*) appears to be a better performance that the mean value is greater than 1, this is a sign that RE firms are overvalued in the market. This is a good sign for investors interested in future trends, rather than historical performance.

Profit persistence

Regression results using two step system GMM show that there is a dynamic relationship between response variables and profitability, meaning that past realization of performance may affect the current year performance. The lagged depended variable has a positive effect on profitability in the short-term. Meaning that accounting-based profitability measured by ROAA is affected by past realization. These results imply that for renewable energy industry the profit persist over years. The results are in line with previous studies, which show that increasing market capitalization implies an increase in profitability. Conversely, the Tobin's *q* of the firm depends on various corporate governance issues. Tobin's *q* represents a long-term companies' financial performance and is an important indicator for investors. Compared to accounting measurement that is based on historical financial performance, Tobin's *q* has a forward-looking element. The information for the future is what investors care about. As such, a positive influence of current profitability to the profitability of the next year is expected, as a result the hypothesis *H1* that profit persists over years is sustained.

RQ2: What is the effect of firm's characteristics on RE companies' profitability?
Related to research question 2, the effect of firm specific factors that influence the profitability of RE companies is investigated. Factors that are identified by literature are size of the firm, risk of the firms, age, capital intensity and growth.

Market capitalization

To give an answer to the second research question the effect of each firm-specific factors has been investigated. *Is the profitability of renewable energy companies affected by the size of the company*? Two-step system GMM shows that the size of the company measured as market capitalization has a positive influence on profitability in all models. The regression analysis that measures the size of the company by market capitalization shows a positive, and a statistically significant relationship between profitability (ROAA) and size. Although, the significance level in the model that includes firm-specific factors, industry specific factors, and macroeconomic factors becomes 5%. This implies that short-term profitability is affected by the size of the companies, meaning that large companies can generate higher profits compared to small companies. Since all companies are listed in stock exchange, this implies that market capitalization is determinant in their profitability. The findings support the hypothesis *H2.*a that there is a positive relationship between size and firm's profitability. There is clear evidence that support the Hypothesis *H2.a* in the 'three model' which is measured using OLS, RE, or two-step system GMM. In the same line, findings show that the effect of market capitalization is positive on Tobin's *q*. Findings reveal that RE companies that increase in size see considerable revenue growth. The findings indicate that RE companies can increase their profitability in the short run by increasing firm size. In addition, the market value of renewable energy companies can be increased through the increased size of the company, that is consistent with previous studies.

Risk

Company risk is another factor that influence profitability. This thesis intends to give an answer to the following question: *Does firm risk influence RE companies' profitability?* Leverage that represents the risk of the companies has a positive effect on short-run profitability (ROAA) in all models. In the short-term, taking on more debt increases the financial performance of electric utilities that use renewable energy sources. In addition, ROAA increases as risk increases in this case, debt- to-assets ratio, due to the fact that renewable energy companies require investment in new technology equipment, due to becoming obsolete quicklier than conventional energy companies. Thus, again there is clear evidence that supports Hypothesis *H2.b* that debt-to equity ratio matters for profitability. In addition, the effect of leverage is statistically significant in case of long-term profitability. This means that leverage enhances market value of companies in case of renewable energy. This can be explained by the fact that some stakeholders evaluate a firm in terms of leverage that they are engaged in, since higher leverage is associated with investment in R&D and new technologies that in turn will improve a company's reputation in the long-run and in turn enhance financial performance.

Age

Age is another firm-specific factor that influences profitability. Thus, answered the following question: *Does the age of the company influence RE companies' profitability?* Age of the firms has a negative effect on profitability as it is shown by the results of two step system GMM, but the effect is not statistically significant. On the other hand, the effect of age is negative and statistically significant to market value (Tobin's *q*) under Random Effects estimation, while in other models the effect is still negative but not statistically significant. Therefore, *H2.c* that age of the firm boost profitability is rejected.

Capital intensity

The effect of capital intensity on profitability is examined. The following question is addressed: *Does capital intensity influence RE companies' profitability?* Two-step-system GMM results indicate that capital intensity measures, as a ratio of capital expenditure to total sales, have a significant negative effect on profitability in short-term. The effect is negative in all models, where the profitability is measured as ROAA. This thesis fails to support of *H2.d* in RE companies and it concludes that capital intensity has a significant negative effect on ROA, ceteris paribus. In contrast the effect of capital intensity on the long-term profitability is not statistically significant.

Growth sales

Sales growth was not consistently across model estimated. Under the OLS and Random Effects estimation, growth sales have a positive effect on profitability (ROAA) but it is not statistically significant. Two-step system GMM estimation method shows that in model (2) growth sales have a negative effect on profitability (ROAA). While in model (4) and (6) it becomes insignificant. The findings fail to support the Hypothesis *H2.e "There is a positive relation between growth sales and profitability in short-term"*.

RQ3: Which is the effect of industry-specific factors on RE companies' profitability?

Electricity price

To respond to the question: What *is the impact of industry-specific factors on RE companies' profitability?,* electricity price impact on profitability by using two-step system GMM is analyzed. The results show that electricity price has a negative effect on RE profitability, but it is not significant. Therefore, *H3.a* that electricity price has positive effect on profitability is rejected. The effect of electricity price is insignificant in the short-term and long-term profitability.

Market concentration

Market concentration is an industry-specific factor that is part of analysis. To respond to the question: *Does market concentration influence RE companies' profitability?* two-step system GMM shows that in the case of RE companies, the effect of market concentration is not significant. Therefore, *H3b* that market concentration has a positive effect on profitability is rejected.

RQ4: What determines the RE companies' profitability in considering the different support schemes and types of renewable energy utilization?

Support Schemes

When investigated, the influence of specific incentive policies to the RE companies' profitability appears to be key predictor for those companies in the short-term profitability and the long term. To respond to the question: *Do RE companies that have adopted Tradeable Green Certificates (TGC) support schemes perform better than RE companies that have adopted Feed-in Tariff (FIT)?*, the results of twostep system GMM have been investigated. The regression results in the full model show that in the case of profitability that is measured in terms of ROAA, the coefficient is statistically negative. Therefore, Tradeable Green Certificate (TGC) has a negative impact on financial performance, meaning that firms using Feed-in Tariff (FIT) support mechanism perform better. In turn, *H4* that shows that firms that have adopted FIT support schemes perform better compared to companies that operate under TGC is rejected. While contrastive results are obtained in the case of RE companies' profitability in the long run in terms of Tobin's *q*. The estimated coefficient is positive and statistically significant. In turn, *H4 is sustained*, since the results show that the long-term profitability (Tobin's *q*) of firms that operate under TGC is higher compared to companies that have adopted FIT scheme. This is argued considering that establishing renewable energy companies under TGC, require higher capital investment that in turn is related to higher returns from the investment.

RQ5: Do macroeconomic factors determine RE companies' profitability?

GDP growth

Among macroeconomic factors that this thesis gives an answer to is, *Does the GDP growth influence profitability?* Two-step system GMM results show that short-term profitability (ROAA) is influenced by GDP growth, meaning that the level of nation income has an influence on profitability of RE companies. On that account, those countries follow policies toward green investment that in turn enhance energy consumption form RE sources. Therefore, the findings support the *H5.a* that economic development of a country enhances investment in green investment and in turn increase profitability of RE companies. Findings related to long-term profitability do not support *H5.a.* Thus, the effect of GDP growth seems to be insignificant in the long-term profitability.

Inflation

Inflation is a macroeconomic factor that is considered in the analysis. In order to give an answer to the question: *Does inflation influence RE companies' profitability?*, by using two-step system GMM, estimation results show that there is no statistically significant correlation between inflation and profitability in both, the short-term and long-term. Therefore, this thesis fails to support *H5b* that inflation has a negative effect on profitability.

Financial crises

An added value in this study is related to the effect of the great recession on RE companies' profitability. In order to give an answer to the question: Did the financial crises influence RE companies' profitability?, the results from two-step system GMM were collected. The estimation results of the short-term profitability in terms of ROAA show that the relationship

between pre-crises and ROAA is positive, but not statistically significant. The effect of post-crises period on the short-term profitability is negative, but again not statistically significant. Therefore, this thesis fails to support the *H5.c* that great recession has a negative influence on profitability.
In cases where the long-term profitability is measured by using Tobin's *q*, the estimated results show that the great recession in both periods of pre-crises and post-crises is statistically decreasing the long term profitability of RE companies. Therefore, profitability in terms of Tobin's *q* support the *H5.c* that financial crises have a negative effect on profitability.

RQ6*:* Which is the optimal strategy that RE companies' owners should adopt to generate profits and to be sustainable in the market?

A clear picture is given related to factors that shape RE companies' profitability. Having this information, it is beneficial for managers and policymakers to take the appropriate decision-making incentives and actions. In overall, the findings suggest that there are different factors affecting profitability variation. Based on how profitability is measured, the factors are identified. Short-term profitability is measured based on accounting measures that is represent by ROAA, while the long-term profitability is measured based on market value that is represented by Tobin's *q*. The estimation results show that for renewable energy companies, firm-specific factors are the most important ones that shape the short-term and long-term profitability. In reference to firm-specific factors two can be mentioned, the size of the firm, the debt of it, that indicate the risk that the firm is implicated and capital intensity. These factors can be seen as "standard" in case that the interest is related to the profitability of sustainable energy companies. In addition, an important factor is the remuneration from the government that is fundamental for RE companies. The findings show that companies established in countries that government incentives towards green investment is based on Feed-in Tariff tend to generate higher profits compared to other countries based on Tradeable Green Certificate. This can be further annotated by how efficient these support schemes are, from the government' side. Since the support from the government related to this sector is in a long-term, the question raised is: What will happen with these policies? Will the support from the government continue, and if yes for how many years? Thus, it is noted that for newly renewable energy companies the government support is crucial since they are implicated in higher initial capital investment and the payback will come after some years.

In addition, the effect of macroeconomic factors is significant for RE companies' profitability. The effect of financial crises has impaired profitability of renewable energy sectors in the long-term. The profitability of renewable energy companies during the period between 2004-2020 indicates a negative value on average related to profitability. However, the trend is that renewable energy companies firstly were considered as a niche market, but due to the interest toward clean and sustainable energy the market share of renewable energy has an upward trend. Therefore, they are getting market share from conventional producers. Hence, RE companies are suggested to improve their business strategies to deal with uncertain environment. Building new strategies to become an international firm that provides energy not only for domestic market, but extending their activity toward international markets. This strategy will be very helpful for mature markets in which enhancing profitability of energy firms is the only way to operate in international market. Therefore, renewable energy companies can operate offshore, since there is no restriction to operate in international markets.

Table 6.1

Summary of Reserch Questions, Hypothesis and Findings

Nr.	Research Questions	Hypothesis	Short-term profitability		Long-term profitability	
			ROAA		Tobin's q	
			Findings	Decision	Findings	Decision
1	Does the profit persist on Renewable Energy companies?	***H1.*** There is a persistence of profit for RE companies	L.ROAA has a positive and statistically significant effect on ROAA	Support *H1.*	L.Tobin's q has a positive and statistically significant effect on Tobin's q	Support *H1.*
2	What is the effect of firm's characteristics on RE companies' profitability?	***H2.a*** There is a positive relationship between firm size (market capitalization) and firm profitability of renewable energy companies	Firm size has a positive and statistically significant effect on ROAA	Support *H2.a*	Firm size has a positive and statistically significant effect on Tobin's q	Support *H2.a*
		H2.b There is a positive relationship between risk and firm profitability of renewable energy companies	Risk has a positive and statistically significant effect on ROAA	Support *H2.b*	Risk has a positive and statistically significant effect on Tobin's q	Support *H2.b*
		H2.c There is a positive relationship between age and firm profitability of renewable energy companies	Age has a negative and non-statistically significant effect on ROAA	Do not Support *H2.c*	Age has a negative and non-statistically significant effect on Tobin's q	Do not Support *H2.c*
		H2.d There is a positive relationship between capital intensity and firm profitability of renewable energy companies	Capital Intensity has a negative and statistically significant effect on ROAA	Do not Support *H2.d*	Capital Intensity has a positive and non-statistically significant effect on Tobin's q	Do not Support *H2.e*
		H2.e There is a positive relationship between growth and firm profitability of renewable energy companies	Growth has a negative and non-statistically significant effect on ROAA	Do not Support *H2.d*	Growth has a positive and non-statistically significant effect on Tobin's q	Do not Support *H2.d*
3	What is the effect of industry-specific factors on RE companies' profitability?	***H3.a*** There is a positive relationship between electricity price and firm profitability of renewable energy companies	Electricity price has negative and non-statistically significant effect on ROAA	Do not Support *H3.a*	Electricity price has negative and non-statistically significant effect on ROA	Do not Support *H3.a*
		H3.b There is a positive relationship between market concentration and firm profitability of renewable energy companies	Electricity price has negative and non-statistically significant effect on ROAA	Do not Support *H3.a*	Market concentration has positive and non-statistically significant effect on Tobin's q	Do not Support *H3.a*

4	What determine the RE companies' profitability in considering the different support schemes and types of renewable energy utilization?	***H4.*** RE companies that have adopted Tradeable Green Certificates (TGC) support schemes perform better than RE companies that have adopted Feed-in Tariff (FIT)	FIT has a positive and statistically significant effect on ROAA	Do not Support *H4.*	TGC has positive and statistically significant effect on Tobin's *q*	Support *H4.*
5	Do macroeconomic factors determine RE companies' profitability?	***H5.a*** There is a positive relation between GDP growth and RE companies' profitability	GDP growth has a positive and statistically significant effect on ROAA	Support *H5.a*	GDP growth has a negative and statistically non-significant effect on Tobin's *q*	Do not Support *H5.a*
		H5.b There is a negative relation between inflation and RE companies' profitability	Inflation has a positive and non-statistically significant effect on ROAA	Do not Support *H5.b*	Inflation has a positive and non-statistically significant effect on Tobin's *q*	Do not Support *H5.b*
		H5.c There is a negative relation between financial crises and RE companies' profitability	Post crisis has a negative and non-statistically significant effect on ROAA	Do not Support *H5.c*	Pre-crisis and Post crisis has a negative and statistically significant effect on Tobin's *q*	Support *H5.c*
6	What is the optimal strategy that RE companies' owners should adopt to generate profits and to be sustainable in the market?	Building new strategies to offer clean energy not only for the domestic market but also to provide clean energy in international markets.				

6.3 Theoretical Contribution

Nations and the global community are fighting against climate crises, to reduce the level of pollution and to overcome the problem of energy security. Furthermore, nations have decided ambitious environmental goals to mitigate environmental degradation, that in turn has increased the importance of renewable energy industry. The emission targets for energy industry have grown attention towards the RE companies since they produce energy with low level of emission in environment. Thus, financial performance of the RE companies is crucial to achieve this target and to provide sustainable development of renewable energy industry that ensures energy for future generation.

Therefore, there is a lack of studies in literature related to renewable energy companies. Since most of the studies are based on the level of green investment in each country, or the nexus between corporate environmental performance and corporate financial performance, neglecting the fact that there are other factors that influence renewable energy companies. Therefore, this research contributes to the existing literature to fill the gap in this field in three ways. Firstly, based on the literature review a gap in renewable energy companies was identified, since researcher's have not included relevant variables that are significant for this study such as the effect of support schemes, or the effect of macroeconomic factors. Furthermore, this study is the first comprehensive one that has included a range of factors that shape RE companies' profitability by divided as firm-specific factors, industry specific factors, support schemes, and macroeconomic factors. Secondly, the study includes a long period from 2004-2020, to investigate the factors that influence profitability, and it has used OLS and RE method for static model. In addition to providing robust results, two-step dynamic GMM estimation is used to overcome the problem of endogeneity that OLS, and Random effects model do not overcome. Thirdly, this study contributes to the natural resource-based view (NRBV) that investigate the relation between being sustainable and profitable.

6.4 Practical and Policy Implication

The general policy implication of the findings of this study is that several economic and energy policies can be recommended.

Identifying factors that affect the profitability of renewable energy companies such as size, risk of the company, growth, capital intensity, the support schemes that are adopted in the country, the economic growth of the country, will facilitate the comparison between renewable energy companies. Thus, a RE company can be profitable in cases when a company has sufficient cash flow to meet their liabilities and they face an increase in economic growth. Furthermore, the internal characteristics seems to be determinant in renewable energy companies, but also as it is expected the support schemes and macroeconomic factors have influenced profitability.

Renewable energy companies depend more on external financial sources that influence profitability. Thus, it is suggested for policymakers to offer financial support towards renewable energy investment through loans, financial schemes, or grants that will be offered to investors with low interest rates.

In addition, the results shows that we have a difference in profitability between companies that operate in countries that have adopted TGC, or FIT. That in turn, is very helpful for investors, as before taking a decision to check the support policy that will enhance their profitability. Also, findings provide enough insight towards the advantages and disadvantages to operate in countries that they have implemented different support schemes, and the way that the support from the government is provided.

To achieve long-term development of renewable energy sector these findings will help practitioners, including regulators, to build strategies to boost their competitiveness in the market. Also, this study provides information to managers related to factors determinant for renewable energy profitability. They could take these results into consideration while building strategic policy decisions, as will be beneficial. Furthermore, corporate governance issues are determinants for profitability in terms of ROAA and Tobin's *q*, which require to put a balance of power between managers of the company, in order to avoid agency problem between managers and shareholders of the company. Being under pressure to generate profits for the company and to protect society at the same time will affect manager's decision related to environment that may result in different investment. Furthermore, the renewable energy companies to be sustainable, they need to operate offshore in order to extend their activities and to increase the revenues. Also, the decision related to strategies to extend their activity in developing countries, in which the geographical condition offers opportunities for installing new plants is a solution that contributes to increased profitability. The findings of the study are relevant for investors in renewable energy companies.

Therefore, since the results of the thesis related to renewable energy polices, highlight the importance of profitability in the short-term and long term, it is recommended that the support mechanisms implemented by the government and energy policymakers need a transformation in order to enhance global demand for renewable energy and also the interaction with other sectors of the economy that in turn enhance firms' profitability. Before assessing the efficiency of RE support schemes at national level, policymakers should evaluate their efficacy in enhancing the economic performance of RE companies in micro level. Therefore, they should also be prudent in case that they implement polices in order to decide whether policymakers want to boost financial performance of firms. Energy companies in the European Union operate under the Energy Union, but also depend on local regulation. This complicates the energy market that can create different condition for some companies apart from others. The free market principle in the energy sector, sometimes is neglected by showing that companies do not have the same opportunity in the market.

Improving financial performance of renewable energy companies through different programs that gave financial support, and through subsidies programs will reduce the dependency on energy imports. Furthermore, it reduces the risk implicated in foreign activities and in turn increases the profit for clean energy companies. It is recommended to implement policies that promote technological development in renewable energy industry in order to create a sustainable market for those technologies offering support for renewable energy companies that produce energy from different sources. Thus, this research will help policymakers take actions that by setting environmental incentives, to foster the profitability of firm in micro level.

Financial crisis is another factor that has influenced renewable energy industry. The negative effects are associated with subsidies cut by the government of each country that has impaired the financial performance of those companies during this period. Global financial crisis, and the cut of subsidies from countries has forced some large companies to have a look to new markets, especially towards developing countries with high potential for renewable energy sources. Thus, these findings are important for companies in order to build new strategies to be well prepared for uncertain events. On the other hand, policymakers on energy sector in

European Union should pay attention so that to create comfortable business conditions towards renewable energy investment in order to be the most attractive markets from investors.

To sum up, this research provides insights to policymakers, investors, practitioners, energy firms related to the appropriate model for profitable renewable energy companies that in turn contribute to sustainability of renewable industry sector. Thus, enhancing the profitability of renewable energy companies it is not only an important factor for RE companies ‘owners, but also for the society, local government, and national economy. Since this sector contributes to emission reduction, job opportunities, and sustainability. Acquiring information related to this sector will be very helpful for other investor deciding to establish new plants. For policymakers and managers of renewable energy companies that are in front of strategic decision, of how to design a company to use renewable energy sources, it is recommended having large assets, to access finance, and to have remuneration from the government for a specific time period.

6.5 Scope and Limitation of the Study

The limitation of this study is related to the lack of complete data related to companies that operate in renewable energy industry. Therefore, after the investigation of each companies form the established date to the last available data in their financial statement, it was revelated that some companies have data only for an approximate number of years. After excluding the companies established from 2017, and those that have lack of information, the final sample consist of 43 companies. In the hence, from the list of companies that operate in this sector, due to lack of data or due to the fact that some companies are delisted, the study takes into account a fraction of companies to examine the factors that affect profitability.

6.6 Suggested Areas for Future Research

This study contributes to the literature since it provides comprehensive results that differ from previous studies by investigating not only the effect of internal factors on profitability of renewable energy companies but also the effect of external factors. In addition, it provides evidence related to the effect of support schemes. Since the attention in renewable energy has increased during the last decade, further studies can be developed in this topic. These results could encourage researchers to find the determinants of profitability of renewable energy companies by including private companies in the sample. In addition, to analyze the financial performance of renewable energy companies by classifying related to the source that use in order to produce clean energy. As well as, to find if is any difference in profitability between companies that produce energy from wind, solar, biomass, or geothermal.

In the European Union policies related to share that conventional companies are obliged to produce a share of energy by using renewable energy sources are decided . Thus, shading light on the factors that shape financial performance of companies in which the production of energy is characterized by a proportion of 80% (renewable), and 20% (fossil fuels) could be different to those companies engaged totally in the production of clean energy.

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APPENDICES

Appendix A: List of Variables, Description and Expected Sign

		Expected Effect
Profitability		
ROA	Net income divided by total assets	
ROE	Net income divided by shareholder's equity	
Tobin's *q*	Market value of a firm as expressed by enterprise value divided by book value of total assets	
Firm-Specific Variable		
Firm size	Size of the firm in terms of market capitalization	+
Leverage (Firm risk)	Ratio of total debt to total assets	+/-
Capital intensity	Ratio of capital expenditure to sales	+
Age	Number of years from establishment	+
Growth	Increase in % in sales on a yearly basis	+
Industry-Specific Variable		
Concentration ratio	Total assets of firm *i* divided by total assets of the sector	+
Macroeconomic factors		
Economic growth	Real GDP growth	+
Inflation	Current period inflation rate	+/-
Financial crisis	Dummy=1 if year=2007,2008,2009 Dummy=1 if year=2010,2011,2012	-
Support Schemes		
TGC	Policy dummy variable (one is assigned for firms operating in countries that adapted the TGC support mechanism and zero is assigned for all other firms operating in FIT countries)	+

Appendix B: List of Renewable Energy Companies

Identifier (RIC)	Company Name	Country of Headquarters
HRPKk.DE	7C SOLARPARKEN AG	Germany
AB9.H	ABO Wind AG	Germany
ABO.BR	ABO-Group Environment NV	Belgium
ANA.MC	Acciona SA	Spain
AFEN.L	AFC ENERGY PLC	United Kingdom
ABIO.PA	Albioma SA	France
ARN.MI	Alerion Clean Power SpA	Italy
ALW.MI	algoWatt SpA	Italy
ALTS.BU	Alteo Energiaszolgaltato Nyrt	Hungary
ADXR.MC	Audax Renovables SA	Spain
CTNGk.F	Centrotherm International AG	Germany
COEN.ST	Cortus Energy AB	Sweden
CE2G.DE	CropEnergies AG	Germany
DGB.AS	DGB Group NV	Netherlands
EDPR.LS	EDP Renovaveis SA	Spain
ECVG.DE	Encavis AG	Germany
ENEI.MI	Enel SpA	Italy
EKTG.DE	Energiekontor AG	Germany
ENGIE.PA	Engie SA	France
ETGG.DE	EnviTec Biogas AG	Germany
EOLUb.ST	Eolus Vind publ AB (Eolus)	Sweden
ERG.MI	ERG SpA	Italy
FKR.MI	Falck Renewables SpA	Italy
GOODG.L	Good Energy Group PLC	United Kingdom
IBE.MC	IBERDROLA, S.A.	Spain
ITM.L	ITM Power PLC	United Kingdom
MARTI.LS	Martifer SGPS SA	Portugal
MDIP.WA	MDI Energia SA	Poland
NDXG.DE	Nordex SE	Germany
ORSTED.CO	Orsted A/S	Denmark
PANP.BU	PannErgy Nyrt	Hungary
PNEGn.DE	PNE AG	Germany
PEPP.WA	POLENERGIA SA	Poland
RWEG.DE	RWE AG	Germany
SGREN.MC	Siemens Gamesa Renewable Energy SA	Spain
S92G.DE	SMA Solar Technology AG	Germany
SELU_p.LU	SOCIETE ELECTRIQUE DE L'OUR SA	Luxembourg
SLRS.MC	Solaria Energia y Medio Ambiente SA	Spain
TENr.AT	Terna Energy SA	Greece
VBKG.DE	Verbio Vereinigte Bioenergie AG (VERBIO AG)	Germany
ALVER.PA	Vergnet SA	France
VWS.CO	Vestas Wind Systems A/S	Denmark
VLTSA.PA	Voltalia SA	France

Appendix C: Unit Root Test

	Levin, Lin & Chu t*	p-value	Im, Pesaran and Shin W-stat	p-value	ADF - Fisher Chi-square	p-value	PP - Fisher Chi-square	p-value
ROAA	-2.94535	0.0016	-3.21926	0.0006	127.277	0.0026	475.732	0.0000
Tobins'q	-4.24228	0.0000	-2.44924	0.0072	158.343	0.0000	190.425	0.0000
lmkt	-1.73766	0.0411	-4.6589	0.0000	111.206	0.0351	202.3493	0.0000
Leveragetotaldebttotalassets	-5.0241	0.0000	-3.31902	0.0005	137.351	0.0004	185.84	0.0000
age	-1.28819	0.0988	-1.500	0.0000	150.016	0.0000	9.608	0.0000
lcapitalintensity	-2.13488	0.0164	-1.84802	0.0323	101.958	0.0888	214.12	0.0000
Growthsaleschanges	-40.4377	0.0000	-16.1	0.0000	318.512	0.0000	518.245	0.0000
lelectricity	-3.59517	0.0002	-1.77332	0.0381	93.1531	0.2804	118.664	0.0113
mk	-9.57439	0.0000	-2.33655	0.0097	196.526	0.0000	256.685	0.0000
GDPgrowthdec	-12.7018	0.0000	-5.81723	0.0000	169.513	0.0000	127.585	0.0024
inflation1	-9.69351	0.0000	-5.65739	0.0000	165.388	0.0000	157.069	0.0000

Before running the regression all the variables are tested for stationarity. Using Levin-Lin Chu test and it is founded that all the variables are stationary in level.

Appendix D : Breusch and Pagan Lagrangian test

Breusch and Pagan Lagrangian multiplier test for random effects

Model	Variable	chibar2	p-value
(1)	ROA	370.31	0.0000
(3)	ROA	164.53	0.0000
(5)	ROA	171.6	0.0000

Appendix E: Literature Review

Authors (Year)	Method/Technique	Main Results	Dependent variable	Independent variables	Country	Data Sampling and Time Period	Reference
Goddard, Tavakoli, Wilson 2005	GMM method	Size and risk of defaulting firms have a negative and significant effect on profitability. The market share and liquidity accelerate profitability. Abnormal profits persist from year to year	Profit (ROA)	ROA (-1) ; ROA(-2);Firm size Asset(natural log of total assets); Share (market share)=sales of firm /total industry sales; Gear=(non-current liabilities plus loans/shareholder funds)= (Long term debt + short term debt)/shareholders 'funds; Liquidity=current assets net of stock/current liabilities	Belgium; France; Italy; Spain; UK	Panel data/ 1993-2001	Goddard, J., Tavakoli, M., & Wilson, J. O. (2005). Determinants of profitability in European manufacturing and services: evidence from a dynamic panel model. *Applied Financial Economics*, 15(18), 1269-1282.
Pätäri (2010).	The Delphi technique	He concludes that the bioenergy sector has increased attention because the price of raw materials is increasing, and investors are looking for alternative sources which means that changes happen more quickly on industry level than on the company level. The collaboration between forest and energy industry is more profitable for the development of bioenergy business which it can use the existing infrastructure and knowledge		Direct interview		Delphi study/ 2006	Pätäri, S. (2010). Industry-and company-level factors influencing the development of the forest energy business—insights from a Delphi Study. *Technological Forecasting and Social Change*, *77*(1), 94-109.
Eyraud, Wane, Zhang, Clements (2011)	Fixed effects	The empirical results show that a high level of income and the increased price of oil and carbon pricing scheme followed by countries promote green investment. The level of investment in green technologies is higher in countries that use feed-in-tariffs mechanism.	Green Investment (log (GI/GDP)); Financial investment in renewable	(+) GDP in constant dollars (-)The long term real interest rate (+)the relative price of international crude oil (+)FIT dummy (+)carbon pricing mechanism variable	35 advanced and emerging countries	Panel data/ 2000–2010	Eyraud, L., Wane, A. A., Zhang, C., & Clements, B. (2011). Who's going green and why? Trends and determinants of green investment. *IMF Working Papers*, 1-38.

Sadorsky (2012)	Beta model; OLS regression; CAPM model	Company sales growth has a negative impact on company risk, while oil price increases have a negative impact on company risk.	beta=(a+size+sales growth+debt/equity+oil price returns/sales); i=a+b*rm (CAPM model)	Size sales growth rate debt/equity oil price returns R&D/sales	Publicly traded RE companies; 52 companies	Panel data/ 2008–2009	Sadorsky, P. (2012). Modeling renewable energy company risk. *Energy Policy*, 40, 39-48.
Halkos & Tzeremes (2012)	Bootstrapped Data Envelopment Analysis (DEA)	Renewable energy firms' performance is influenced by ROA and ROE and from lower levels of debt to equity because the efficiency of green energy companies in Greece market have not significant differences and they operate in a highly competitive market.	Gross profit margin; operating profit margin; return on equity	Debt to equity; Assets turnover; Current Raito	Greek renewable energy companies	Panel data / 2006-2018	Halkos, G. E., & Tzeremes, N. G. (2012). Analyzing the Greek renewable energy sector: A Data Envelopment Analysis approach. *Renewable and Sustainable Energy Reviews*, 16(5), 2884–2893. https://doi.org/10.1016/j.rser.2012.02.003
Jaraitė & Kažukauskas (2013)	OLS Model; Random effect model; GMM	Countries that have adopted Tradeable Green Certificates systems are more profitable than firms operating in countries that have introduced Feed-in Tariffs; The positive effect of EU ETS is found for energy generating firms operating in countries that have TGC policy	EBIT margin= earnings before net interest and tax over operating revenues	Tradeable green certificates (TGC) D=1 Feed in tariffs (FIT) D=0 ETS (emissions trading system) D=1 Country level characteristics Profit (-1) Electricity price Market concentration (country characteristics) Electricity market opening (country characteristics) Capacity of Renewable electricity Region dummy	24 EU countries	Panel data/ 2002–2010	Jaraitė, J., & Kažukauskas, A. (2013). The profitability of electricity generating firms and policies promoting renewable energy. *Energy Economics*, 40, 858-865
Gschwandtner, Caressa (2013)	Autoregressive specification with the interaction effects in the persistence parameters; Panel estimator technique	They conclude that concertation as industry characteristic has a positive effect on profit persistence, while market share and risk as company features appear negative influence.	Profit rate; Relative deviation	Concentration (industry level); Value of shipments (industry level); Number of firms (industry level); firm size (firm level)	US, 151 US manufacturing companies	Panel data/ 1950–1999	Gschwandtner, A., & Cuaresma, J. C. (2013). Explaining the persistence of profits: A time-varying approach. I*nternational Journal of the Economics of Business*, 20(1), 39-55.

Corsatea, T. D., Giaccaria, S., & Arántegui, R. L. (2014)	Panel Fixed Effects Model	They conclude that three main sources of financing for the development of renewable energy technology, focusing on wind energy are public research, development, and demonstration (RD&D) investment, the support schemes such as subsidies and feed-in-tariffs to promote the generation of green energy and the access to credit	R&D	Research and Development incentives, growth installed wind capacities,	Europe	Panel data /2002-2011	Corsatea, T. D., Giaccaria, S., & Arántegui, R. L. (2014). The role of sources of finance on the development of wind technology. *Renewable Energy*, 66, 140–149. https://doi.org/10.1016/j.renene.2013.11.063
Inchauspe, J., Ripple, R. D., & Trück, S. (2015)	State space multi factor asset pricing model with time varying coefficients; This model is an extension of CAPM model in which additional explanatory variables are introduced and coefficients are allowed to change over time	The main determinants of renewable energy stock price are the world equity index MSCI and technology stocks that have a high correlation with NEX returns. The influence of changes in oil prices in NEX returns is less significant than the MSCI and PSE index. Global financial crises of 2008 have caused underperformance of RE companies	rNex	rMSCI world equity index; Technology stock; roil prices	Returns of Wilderhill New Energy Global Innovation index	Panel data/ 2003-2013	Inchauspe, J., Ripple, R. D., & Trück, S. (2015). The dynamics of returns on renewable energy companies: A state-space approach. *Energy Economics*, *48*, 325-335.
Fareed, Z., Ali, Z., Shahzad, F., Nazir, M. I., & Ullah, A. (2016)	Panel data for 16 firms of power and energy sector during 2001-2012; Random effect model	Firm and industry affiliation level; Resource based approaches	ROA= firms' book value of net profit after tax/total assets; NIM; ROCE (return on capital employed);	Firm size (+) Firm growth (+) Electricity crisis (+) Firm age (-) Financial leverage (-) Productivity (-)	Pakistan	Panel data / 2001-2012	Fareed, Z., Ali, Z., Shahzad, F., Nazir, M. I., & Ullah, A. (2016). Determinants of Profitability: Evidence from Power and Energy Sector. *Studia Universitatis Babe-Bolyai Oeconomica*, *61*(3), 59-78.
Salvatore and Heikki (2016)	Fixed effect, Random effect, Granger Causality	They conducted a study in 26 different emerging and developed countries to measure the performance of 66 large electric utilities that use renewable energy. In the short-run and long-run the volume of renewable energy generated has a negative effect on financial performance. Tobin's q is used to measure the long-run performance of firms and for the short-run is used ROA and ROE.	ROE=net income/equity; ROA=net income/total assets; Tobin's q= firm's market value/book value of its total assets	Volume of RE produced yearly (RE Volume); firm size (+); risk (+); capital intensity; firm growth	26 countries	Panel data/ 2005-2014	Ruggiero, S., & Lehkonen, H. (2017). Renewable energy growth and the financial performance of electric utilities: A panel data study. *Journal of Cleaner Production*, *142*, 3676-3688.

Kim, J., & Park, K. (2016)	Tobit regression	Impact of financial markets on RE sectors The relation between financial development and RE growth 4 renewable sectors a) biomass and waste b) geothermal c) solar PV d) wind onshore	RE deployment Ln(annual renewable capacity+1 Ln(cumulative Renewable capacity +1)	GDP per capita Feed in tariff dummy Renewable sector's share Equity (%of GDP) Credit Overall	Panel data for 30 countries (15 developed+ 15 developing)	Panel data/ 2000-2013	Kim, J., & Park, K. (2016). Financial development and deployment of renewable energy technologies. *Energy Economics*, 59, 238-250.
Tsai, Y. L., & Tung, J.(2017)	Panel data methodology	The results show that shares of renewable energy and energy consumption have a negative effect on ROA while market capitalization has a positive significant effect. Also, market capitalization has a positive effect on interest coverage. Capital intensity has a positive effect on the gross profit margin.	ROA; GPM (gross profit margin); Interest coverage	Tax Company specific advantages Share of renewable Company specific advantages Energy consumption Company specific advantages Infrastructure Company specific advantages Market capitalization Firm specific advantages R&D Firm specific advantages Capital intensity Firm specific advantages Employees Firm specific advantages	93 RE, 34 countries	Panel data /2008-2013	Tsai, Y. L., & Tung, J. (2017). The factors affect company performance in renewable energy industry. *Internationa l Journal for Innovation Education and Research*, *5*(6), 188-204.
Salvatore , Lehkonen (2017)	FE and RE; Granger causality	They find that increasing renewable energy penetration is also adversely connected with long-term company performance, which might be explained by the combined effect of low power demand and overcapacity in developed economies.	ROA; ROE; Tobin's q	Renewable energy volume Time Size (in terms of market capitalization) Capital intensity(capital expenditures/ sales) Growth(Increase in % in sales on a yearly basis) RE. penetration Carbon intensity (Ratio of total amount of greenhouse gas emission to total assets)	26 different countries	Panel data/ 2005-2014	Ruggiero, S., & Lehkonen, H. (2017). Renewable energy growth and the financial performance of electric utilities: A panel data study. *Journal of Cleaner Production*, 142, 3676–3688. https://doi.org/10.1016/j.jclepro.2016.10.100
Gupta (2017)	Fixed Effects Model, Factor analysis	They conduct the study in 26 developed and developing countries and reveal that when	Stock price	Local market Return; Oil price; Technology	26 different countries	Panel data/ 1987-2014	Gupta, K. (2017). Do economic and societal factors influence the

		country level technology and innovation is well developed, the financial performance of alternative energy firms is positively influenced		index; risk; liquidity; size; growth; leverage			financial performance of alternative energy firms? Energy Economics, 65, 172–182. https://doi.org/10.1016/j.eneco.2017.05.004
Fan, L. W., Pan, S. J., Liu, G. Q., & Zhou, P. (2017)	Random effects model	The findings reveal that energy efficiency is positively connected to return on equity, return on assets, return on investment, return on invested capital, and return on sales, but not to Tobin's q. In addition, firm growth contributes to the favorable association between energy intensity and financial performance.	ROE ROA ROI ROIC ROS Tobin's q	Energy efficiency Control Variable Size Growth Risk Sector	17 companies in China	Panel data/ 2010-2014	Fan, L. W., Pan, S. J., Liu, G. Q., & Zhou, P. (2017). Does energy efficiency affect financial performance? Evidence from Chinese energy-intensive firms. *Journal of Cleaner Production*, 151, 53-59.
Milanés-Montero, P., Arroyo-Farrona, A., & Pérez-Calderón, E. (2018)	Static linear Panel model; Fixed effects and random effects model	The profitability is affected positively by FITs because this support scheme promotes RE companies in Europe. When these companies enlarge their activity in terms of assets, they increase the competition in the market and make it more profitable since large companies take advantages of economies of scale. Contrary to other studies the leverage ratio promotes profitability because they use the borrow funds to invest in technology that provides profits in the future	ROI; (EBIT/total assets)	(+) FIT; (+) Assets (log); Liquidity ratio=(cash/current liabilities) Leverage=(cash/current liabilities+ non-current liabilities) Age Secondary activity Country 1 1 if Germany 0 otherwise Country 2 1 Italy Country 3 1 France Country 4 1 Spain	Italy; Germany; France; Spain	Panel data / 2008-2012	Milanés-Montero, P., Arroyo-Farrona, A., & Pérez-Calderón, E. (2018). Assessment of the Influence of Feed-In Tariffs on the Profitability of European Photovoltaic Companies. *Sustainability*, 10(10), 3427.
Coto-Millán et al. (2018)	DEA (Data Envelopment Analysis)	The study conclude that the electricity firms require high weigh of capital, and those companies are highly depended on external funds and to achieve technical efficiency it is needed restructuring capital structure	Output (Added Value)	Labor; capital; intermediate consumption	26 different European countries	Panel data / 2005-2012	Coto-Millán, P., de la Fuente, M., & Fernández, X. L. (2018). Determinants of the European electricity companies efficiency: 2005–2014. *Energy Strategy Reviews*, 21(February 2017), 149–156. https://doi.org/10.1016/j.esr.2018.06.001

Ibarloza, Heras-Saizarbitoria, Allur, & Larrea (2018)	Economic and financial analysis for 890 firms	They found that the before the financial crises the financial performance of solar PV companies was profitable but after the crises the financial performance remained negative due to a reduction in tariff as well the continuous increase in the cost of finance. As a result, new solar PV plan investments in Spain have declined dramatically.	Economic profit		Spanish companies	Panel data/ 2006-2015	Ibarloza, A., Heras-Saizarbitoria, I., Allur, E., & Larrea, A. (2018). Regulatory cuts and economic and financial performance of Spanish solar power companies: An empirical review. *Renewable and Sustainable Energy Reviews*, 92(April), 784–793. https://doi.org/10.1016/j.rser.2018.04.087
Makridou, Doumpos, & Galariotis (2019)	Multilevel cross-classified model	The effect of EU ETS schemes was examined in four stages and the study reveal that the environmental policies improve financial performance.	ROA	Current ratio; Solvency ratio; Size; Number of employees; Operating revenue; GDP growth; Number of main electricity retailers; Annual growth rate of future price; Energy efficiency polices score for industry; Allocation factor; Verified emissions/Sales	19 European Union countries	Panel data/ 2006-2014	Makridou, G., Doumpos, M., & Galariotis, E. (2019). The financial performance of firms participating in the EU emissions trading scheme. *Energy Policy*, 129(August 2018), 250–259. https://doi.org/10.1016/j.enpol.2019.02.026
Chang, K., Zeng, Y., Wang, W., & Wu, X. (2019)	Dynamic panel generalized moments of method (GMM) analysis.	Renewable energy firms having high tangible assets, can mitigate the effect of financial constraint on their financial performance, during certain contractionary monetary policy periods	R&D	Size; ROA; Tobin's Q value; Leverage; Liquidity constraint; Credit policy	China	Panel data / 2010-2017	Chang, K., Zeng, Y., Wang, W., & Wu, X. (2019). The effects of credit policy and financial constraints on tangible and research & development investment: Firm-level evidence from China's renewable energy industry. *Energy Policy*, 130(January), 438–447. https://doi.org/10.1016/j.enpol.2019.04.005

Sun, Zhan, & Du (2020)	Difference-In-Difference (DID) approach	The estimation results show that the value added tax for new energy firms that operate in wind and solar sector are ineffective	ROE	size; leverage; growth;	China	Panel data / 2004-2012	Sun, C., Zhan, Y., & Du, G. (2020). Can value-added tax incentives of new energy industry increase firm's profitability? Evidence from financial data of China's listed companies. *Energy Economics*, 86, 1–13. https://doi.org/10.1016/j.eneco.2019.104654
Chen & Ma (2021)	Two-stage IV- GMM estimation method	The study's findings demonstrate a strong and positive relationship between green investment and firm performance.	Tobin's q; ROE; Net profit	Green investment; Environment tax; Subsidy; Patent; firm size; Leverage; Asset structure; Proportion of Independent Directors	China	Panel data / 2008-2017	Chen, Y., & Ma, Y. (2021). Does green investment improve energy firm performance? *Energy Policy*, 153(121), 112252. https://doi.org/10.1016/j.enpol.2021.112252
Cohen, Azarova, Kollmann, & Reichl (2021)	Probit model	The study shows that invest in community renewable energy projects is greater than investment in utility electricity	Probability of accepting an investment option	Household size; Kids; Age; Employed; University; Income; Renewable environment; Renewable jobs; Environmentalist; Climate change anthropogenic	31 European Countries	Questionnaire	Cohen, J. J., Azarova, V., Kollmann, A., & Reichl, J. (2021). Preferences for community renewable energy investments in Europe. Energy Economics, 100(June), 105386. https://doi.org/10.1016/j.eneco.2021.105386
Anton (2021)	Quantile regression approach	The study shows that electricity price and market concentration are determinant factors for profitability of energy and gas sector.	Operating profit margin or EBIT margin; Return on equity (ROE)	Temperature; Rainfall; Cash flows; Tobin's Q; Size; Leverage; Current ratio; Electricity price; Market concentration	European energy firms	Panel data /2009-2016	Anton, S. G. (2021). The impact of temperature increase on firm profitability. Empirical evidence from the European energy and gas sectors. *Applied Energy*, 295(11), 117051. https://doi.org/10.101

							6/j.apenergy.2021.117051
Cortez, Andrade, & Silva (2022)	Four factor model; Five factor model	The study shows that there is not statistically significant difference between fossil fuels and green energy stocks, but in overall the portfolio that consist by green energy stock seems to have abnormal returns compared to the market	Excess return of portfolio	Market excess return; Size; Value; Momentum factors; The profitability and investment factors	European Countries	Panel data/ January 2008-November 2018	Cortez, M. C., Andrade, N., & Silva, F. (2022). The environmental and financial performance of green energy investments: European evidence. *Ecological Economics*, 197, 1–26. https://doi.org/10.1016/j.ecolecon.2022.107427

Appendix F: Data

Year	Company	Headquarter	Leverage(total debt/total assets)	Roa Av	Capital Intensity(cap exp/sales)	age	Growth(sales% changes)	Tobin's Q	Market Capitalization	FIT	TGC	Inflation	Electricity $	GDP Growth	Market concentration
2004	Albioma SA	France	0.64	0.03	0.01	22.00	1.84	1.05	409536.82	1.00	0	2.14	0.07	2.83	90.20
2005	Albioma SA	France	0.58	0.06	0.51	23.00	2.07	1.45	763752.02	1.00	0	1.75	0.07	1.66	89.10
2006	Albioma SA	France	0.55	0.07	0.45	24.00	0.14	2.07	1564487.68	1.00	0	1.68	0.07	2.45	88.70
2007	Albioma SA	France	0.54	0.09	0.34	25.00	0.38	2.51	2356619.78	1.00	0	1.49	0.07	2.42	88.00
2008	Albioma SA	France	0.55	0.08	0.38	26.00	0.42	1.48	1278826.87	1.00	0	2.81	0.08	0.25	87.30
2009	Albioma SA	France	0.53	0.05	0.31	27.00	-0.24	1.24	1153195.27	1.00	0	0.09	0.09	-2.87	87.30
2010	Albioma SA	France	0.55	0.04	0.43	28.00	0.19	0.98	723581.01	1.00	0	1.53	0.09	1.95	86.50
2011	Albioma SA	France	0.55	0.03	0.21	29.00	0.22	0.80	403040.12	1.00	0	2.11	0.10	2.19	86.00
2012	Albioma SA	France	0.49	0.03	0.07	30.00	-0.02	0.82	542199.16	1.00	0	1.95	0.09	0.31	86.00
2013	Albioma SA	France	0.46	0.04	0.09	31.00	0.00	0.86	674187.89	1.00	0	0.86	0.10	0.58	83.80
2014	Albioma SA	France	0.47	0.03	0.10	32.00	-0.03	0.85	590828.03	1.00	0	0.51	0.10	0.96	76.50
2015	Albioma SA	France	0.46	0.03	0.22	33.00	-0.17	0.84	479321.21	1.00	0	0.04	0.08	1.11	74.90
2016	Albioma SA	France	0.49	0.03	0.37	34.00	0.05	0.84	519021.11	1.00	0	0.18	0.08	1.10	71.60
2017	Albioma SA	France	0.50	0.03	0.40	35.00	0.11	0.94	763471.68	1.00	0	1.03	0.08	2.29	70.60
2018	Albioma SA	France	0.53	0.04	0.33	36.00	0.12	0.88	652877.48	1.00	0	1.85	0.08	1.79	67.20
2019	Albioma SA	France	0.55	0.03	0.29	37.00	0.12	0.97	900214.94	1.00	0	1.11	0.09	1.51	65.59
2020	Albioma SA	France	0.54	0.04	0.25	38.00	0.02	1.35	1791686.05	1.00	0	0.48	0.10	-8.11	
2004	Engie SA	France	0.15	0.04	0.08	12.00	0.09			1.00	0	2.14	0.07	2.83	90.20
2005	Engie SA	France	0.11	0.05	0.08	13.00	0.25	0.66	29102877.88	1.00	0	1.75	0.07	1.66	89.10
2006	Engie SA	France	0.13	0.06	0.08	14.00	0.22	0.87	45683912.45	1.00	0	1.68	0.07	2.45	88.70
2007	Engie SA	France	0.12	0.06	0.09	15.00	0.08	0.92	57880100.00	1.00	0	1.49	0.07	2.42	88.00
2008	Engie SA	France	0.23	0.05	0.13	16.00	1.66	0.67	########	1.00	0	2.81	0.08	0.25	87.30

2009	Engie SA	France	0.25	0.03	0.12	17.00	0.12	0.59	93448418.73	1.00	0	0.09	0.09	-2.87	87.30
2010	Engie SA	France	0.26	0.03	0.11	18.00	0.01	0.55	77715151.74	1.00	0	1.53	0.09	1.95	86.50
2011	Engie SA	France	0.27	0.02	0.10	19.00	0.13	0.48	58871500.52	1.00	0	2.11	0.10	2.19	86.00
2012	Engie SA	France	0.27	0.01	0.09	20.00	-0.01	0.45	47119242.35	1.00	0	1.95	0.09	0.31	86.00
2013	Engie SA	France	0.25	-0.05	0.07	21.00	-0.06	0.48	########	1.00	0	0.86	0.10	0.58	83.80
2014	Engie SA	France	0.23	0.02	0.08	22.00	-0.15	0.48	54652811.95	1.00	0	0.51	0.10	0.96	76.50
2015	Engie SA	France	0.24	-0.03	0.09	23.00	-0.22	0.45	41316956.28	1.00	0	0.04	0.08	1.11	74.90
2016	Engie SA	France	0.23	0.00	0.08	24.00	-0.07	0.37	29717874.37	1.00	0	0.18	0.08	1.10	71.60
2017	Engie SA	France	0.22	0.01	0.10	25.00	-0.06	0.41	########	1.00	0	1.03	0.08	2.29	70.60
2018	Engie SA	France	0.20	0.00	0.11	26.00	0.00	0.36	########	1.00	0	1.85	0.08	1.79	67.20
2019	Engie SA	France	0.24	0.01	0.11	27.00	0.00	0.41	########	1.00	0	1.11	0.09	1.51	65.59
2020	Engie SA	France	0.25	-0.01	0.09	28.00	-0.05	0.38	36954787.12	1.00	0	0.48	0.10	-8.11	
2004	Audax Renovables SA	Spain	0.00	0.01	1.82	4.00	0.23			1.00	0	3.04	0.07	3.12	36.00
2005	Audax Renovables SA	Spain	0.13	0.02	7.90	5.00	0.18			1.00	0	3.37	0.09	3.65	35.00
2006	Audax Renovables SA	Spain	0.53	0.02	11.88	6.00	2.15			1.00	0	3.52	0.09	4.10	31.00
2007	Audax Renovables SA	Spain	0.19	0.01	1.53	7.00	1.29	1.12	515787.83	1.00	0	2.79	0.10	3.60	31.00
2008	Audax Renovables SA	Spain	0.22	0.01	4.61	8.00	1.80	0.67	446851.84	1.00	0	4.08	0.14	0.89	22.20
2009	Audax Renovables SA	Spain	0.23	0.00	1.10	9.00	0.04	0.67	425991.44	1.00	0	-0.29	0.15	-3.76	32.90
2010	Audax Renovables SA	Spain	0.33	-0.07	3.35	10.00	0.32	0.56	220295.14	1.00	0	1.80	0.14	0.16	24.00
2011	Audax Renovables SA	Spain	0.44	-0.17	0.57	11.00	0.48	0.58	136699.08	1.00	0	3.20	0.15	-0.81	23.50
2012	Audax Renovables SA	Spain	0.47	-0.15	0.37	12.00	-0.05	0.52	60491.82	1.00	0	2.45	0.15	-2.96	23.80
2013	Audax Renovables SA	Spain	0.49	0.00	0.14	13.00	-0.12	0.59	71687.38	1.00	0	1.41	0.15	-1.44	22.00
2014	Audax Renovables SA	Spain	0.46	0.00	0.61	14.00	-0.32	0.53	61266.79	1.00	0	-0.15	0.15	1.38	23.42
2015	Audax Renovables SA	Spain	0.50	-0.04	1.23	15.00	-0.07	0.60	57465.00	1.00	0	-0.50	0.12	3.84	24.65
2016	Audax Renovables SA	Spain	0.54	-0.11	0.03	16.00	0.06	0.75	73593.27	1.00	0	-0.20	0.11	3.03	22.50
2017	Audax Renovables SA	Spain	0.54	0.01	0.01	17.00	0.25	0.47	73897.48	1.00	0	1.96	0.11	2.97	22.26
2018	Audax Renovables SA	Spain	0.48	0.01	0.00	18.00	26.91	1.03	648882.81	1.00	0	1.68	0.12	2.43	23.53

2019	Audax Renovables SA	Spain	0.44	0.04	0.03	19.00	0.01	1.46	1056232.75	1.00	0	0.70	0.10	1.95	22.79
2020	Audax Renovables SA	Spain	0.57	0.03	0.02	20.00	-0.05	0.93	1045341.33	1.00	0	-0.32	0.10	-10.84	
2004	RWE AG	Germany	0.28	0.03	0.08	28.00	0.05	0.39	########	1.00	0	1.67	0.09	1.18	28.40
2005	RWE AG	Germany	0.24	0.02	0.10	29.00	-0.07	0.42	########	1.00	0	1.55	0.10	0.73	31.00
2006	RWE AG	Germany	0.20	0.03	0.11	30.00	0.09	0.45	########	1.00	0	1.58	0.11	3.82	31.00
2007	RWE AG	Germany	0.15	0.04	0.10	31.00	0.09	0.61	########	1.00	0	2.30	0.12	2.98	30.00
2008	RWE AG	Germany	0.14	0.04	0.09	32.00	0.24	0.40	########	1.00	0	2.63	0.14	0.96	30.00
2009	RWE AG	Germany	0.21	0.04	0.13	33.00	-0.08	0.51	49468301.54	1.00	0	0.31	0.13	-5.69	26.00
2010	RWE AG	Germany	0.21	0.04	0.13	34.00	0.05	0.43	33933273.01	1.00	0	1.10	0.12	4.18	28.40
2011	RWE AG	Germany	0.24	0.02	0.13	35.00	0.02	0.37	20584125.68	1.00	0	2.08	0.13	3.93	
2012	RWE AG	Germany	0.23	0.02	0.10	36.00	-0.05	0.42	24152361.87	1.00	0	2.01	0.11	0.42	
2013	RWE AG	Germany	0.20	-0.03	0.08	37.00	0.01	0.37	21427846.65	1.00	0	1.50	0.12	0.44	32.00
2014	RWE AG	Germany	0.19	0.02	0.07	38.00	-0.07	0.33	18181841.61	1.00	0	0.91	0.11	2.21	29.00
2015	RWE AG	Germany	0.22	-0.01	0.07	39.00	-0.17	0.22	7451759.37	1.00	0	0.51	0.09	1.49	27.00
2016	RWE AG	Germany	0.21	-0.07	0.05	40.00	-0.05	0.18	7278370.26	1.00	0	0.49	0.09	2.23	27.00
2017	RWE AG	Germany	0.22	0.02	0.07	41.00	-0.68	0.31	11949733.08	1.00	0	1.51	0.09	2.60	25.80
2018	RWE AG	Germany	0.02	0.00	0.09	42.00	0.01	0.15	13371233.91	1.00	0	1.73	0.09	1.27	25.10
2019	RWE AG	Germany	0.06	-0.01	0.13	43.00	-0.07	0.23	18847714.26	1.00	0	1.45	0.09	0.56	22.40
2020	RWE AG	Germany	0.08	0.01	0.25	44.00	0.06	0.33	28550217.73	1.00	0	0.51	0.10	-4.90	
2004	Solaria Energia y Medio Ambiente SA	Spain	0.49		0.00	2.00				1.00	0	3.04	0.07	3.12	36.00
2005	Solaria Energia y Medio Ambiente SA	Spain	0.41	0.01	0.00	3.00	0.71			1.00	0	3.37	0.09	3.65	35.00
2006	Solaria Energia y Medio Ambiente SA	Spain	0.42	0.25	0.00	4.00	26.67			1.00	0	3.52	0.09	4.10	31.00
2007	Solaria Energia y Medio Ambiente SA	Spain	0.14	0.22	0.00	5.00	9.60	5.13	3169641.90	1.00	0	2.79	0.10	3.60	31.00
2008	Solaria Energia y Medio Ambiente SA	Spain	0.24	-0.05	0.00	6.00	-0.36	0.70	266137.48	1.00	0	4.08	0.14	0.89	22.20
2009	Solaria Energia y Medio Ambiente SA	Spain	0.20	0.00	0.23	7.00	-0.23	0.87	360415.86	1.00	0	-0.29	0.15	-3.76	32.90
2010	Solaria Energia y Medio Ambiente SA	Spain	0.30	0.02	0.09	8.00	0.71	0.55	191974.89	1.00	0	1.80	0.14	0.16	24.00
2011	Solaria Energia y Medio Ambiente SA	Spain	0.43	-0.25	0.01	9.00	-0.28	0.64	122693.94	1.00	0	3.20	0.15	-0.81	23.50

2012	Solaria Energia y Medio Ambiente SA	Spain	0.48	-0.07	0.11	10.00	-0.71	0.65	90721.92	1.00	0	2.45	0.15	-2.96	23.80
2013	Solaria Energia y Medio Ambiente SA	Spain	0.69	-0.31	0.12	11.00	0.01	1.01	103286.21	1.00	0	1.41	0.15	-1.44	22.00
2014	Solaria Energia y Medio Ambiente SA	Spain	0.58	0.02	0.03	12.00	-0.28	0.89	87251.96	1.00	0	-0.15	0.15	1.38	23.42
2015	Solaria Energia y Medio Ambiente SA	Spain	0.62	0.04	0.01	13.00	-0.44	1.00	82889.78	1.00	0	-0.50	0.12	3.84	24.65
2016	Solaria Energia y Medio Ambiente SA	Spain	0.71	0.03	0.00	14.00	0.39	0.98	87070.65	1.00	0	-0.20	0.11	3.03	22.50
2017	Solaria Energia y Medio Ambiente SA	Spain	0.77	0.06	1.47	15.00	0.37	1.32	211693.15	1.00	0	1.96	0.11	2.97	22.26
2018	Solaria Energia y Medio Ambiente SA	Spain	0.55	0.06	0.84	16.00	0.14	1.57	568205.97	1.00	0	1.68	0.12	2.43	23.53
2019	Solaria Energia y Medio Ambiente SA	Spain	0.59	0.05	2.89	17.00	-0.03	1.80	952476.42	1.00	0	0.70	0.10	1.95	22.79
2020	Solaria Energia y Medio Ambiente SA	Spain	0.59	0.05	2.52	18.00	0.57	4.60	3607520.38	1.00	0	-0.32	0.10	-10.84	
2004	Alerion Clean Power SpA	Italy	0.08	0.01		9.00	1.27	0.61	253440.44	1.00	0	2.21	0.11	1.42	43.40
2005	Alerion Clean Power SpA	Italy	0.07	-0.03		10.00	-0.83	0.60	208136.41	1.00	0	1.99	0.10	0.82	38.60
2006	Alerion Clean Power SpA	Italy	0.17	-0.06		11.00	-0.68	0.67	248175.67	1.00	0	2.09	0.13	1.79	34.60
2007	Alerion Clean Power SpA	Italy	0.31	0.03	14.15	12.00	1.72	1.05	408403.35	1.00	0	1.83	0.16	1.49	31.30
2008	Alerion Clean Power SpA	Italy	0.50	-0.01	16.13	13.00	1.08	0.68	243790.30	1.00	0	3.35		-0.96	31.30
2009	Alerion Clean Power SpA	Italy	0.58	-0.01	3.12	14.00	1.29	0.94	319704.47	1.00	0	0.77		-5.28	29.80
2010	Alerion Clean Power SpA	Italy	0.55	-0.01	2.15	15.00	0.55	0.83	312032.60	1.00	0	1.53	0.15	1.71	28.00
2011	Alerion Clean Power SpA	Italy	0.63	-0.01	0.67	16.00	0.40	0.81	233825.17	1.00	0	2.78	0.15	0.71	27.00
2012	Alerion Clean Power SpA	Italy	0.59	0.01	0.27	17.00	0.20	0.83	210035.29	1.00	0	3.04	0.16	-2.98	26.00
2013	Alerion Clean Power SpA	Italy	0.57	0.00	0.00	18.00	-0.29	0.79	196305.38	1.00	0	1.22	0.15	-1.84	27.00
2014	Alerion Clean Power SpA	Italy	0.57	-0.07	0.00	19.00	-0.14	0.76	148321.56	1.00	0	0.24	0.13	0.00	31.00
2015	Alerion Clean Power SpA	Italy	0.59	-0.02		20.00	-0.17	0.79	112987.44	1.00	0	0.04	0.10	0.78	28.00
2016	Alerion Clean Power SpA	Italy	0.58	0.00	0.01	21.00	0.12	0.84	134083.31	1.00	0	-0.09	0.09	1.29	26.00
2017	Alerion Clean Power SpA	Italy	0.57	0.01	0.01	22.00	0.07	0.81	153201.17	1.00	0	1.23	0.10	1.67	24.00
2018	Alerion Clean Power SpA	Italy	0.57	0.01	1.04	23.00	0.12	0.73	166460.20	1.00	0	1.14	0.10	0.94	24.00
2019	Alerion Clean Power SpA	Italy	0.72	0.03	0.28	24.00	0.19	0.63	173900.90	1.00	0	0.61	0.11	0.29	23.00
2020	Alerion Clean Power SpA	Italy	0.66	0.03	0.02	25.00	0.46	1.10	687505.80	1.00	0	-0.14	0.11	-8.87	
2005	EnviTec Biogas AG	Germany	0.24		0.06	2.00				1.00	0	1.55	0.10	0.73	31.00

2006	EnviTec Biogas AG	Germany	0.17	0.44	0.06	3.00	1.50		489419.25	1.00	0	1.58	0.11	3.82	31.00
2007	EnviTec Biogas AG	Germany	0.04	0.12	0.07	4.00	0.44	1.41	325276.54	1.00	0	2.30	0.12	2.98	30.00
2008	EnviTec Biogas AG	Germany	0.07	0.03	0.11	5.00	-0.18	0.84	275523.76	1.00	0	2.63	0.14	0.96	30.00
2009	EnviTec Biogas AG	Germany	0.12	0.01	0.11	6.00	0.14	0.70	224072.81	1.00	0	0.31	0.13	-5.69	26.00
2010	EnviTec Biogas AG	Germany	0.15	0.01	0.12	7.00	0.18	0.74	186592.04	1.00	0	1.10	0.12	4.18	28.40
2011	EnviTec Biogas AG	Germany	0.27	0.03	0.14	8.00	0.74	0.68	149730.62	1.00	0	2.08	0.13	3.93	
2012	EnviTec Biogas AG	Germany	0.27	0.00	0.28	9.00	-0.30	0.51	122140.28	1.00	0	2.01	0.11	0.42	
2013	EnviTec Biogas AG	Germany	0.30	0.00	0.12	10.00	-0.19	0.55	138023.77	1.00	0	1.50	0.12	0.44	32.00
2014	EnviTec Biogas AG	Germany	0.29	0.01	0.33	11.00	-0.04	0.56	126034.54	1.00	0	0.91	0.11	2.21	29.00
2015	EnviTec Biogas AG	Germany	0.26	0.00	0.08	12.00	0.02	0.52	123405.54	1.00	0	0.51	0.09	1.49	27.00
2016	EnviTec Biogas AG	Germany	0.26	0.01	0.06	13.00	-0.07	0.60	119410.24	1.00	0	0.49	0.09	2.23	27.00
2017	EnviTec Biogas AG	Germany	0.28	0.02	0.08	14.00	0.24	0.62	128954.78	1.00	0	1.51	0.09	2.60	25.80
2018	EnviTec Biogas AG	Germany	0.24	0.03	0.04	15.00	-0.02	0.64	213684.22	1.00	0	1.73	0.09	1.27	25.10
2019	EnviTec Biogas AG	Germany	0.24	0.03	0.05	16.00	0.08	0.95	365623.04	1.00	0	1.45	0.09	0.56	22.40
2020	EnviTec Biogas AG	Germany	0.24	0.05	0.04	17.00	-0.08	1.55	641596.09	1.00	0	0.51	0.10	-4.90	
2004	Encavis AG	Germany	0.49	0.30		2.00				1.00	0	1.67	0.10	1.18	28.40
2005	Encavis AG	Germany	0.00	0.92		3.00				1.00	0	1.55	0.09	0.73	31.00
2006	Encavis AG	Germany	0.00	0.32		4.00		0.22	62522.27	1.00	0	1.58	0.12	3.82	31.00
2007	Encavis AG	Germany	0.00	0.13		5.00		0.65	95222.14	1.00	0	2.30	0.13	2.98	30.00
2008	Encavis AG	Germany	0.00	0.10		6.00		0.32	75732.80	1.00	0	2.63	0.13	0.96	30.00
2009	Encavis AG	Germany	0.00	0.00	1336.57	7.00		0.35	69632.93	1.00	0	0.31	0.14	-5.69	26.00
2010	Encavis AG	Germany	0.61	0.01	0.76	8.00	1226.79	0.81	77881.07	1.00	0	1.10	0.12	4.18	28.40
2011	Encavis AG	Germany	0.63	0.01	0.68	9.00	1.87	0.96	162834.90	1.00	0	2.08	0.12	3.93	:
2012	Encavis AG	Germany	0.62	0.02	0.53	10.00	0.18	1.00	242030.74	1.00	0	2.01	0.12	0.42	:
2013	Encavis AG	Germany	0.55	0.03	0.01	11.00	0.31	0.94	349162.96	1.00	0	1.50	0.12	0.44	32.00
2014	Encavis AG	Germany	0.65	0.04	0.50	12.00	0.26	0.93	421496.47	1.00	0	0.91	0.10	2.21	29.00
2015	Encavis AG	Germany	0.70	0.02	0.22	13.00	0.31	1.11	646778.16	1.00	0	0.51	0.09	1.49	27.00

2016	Encavis AG	Germany	0.61	0.01	0.10	14.00	0.25	0.91	844028.90	1.00	0	0.49	0.08	2.23	27.00
2017	Encavis AG	Germany	0.59	0.01	0.43	15.00	0.60	0.87	994194.15	1.00	0	1.51	0.09	2.60	25.80
2018	Encavis AG	Germany	0.61	0.00	0.31	16.00	0.17	0.81	816794.97	1.00	0	1.73	0.09	1.27	25.10
2019	Encavis AG	Germany	0.64	0.01	0.02	17.00	0.04	1.06	1442504.09	1.00	0	1.45	0.09	0.56	22.40
2020	Encavis AG	Germany	0.63	0.01	0.12	18.00	0.09	1.64	3609707.96	1.00	0	0.51	0.11	-4.90	
2007	EDP Renovaveis SA	Spain	0.41		10.44	0.00				1.00	0	2.79	0.11	3.60	31.00
2008	EDP Renovaveis SA	Spain	0.16	0.01	3.61	1.00	38.25	0.60	6100219.67	1.00	0	4.08	0.13	0.89	22.20
2009	EDP Renovaveis SA	Spain	0.24	0.01	2.67	2.00	0.16	0.72	8279508.31	1.00	0	-0.29	0.15	-3.76	32.90
2010	EDP Renovaveis SA	Spain	0.27	0.01	1.69	3.00	0.23	0.54	5060798.64	1.00	0	1.80	0.14	0.16	24.00
2011	EDP Renovaveis SA	Spain	0.29	0.01	0.93	4.00	0.20	0.60	5338863.12	1.00	0	3.20	0.14	-0.81	23.50
2012	EDP Renovaveis SA	Spain	0.29	0.01	0.53	5.00	0.12	0.56	4596788.00	1.00	0	2.45	0.15	-2.96	23.80
2013	EDP Renovaveis SA	Spain	0.29	0.01	0.68	6.00	0.06	0.56	4629274.15	1.00	0	1.41	0.16	-1.44	22.00
2014	EDP Renovaveis SA	Spain	0.29	0.01	0.47	7.00	-0.03	0.63	5702478.73	1.00	0	-0.15	0.14	1.38	23.42
2015	EDP Renovaveis SA	Spain	0.28	0.02	0.65	8.00	-0.02	0.71	6868118.30	1.00	0	-0.50	0.12	3.84	24.65
2016	EDP Renovaveis SA	Spain	0.24	0.01	0.70	9.00	0.07	0.61	5535380.55	1.00	0	-0.20	0.11	3.03	22.50
2017	EDP Renovaveis SA	Spain	0.24	0.03	0.65	10.00	0.12	0.69	7290426.35	1.00	0	1.96	0.12	2.97	22.26
2018	EDP Renovaveis SA	Spain	0.24	0.03	0.60	11.00	-0.01	0.69	7778459.83	1.00	0	1.68	0.12	2.43	23.53
2019	EDP Renovaveis SA	Spain	0.24	0.04	0.74	12.00	0.03	0.81	10267512.36	1.00	0	0.70	0.10	1.95	22.79
2020	EDP Renovaveis SA	Spain	0.26	0.04	1.01	13.00	-0.05	1.41	24289959.10	1.00	0	-0.32	0.10	-10.84	
2004	Falck Renewables SpA	Italy	0.58	0.01	0.49	2.00	-0.08	0.94	172810.78	1.00	0	2.21	0.11	1.42	43.40
2005	Falck Renewables SpA	Italy	0.56	0.01	0.49	3.00	0.15	1.43	378443.84	1.00	0	1.99	0.10	0.82	38.60
2006	Falck Renewables SpA	Italy	0.21	0.03	0.32	4.00	0.18	0.88	766722.54	1.00	0	2.09	0.13	1.79	34.60
2007	Falck Renewables SpA	Italy	0.21	0.03	0.33	5.00	0.03	0.65	638835.97	1.00	0	1.83	0.16	1.49	31.30
2008	Falck Renewables SpA	Italy	0.19	0.04	0.18	6.00	0.15	0.53	288533.88	1.00	0	3.35		-0.96	31.30
2009	Falck Renewables SpA	Italy	0.17	0.01	0.14	7.00	-0.08	0.63	348808.85	1.00	0	0.77		-5.28	29.80
2010	Falck Renewables SpA	Italy	0.62	0.01	0.79	8.00	0.00	0.82	471580.44	1.00	0	1.53	0.15	1.71	28.00
2011	Falck Renewables SpA	Italy	0.60	0.01	0.72	9.00	1.63	0.71	320465.92	1.00	0	2.78	0.15	0.71	27.00

2012	Falck Renewables SpA	Italy	0.66	-0.06	0.21	10.00	0.02	0.76	374076.29	1.00	0	3.04	0.16	-2.98	26.00
2013	Falck Renewables SpA	Italy	0.61	0.01	0.22	11.00	-0.05	0.80	518294.57	1.00	0	1.22	0.15	-1.84	27.00
2014	Falck Renewables SpA	Italy	0.56	0.01	0.19	12.00	-0.02	0.63	327151.81	1.00	0	0.24	0.13	0.00	31.00
2015	Falck Renewables SpA	Italy	0.53	0.01	0.22	13.00	-0.09	0.70	349474.80	1.00	0	0.04	0.10	0.78	28.00
2016	Falck Renewables SpA	Italy	0.51	0.00	0.37	14.00	-0.08	0.54	282485.38	1.00	0	-0.09	0.09	1.29	26.00
2017	Falck Renewables SpA	Italy	0.51	0.02	0.07	15.00	0.18	0.77	754657.62	1.00	0	1.23	0.10	1.67	24.00
2018	Falck Renewables SpA	Italy	0.46	0.04	0.15	16.00	0.22	0.77	777800.57	1.00	0	1.14	0.10	0.94	24.00
2019	Falck Renewables SpA	Italy	0.46	0.04	0.34	17.00	0.06	1.19	1543181.19	1.00	0	0.61	0.11	0.29	23.00
2020	Falck Renewables SpA	Italy	0.46	0.03	0.24	18.00	0.05	1.38	2327612.70	1.00	0	-0.14	0.11	-8.87	
2004	Energiekontor AG	Germany	0.53	-0.07	0.00	14.00	-0.73			1.00	0	1.67	0.10	1.18	28.40
2005	Energiekontor AG	Germany	0.56	0.00	1.62	15.00	1.06			1.00	0	1.55	0.09	0.73	31.00
2006	Energiekontor AG	Germany	0.66	-0.01	0.22	16.00	-0.56			1.00	0	1.58	0.12	3.82	31.00
2007	Energiekontor AG	Germany	0.68	0.00	0.25	17.00	1.02	0.88	108658.24	1.00	0	2.30	0.13	2.98	30.00
2008	Energiekontor AG	Germany	0.68	0.01	0.10	18.00	1.58	0.78	90382.91	1.00	0	2.63	0.13	0.96	30.00
2009	Energiekontor AG	Germany	0.70	-0.01	0.11	19.00	-0.50	0.74	67819.85	1.00	0	0.31	0.14	-5.69	26.00
2010	Energiekontor AG	Germany	0.72	-0.02	0.14	20.00	-0.05	0.78	80235.90	1.00	0	1.10	0.12	4.18	28.40
2011	Energiekontor AG	Germany	0.73	0.03	0.05	21.00	0.89	0.64	86328.06	1.00	0	2.08	0.12	3.93	
2012	Energiekontor AG	Germany	0.79	0.00	1.48	22.00	-0.41	0.78	88853.71	1.00	0	2.01	0.12	0.42	
2013	Energiekontor AG	Germany	0.75	0.04	0.40	23.00	2.02	0.73	92728.87	1.00	0	1.50	0.12	0.44	32.00
2014	Energiekontor AG	Germany	0.72	0.04	0.13	24.00	0.30	0.95	213168.65	1.00	0	0.91	0.10	2.21	29.00
2015	Energiekontor AG	Germany	0.70	0.06	0.21	25.00	0.04	0.86	194333.77	1.00	0	0.51	0.09	1.49	27.00
2016	Energiekontor AG	Germany	0.63	0.07	0.03	26.00	0.05	0.89	244878.37	1.00	0	0.49	0.08	2.23	27.00
2017	Energiekontor AG	Germany	0.63	0.03	0.22	27.00	-0.24	0.99	234115.80	1.00	0	1.51	0.09	2.60	25.80
2018	Energiekontor AG	Germany	0.64	0.02	0.20	28.00	-0.23	0.98	222761.22	1.00	0	1.73	0.09	1.27	25.10
2019	Energiekontor AG	Germany	0.69	0.00	0.12	29.00	-0.45	1.30	342118.30	1.00	0	1.45	0.09	0.56	22.40
2020	Energiekontor AG	Germany	0.68	0.05	0.01	30.00	1.34	2.32	993746.57	1.00	0	0.51	0.11	-4.90	
2004	ERG SpA	Italy	0.34	0.07	0.03	67.00	-0.73	0.68	1738398.33	1.00	0	2.21	0.11	1.42	43.40

2005	ERG SpA	Italy	0.23	0.11	0.03	68.00	0.41	0.94	3531807.02	1.00	0	1.99	0.10	0.82	38.60
2006	ERG SpA	Italy	0.33	0.04	0.04	69.00	0.03	0.85	3360063.91	1.00	0	2.09	0.13	1.79	34.60
2007	ERG SpA	Italy	0.31	0.04	0.04	70.00	0.21	0.63	2750150.26	1.00	0	1.83	0.16	1.49	31.30
2008	ERG SpA	Italy	0.34	0.12	0.03	71.00	0.21	0.29	1724437.90	1.00	0	3.35		-0.96	31.30
2009	ERG SpA	Italy	0.41	0.00	0.09	72.00	-0.68	0.37	2008947.16	1.00	0	0.77		-5.28	29.80
2010	ERG SpA	Italy	0.39	-0.01	0.04	73.00	0.32	0.45	2026499.65	1.00	0	1.53	0.15	1.71	28.00
2011	ERG SpA	Italy	0.31	0.02	0.01	74.00	0.32	0.49	1647662.94	1.00	0	2.78	0.15	0.71	27.00
2012	ERG SpA	Italy	0.33	0.01	0.01	75.00	-0.29	0.37	1405147.81	1.00	0	3.04	0.16	-2.98	26.00
2013	ERG SpA	Italy	0.36	0.00	0.02	76.00	-0.11	0.46	1870811.40	1.00	0	1.22	0.15	-1.84	27.00
2014	ERG SpA	Italy	0.37	0.00	0.05	77.00	-0.78	0.40	1563721.29	1.00	0	0.24	0.13	0.00	31.00
2015	ERG SpA	Italy	0.48	0.01	0.12	78.00	-0.23	0.68	1891475.34	1.00	0	0.04	0.10	0.78	28.00
2016	ERG SpA	Italy	0.46	0.02	0.06	79.00	0.11	0.67	1560786.94	1.00	0	-0.09	0.09	1.29	26.00
2017	ERG SpA	Italy	0.45	0.02	0.05	80.00	0.05	0.75	2688895.89	1.00	0	1.23	0.10	1.67	24.00
2018	ERG SpA	Italy	0.47	0.02	0.06	81.00	0.02	0.82	2816175.28	1.00	0	1.14	0.10	0.94	24.00
2019	ERG SpA	Italy	0.48	0.01	0.07	82.00	-0.05	0.96	3206354.32	1.00	0	0.61	0.76	0.29	23.00
2020	ERG SpA	Italy	0.49	0.02	0.12	83.00	-0.03	1.11	4254468.34	1.00	0	-0.14	0.91	-8.87	
2009	Alteo Energiaszolgaltato Nyrt	Hungary	0.18		0.15	1.00				1.00	0	4.21	0.17	-6.70	43.10
2010	Alteo Energiaszolgaltato Nyrt	Hungary	0.41	0.02	0.03	2.00	4.02			1.00	0	4.86	0.14	1.12	42.10
2011	Alteo Energiaszolgaltato Nyrt	Hungary	0.46	-0.02	0.14	3.00	-0.11			1.00	0	3.93	0.13	1.94	44.10
2012	Alteo Energiaszolgaltato Nyrt	Hungary	0.56	0.01	0.06	4.00	0.02	0.83	15882.05	1.00	0	5.65	0.12	-1.38	47.10
2013	Alteo Energiaszolgaltato Nyrt	Hungary	0.53	-0.01	0.02	5.00	0.12	1.02	23617.71	1.00	0	1.73	0.12	1.86	52.90
2014	Alteo Energiaszolgaltato Nyrt	Hungary	0.61	-0.04	0.03	6.00	-0.08			1.00	0	-0.23	0.11	4.23	28.05
2015	Alteo Energiaszolgaltato Nyrt	Hungary	0.47	0.10	0.02	7.00	0.49	0.80	25501.41	1.00	0	-0.06	0.09	3.82	29.80

2016	Alteo Energiaszolgaltato Nyrt	Hungary	0.37	0.05	0.01	8.00	0.32	0.59	32377.96	1.00	0	0.39	0.08	2.14	27.66
2017	Alteo Energiaszolgaltato Nyrt	Hungary	0.36	0.06	0.08	9.00	0.35	0.78	40451.15	1.00	0	2.35	0.07	4.32	23.66
2018	Alteo Energiaszolgaltato Nyrt	Hungary	0.43	0.03	0.34	10.00	0.03	0.70	37008.53	1.00	0	2.85	0.09	5.40	42.42
2019	Alteo Energiaszolgaltato Nyrt	Hungary	0.58	0.01	0.39	11.00	0.27	0.85	54138.04	1.00	0	3.34	0.10	4.64	39.91
2020	Alteo Energiaszolgaltato Nyrt	Hungary	0.57	0.01	0.17	12.00	0.22	0.84	56332.54	1.00	0	3.33	0.10	-4.96	
2005	Orsted A/S	Denmark	0.15		0.00	0.00	#REF!	#DIV/0!		1.00	0	1.82	0.08	2.34	33.00
2006	Orsted A/S	Denmark	0.20		0.00	1.00	1.00	#DIV/0!		1.00	0	1.92	0.10	3.91	54.00
2007	Orsted A/S	Denmark	0.53		0.00	2.00	0.33	#DIV/0!		1.00	0	1.69	0.09	0.91	47.00
2008	Orsted A/S	Denmark	0.56		0.00	3.00	0.38	#DIV/0!		1.00	0	3.42	0.11	-0.51	56.00
2009	Orsted A/S	Denmark	0.29		0.32	4.00	-0.19	0.00		1.00	0	1.30	0.09	-4.91	47.00
2010	Orsted A/S	Denmark	0.28	0.03	0.28	5.00	0.05	0.00		1.00	0	2.31	0.10	1.87	46.00
2011	Orsted A/S	Denmark	0.26	0.03	0.31	6.00	0.12	0.00		1.00	0	2.76	0.10	1.34	42.00
2012	Orsted A/S	Denmark	0.33	-0.03	0.25	7.00	0.05	0.00		1.00	0	2.40	0.08	0.23	37.00
2013	Orsted A/S	Denmark	0.32	-0.01	0.29	8.00	0.13	0.00		1.00	0	0.79	0.09	0.93	41.00
2014	Orsted A/S	Denmark	0.24	-0.02	0.20	9.00	-0.01	0.00		1.00	0	0.56	0.09	1.62	38.20
2015	Orsted A/S	Denmark	0.25	0.01	0.19	10.00	-0.22	0.00		1.00	0	0.45	0.06	2.34	37.22
2016	Orsted A/S	Denmark	0.18	0.07	0.26	11.00	-0.14	0.90	15916877.00	1.00	0	0.25	0.07	3.25	36.60
2017	Orsted A/S	Denmark	0.20	0.09	0.29	12.00	0.06	1.00	########	1.00	0	1.15	0.07	2.82	36.21
2018	Orsted A/S	Denmark	0.16	0.11	0.19	13.00	0.32	1.07	28109620.91	1.00	0	0.81	0.07	2.18	32.71
2019	Orsted A/S	Denmark	0.22	0.04	0.32	14.00	-0.12	1.62	43435881.14	1.00	0	0.76	0.07	2.85	32.40
2020	Orsted A/S	Denmark	0.21	0.08	0.54	15.00	-0.27	2.73	########	1.00	0	0.42	0.07	-2.73	
2004	IBERDROLA, S.A.	Spain	0.41	0.05	0.24	12.00	0.01	1.08	24272683.13	1.00	0	3.04	0.07	3.12	36.00
2005	IBERDROLA, S.A.	Spain	0.42	0.05	0.18	13.00	0.35	1.13	26176348.49	1.00	0	3.37	0.09	3.65	35.00
2006	IBERDROLA, S.A.	Spain	0.43	0.05	0.23	14.00	-0.05	1.36	41847347.74	1.00	0	3.52	0.09	4.10	31.00
2007	IBERDROLA, S.A.	Spain	0.32	0.05	0.30	15.00	0.73	1.13	78577871.37	1.00	0	2.79	0.10	3.60	31.00

2008	IBERDROLA, S.A.	Spain	0.36	0.04	0.29	16.00	0.54	0.76	47671686.72	1.00	0	4.08	0.14	0.89	22.20
2009	IBERDROLA, S.A.	Spain	0.36	0.03	0.19	17.00	-0.02	0.71	49701499.99	1.00	0	-0.29	0.15	-3.76	32.90
2010	IBERDROLA, S.A.	Spain	0.34	0.03	0.18	18.00	0.12	0.64	44717469.88	1.00	0	1.80	0.14	0.16	24.00
2011	IBERDROLA, S.A.	Spain	0.35	0.03	0.14	19.00	0.09	0.55	########	1.00	0	3.20	0.15	-0.81	23.50
2012	IBERDROLA, S.A.	Spain	0.34	0.03	0.13	20.00	0.00	0.55	33343417.69	1.00	0	2.45	0.15	-2.96	23.80
2013	IBERDROLA, S.A.	Spain	0.31	0.03	0.11	21.00	-0.06	0.61	########	1.00	0	1.41	0.15	-1.44	22.00
2014	IBERDROLA, S.A.	Spain	0.29	0.03	0.12	22.00	-0.03	0.63	41985349.56	1.00	0	-0.15	0.15	1.38	23.42
2015	IBERDROLA, S.A.	Spain	0.28	0.02	0.13	23.00	-0.12	0.68	44382114.85	1.00	0	-0.50	0.12	3.84	24.65
2016	IBERDROLA, S.A.	Spain	0.29	0.03	0.17	24.00	-0.09	0.67	########	1.00	0	-0.20	0.11	3.03	22.50
2017	IBERDROLA, S.A.	Spain	0.33	0.03	0.20	25.00	0.11	0.71	########	1.00	0	1.96	0.11	2.97	22.26
2018	IBERDROLA, S.A.	Spain	0.33	0.03	0.18	26.00	0.17	0.75	49518231.33	1.00	0	1.68	0.12	2.43	23.53
2019	IBERDROLA, S.A.	Spain	0.33	0.03	0.15	27.00	-0.01	0.85	64013356.02	1.00	0	0.70	0.10	1.95	22.79
2020	IBERDROLA, S.A.	Spain	0.33	0.03	0.18	28.00	-0.07	0.98	########	1.00	0	-0.32	0.10	-10.84	
2004	Enel SpA	Italy	0.41	0.04	0.13	43.00	0.09	1.09	########	1.00	0	2.21	0.11	1.42	43.40
2005	Enel SpA	Italy	0.26	0.05	0.10	44.00	0.13	1.06	########	1.00	0	1.99	0.10	0.82	38.60
2006	Enel SpA	Italy	0.25	0.06	0.08	45.00	0.17	1.13	########	1.00	0	2.09	0.13	1.79	34.60
2007	Enel SpA	Italy	0.46	0.04	0.12	46.00	0.24	0.87	########	1.00	0	1.83	0.16	1.49	31.30
2008	Enel SpA	Italy	0.45	0.04	0.12	47.00	0.49	0.64	39107685.84	1.00	0	3.35		-0.96	31.30
2009	Enel SpA	Italy	0.41	0.05	0.11	48.00	0.00	0.67	########	1.00	0	0.77		-5.28	29.80
2010	Enel SpA	Italy	0.38	0.03	0.10	49.00	0.10	0.58	########	1.00	0	1.53	0.15	1.71	28.00
2011	Enel SpA	Italy	0.37	0.03	0.10	50.00	0.13	0.53	38270742.01	1.00	0	2.78	0.15	0.71	27.00
2012	Enel SpA	Italy	0.37	0.01	0.09	51.00	-0.02	0.54	########	1.00	0	3.04	0.16	-2.98	26.00
2013	Enel SpA	Italy	0.35	0.03	0.08	52.00	-0.10	0.56	41023531.92	1.00	0	1.22	0.15	-1.84	27.00
2014	Enel SpA	Italy	0.34	0.00	0.10	53.00	-0.04	0.57	########	1.00	0	0.24	0.13	0.00	31.00
2015	Enel SpA	Italy	0.33	0.02	0.11	54.00	-0.16	0.59	########	1.00	0	0.04	0.10	0.78	28.00
2016	Enel SpA	Italy	0.33	0.02	0.13	55.00	-0.06	0.64	########	1.00	0	-0.09	0.09	1.29	26.00
2017	Enel SpA	Italy	0.33	0.03	0.15	56.00	-0.11	0.70	########	1.00	0	1.23	0.10	1.67	24.00

2018	Enel SpA	Italy	0.34	0.04	0.15	57.00	-0.02	0.67	58813565.76	1.00	0	1.14	0.10	0.94	24.00
2019	Enel SpA	Italy	0.36	0.02	0.17	58.00	-0.05	0.80	80586301.23	1.00	0	0.61	0.67	0.29	23.00
2020	Enel SpA	Italy	0.36	0.02	0.20	59.00	-0.09	0.89	########	1.00	0	-0.14	0.86	-8.87	
2004	Polenergia SA	Poland	0.67	0.02	0.11	7.00				0.00	1	3.38	0.06	4.98	18.50
2005	Polenergia SA	Poland	0.67	0.03	1.10	8.00	0.03	1.00	52675.09	0.00	1	2.18	0.06	3.51	18.50
2006	Polenergia SA	Poland	0.68	0.00	1.71	9.00	0.06	1.29	97203.21	0.00	1	1.28	0.07	6.13	17.30
2007	Polenergia SA	Poland	0.64	0.07	0.54	10.00	2.90	1.94	279900.20	0.00	1	2.46	0.08	7.06	16.50
2008	Polenergia SA	Poland	0.61	0.06	0.07	11.00	0.11	1.25	125702.14	0.00	1	4.16	0.12	4.20	18.90
2009	Polenergia SA	Poland	0.58	0.08	0.18	12.00	-0.09	1.45	222162.09	0.00	1	3.80	0.12	2.83	18.10
2010	Polenergia SA	Poland	0.53	0.08	0.74	13.00	0.80	1.29	223831.49	0.00	1	2.58	0.12	3.74	17.40
2011	Polenergia SA	Poland	0.52	0.03	1.55	14.00	-0.17	0.76	117354.11	0.00	1	4.24	0.13	4.76	17.80
2012	Polenergia SA	Poland	0.34	0.02	0.44	15.00	-0.39	0.69	198298.34	0.00	1	3.56	0.11	1.32	16.40
2013	Polenergia SA	Poland	0.34	0.01	0.99	16.00	0.11	0.75	197875.06	0.00	1	0.99	0.11	1.13	17.30
2014	Polenergia SA	Poland	0.29	0.02	0.51	17.00	7.59	0.59	385311.32	0.00	1	0.05	0.10	3.38	11.68
2015	Polenergia SA	Poland	0.36	0.02	0.25	18.00	1.35	0.61	322006.57	0.00	1	-0.87	0.09	4.24	11.41
2016	Polenergia SA	Poland	0.38	-0.04	0.03	19.00	0.10	0.41	116257.04	0.00	1	-0.66	0.08	3.14	11.25
2017	Polenergia SA	Poland	0.38	-0.03	0.01	20.00	-0.05	0.47	158619.63	0.00	1	2.08	0.07	4.83	10.73
2018	Polenergia SA	Poland	0.30	0.00	0.01	21.00	0.31	0.50	249108.84	0.00	1	1.81	0.08	5.35	10.66
2019	Polenergia SA	Poland	0.35	0.04	0.04	22.00	-0.29	0.72	322286.73	0.00	1	2.23	0.08	4.54	11.82
2020	Polenergia SA	Poland	0.37	0.04	0.20	23.00	-0.32	1.07	660846.06	0.00	1	3.37	0.09	-2.70	
2004	7C Solarparken AG	Germany	0.00	-0.98				0.00		1.00	0	1.67	0.09	1.18	28.40
2005	7C Solarparken AG	Germany	0.01	0.12	0.00	0.00		0.56	73707.00	1.00	0	1.55	0.10	0.73	31.00
2006	7C Solarparken AG	Germany	0.24	-0.09	0.01	1.00	0.20	1.34	41715.00	1.00	0	1.58	0.11	3.82	31.00
2007	7C Solarparken AG	Germany	0.24	-0.01	0.00	2.00	0.50	0.37	98043.00	1.00	0	2.30	0.12	2.98	30.00
2008	7C Solarparken AG	Germany	0.46	-0.01	20.41	3.00	-0.90	0.64	29707.00	1.00	0	2.63	0.14	0.96	30.00
2009	7C Solarparken AG	Germany	0.50	0.02	0.07	4.00	13.63	0.56	105501.00	1.00	0	0.31	0.13	-5.69	26.00
2010	7C Solarparken AG	Germany	0.51	-0.24	0.05	5.00	0.59	0.65	42758.00	1.00	0	1.10	0.12	4.18	28.40

2011	7C Solarparken AG	Germany	0.64	-0.12	0.12	6.00	-0.49	0.74	5746.00	1.00	0	2.08	0.13	3.93	
2012	7C Solarparken AG	Germany	0.80	-0.04	0.00	7.00	-0.75	0.74	13799.00	1.00	0	2.01	0.11	0.42	
2013	7C Solarparken AG	Germany	0.74	0.00	0.21	8.00	-0.59	0.91	13019.00	1.00	0	1.50	0.12	0.44	32.00
2014	7C Solarparken AG	Germany	0.73	0.05	0.12	9.00	0.42	0.96	61327.00	1.00	0	0.91	0.11	2.21	29.00
2015	7C Solarparken AG	Germany	0.69	0.02	0.10	10.00	0.46	0.96	103483.00	1.00	0	0.51	0.09	1.49	27.00
2016	7C Solarparken AG	Germany	0.65	0.02	0.37	11.00	0.19	0.90	116295.00	1.00	0	0.49	0.09	2.23	27.00
2017	7C Solarparken AG	Germany	0.61	0.02	0.08	12.00	0.11	0.88	135606.00	1.00	0	1.51	0.09	2.60	25.80
2018	7C Solarparken AG	Germany	0.61	0.02	0.23	13.00	0.28	0.91	155529.00	1.00	0	1.73	0.09	1.27	25.10
2019	7C Solarparken AG	Germany	0.59	0.02	0.24	14.00	0.01	1.02	240043.19	1.00	0	1.45	0.09	0.56	22.40
2020	7C Solarparken AG	Germany	0.55	0.01	0.08	15.00	0.19	1.16	379169.23	1.00	0	0.51	0.10	-4.90	
2004	Good Energy Group PLC	United Kingdom	0.13	0.01	0.00	5.00				0.00	1	1.39	0.06	2.29	20.10
2005	Good Energy Group PLC	United Kingdom	0.13	0.01	0.00	6.00	0.67	0.75	8824.00	0.00	1	2.09	0.08	2.96	20.50
2006	Good Energy Group PLC	United Kingdom	0.19	0.01	0.01	7.00	0.64	0.83	11113.00	0.00	1	2.46	0.10	2.69	22.20
2007	Good Energy Group PLC	United Kingdom	0.01	0.06	0.02	8.00	0.26	0.50	10081.00	0.00	1	2.39	0.15	2.36	18.50
2008	Good Energy Group PLC	United Kingdom	0.09	0.03	0.02	9.00	0.26	0.43	5718.00	0.00	1	3.52	0.15	-0.28	15.30
2009	Good Energy Group PLC	United Kingdom	0.00	0.04	0.07	10.00	-0.12	0.25	6105.00	0.00	1	1.96	0.14	-4.11	24.50
2010	Good Energy Group PLC	United Kingdom	0.37	0.03	0.53	11.00	0.08	0.61	8040.00	0.00	1	2.49	0.13	2.07	21.00
2011	Good Energy Group PLC	United Kingdom	0.43	0.04	0.10	12.00	0.12	0.58	9069.00	0.00	1	3.86	0.13	1.28	45.60
2012	Good Energy Group PLC	United Kingdom	0.31	0.04	0.01	13.00	0.29	0.65	31765.00	0.00	1	2.57	0.14	1.43	51.70
2013	Good Energy Group PLC	United Kingdom	0.45	0.06	0.23	14.00	0.41	0.73	55612.00	0.00	1	2.29	0.15	2.19	29.30
2014	Good Energy Group PLC	United Kingdom	0.58	0.03	0.32	15.00	0.50	0.80	48207.00	0.00	1	1.45	0.17	2.86	
2015	Good Energy Group PLC	United Kingdom	0.66	0.00	0.28	16.00	0.04	0.93	45265.00	0.00	1	0.37	0.13	2.36	
2016	Good Energy Group PLC	United Kingdom	0.59	0.02	0.06	17.00	0.23	0.96	55695.00	0.00	1	1.01	0.11	1.72	
2017	Good Energy Group PLC	United Kingdom	0.57	0.01	0.05	18.00	0.11	0.71	40735.00	0.00	1	2.56	0.10	1.74	
2018	Good Energy Group PLC	United Kingdom	0.51	0.01	0.00	19.00	0.16	0.51	19763.00	0.00	1	2.29	0.12	1.25	
2019	Good Energy Group PLC	United Kingdom	0.51	0.01	0.02	20.00	0.02	0.70	46500.70	0.00	1	1.74	0.11	1.37	
2020	Good Energy Group PLC	United Kingdom	0.43	0.00	0.00	21.00	0.06	0.52	40505.72	0.00	1	0.99	0.12	-9.79	

2004	Terna Energy SA	Greece	0.36		0.86	7.00				1.00	0	2.90	0.08	5.06	97.00
2005	Terna Energy SA	Greece	0.46	0.02	0.95	8.00	-0.48			1.00	0	3.55	0.08	0.60	97.00
2006	Terna Energy SA	Greece	0.40	0.05	0.98	9.00	1.13			1.00	0	3.20	0.08	5.65	94.60
2007	Terna Energy SA	Greece	0.21	0.04	0.88	10.00	0.58	1.36	988931.03	1.00	0	2.90	0.10	3.27	91.60
2008	Terna Energy SA	Greece	0.26	0.04	1.14	11.00	0.31	0.49	483768.80	1.00	0	4.15	0.13	-0.34	91.60
2009	Terna Energy SA	Greece	0.30	0.03	1.51	12.00	-0.05	0.99	750710.66	1.00	0	1.21	0.13	-4.30	91.80
2010	Terna Energy SA	Greece	0.30	0.02	1.03	13.00	-0.23	0.48	336395.38	1.00	0	4.71	0.11	-5.48	85.10
2011	Terna Energy SA	Greece	0.33	0.02	2.56	14.00	0.35	0.30	149619.36	1.00	0	3.33	0.13	-10.15	
2012	Terna Energy SA	Greece	0.36	0.01	1.78	15.00	0.50	0.55	373591.94	1.00	0	1.50	0.13	-7.08	77.00
2013	Terna Energy SA	Greece	0.34	0.00	0.26	16.00	0.16	0.61	467767.14	1.00	0	-0.92	0.14	-2.74	67.50
2014	Terna Energy SA	Greece	0.37	0.01	0.37	17.00	0.13	0.40	230758.32	1.00	0	-1.31	0.14	0.70	60.25
2015	Terna Energy SA	Greece	0.40	0.01	0.43	18.00	0.05	0.47	258348.46	1.00	0	-1.74	0.11	-0.41	60.25
2016	Terna Energy SA	Greece	0.46	0.02	0.64	19.00	0.13	0.56	290550.90	1.00	0	-0.83	0.10	-0.49	60.25
2017	Terna Energy SA	Greece	0.49	0.02	0.83	20.00	0.25	0.66	470811.82	1.00	0	1.12	0.10	1.28	55.18
2018	Terna Energy SA	Greece	0.49	0.03	0.37	21.00	0.10	0.79	704472.65	1.00	0	0.63	0.09	1.56	51.10
2019	Terna Energy SA	Greece	0.48	0.03	0.57	22.00	-0.03	0.77	955542.90	1.00	0	0.25	0.09	1.86	51.26
2020	Terna Energy SA	Greece	0.49	0.04	0.32	23.00	0.12	1.12	1867717.00	1.00	0	-1.25	0.09	-8.25	
2004	PannErgy Nyrt	Hungary	0.26	-0.06	0.04	13.00	0.12	0.45	27041.59	1.00	0	6.74	0.08	4.82	35.40
2005	PannErgy Nyrt	Hungary	0.25	-0.01	0.08	14.00	-0.01	0.53	38306.75	1.00	0	3.56	0.09	4.24	38.70
2006	PannErgy Nyrt	Hungary	0.22	0.04	0.12	15.00	-0.41	0.82	75104.77	1.00	0	3.93	0.09	4.03	41.70
2007	PannErgy Nyrt	Hungary	0.28	0.01	0.18	16.00	-0.05	1.56	186409.59	1.00	0	7.96	0.12	0.24	40.90
2008	PannErgy Nyrt	Hungary	0.30	-0.13	0.18	17.00	0.04	1.02	72380.86	1.00	0	6.04	0.17	1.06	42.00
2009	PannErgy Nyrt	Hungary	0.28	0.00	0.11	18.00	-0.17	1.09	78005.88	1.00	0	4.21	0.17	-6.70	43.10
2010	PannErgy Nyrt	Hungary	0.27	0.00	0.25	19.00	0.16	1.08	79003.37	1.00	0	4.86	0.14	1.12	42.10
2011	PannErgy Nyrt	Hungary	0.11	0.06	0.19	20.00	0.30	0.69	45195.78	1.00	0	3.93	0.13	1.94	44.10
2012	PannErgy Nyrt	Hungary	0.13	-0.03	5.48	21.00	-0.96	0.73	48060.58	1.00	0	5.65	0.12	-1.38	47.10
2013	PannErgy Nyrt	Hungary	0.18	-0.05	2.38	22.00	0.70	0.53	29113.76	1.00	0	1.73	0.12	1.86	52.90

2014	PannErgy Nyrt	Hungary	0.23	-0.03	1.49	23.00	0.72	0.51	21610.40	1.00	0	-0.23	0.11	4.23	28.05
2015	PannErgy Nyrt	Hungary	0.37	0.00	3.26	24.00	-0.01	0.56	22576.73	1.00	0	-0.06	0.09	3.82	29.80
2016	PannErgy Nyrt	Hungary	0.39	-0.01	0.29	25.00	0.65	0.71	27208.81	1.00	0	0.39	0.08	2.14	27.66
2017	PannErgy Nyrt	Hungary	0.40	0.02	0.11	26.00	0.07	0.84	45825.30	1.00	0	2.35	0.07	4.32	23.66
2018	PannErgy Nyrt	Hungary	0.38	0.02	0.34	27.00	0.01	0.90	49893.81	1.00	0	2.85	0.09	5.40	42.42
2019	PannErgy Nyrt	Hungary	0.39	0.03	0.38	28.00	0.12	0.87	44677.38	1.00	0	3.34	0.63	4.64	39.91
2020	PannErgy Nyrt	Hungary	0.44	0.01	0.25	29.00	-0.01	0.89	43193.84	1.00	0	3.33	0.96	-4.96	
2004	DGB Group NV	Netherlands	0.22	0.06	0.06	53.00	-0.04	0.30	41808.57	1.00	0	1.26		1.98	
2005	DGB Group NV	Netherlands	0.28	0.04	0.09	54.00	-0.01	0.39	49242.34	1.00	0	1.69	0.10	2.05	
2006	DGB Group NV	Netherlands	0.26	0.02	0.03	55.00	0.00	0.36	46907.10	1.00	0	1.10	0.11	3.46	
2007	DGB Group NV	Netherlands	0.19	0.02	0.06	56.00	0.00	0.28	40838.88	1.00	0	1.61	0.12	3.77	
2008	DGB Group NV	Netherlands	0.25	0.00	0.06	57.00	-0.01	0.30	20992.82	1.00	0	2.49	0.13	2.17	
2009	DGB Group NV	Netherlands	0.25	-0.10	0.06	58.00	-0.12	0.28	12798.47	1.00	0	1.19	0.13	-3.67	
2010	DGB Group NV	Netherlands	0.37	-0.09	0.05	59.00	-0.21	0.42	16048.43	1.00	0	1.28	0.11	1.34	
2011	DGB Group NV	Netherlands	0.35	0.00	0.03	60.00	0.04	0.39	10008.28	1.00	0	2.34	0.12	1.55	
2012	DGB Group NV	Netherlands	0.40	-0.15	0.02	61.00	-0.15	0.43	7855.80	1.00	0	2.46	0.11	-1.03	
2013	DGB Group NV	Netherlands	0.37	-0.02	0.02	62.00	-0.05	0.40	6253.92	1.00	0	2.51	0.11	-0.13	
2014	DGB Group NV	Netherlands	0.40	-0.11	0.01	63.00	-0.09	0.42	3977.58	1.00	0	0.98	0.10	1.42	
2015	DGB Group NV	Netherlands	0.00	-0.28	0.03	64.00	-0.62	7.41	7325.15	1.00	0	0.60	0.08	1.96	
2016	DGB Group NV	Netherlands	0.00	-0.31		65.00		12.85	9702.66	1.00	0	0.32	0.07	2.19	
2017	DGB Group NV	Netherlands	0.14	-0.08	0.02	66.00		0.58	11696.12	1.00	0	1.38	0.07	2.91	
2018	DGB Group NV	Netherlands	0.00	0.02	0.06	67.00	0.11	0.29	7208.23	1.00	0	1.70	0.07	2.36	
2019	DGB Group NV	Netherlands	0.28	-0.15	0.14	68.00	-0.92	0.78	8308.62	1.00	0	2.63	0.08	1.68	
2020	DGB Group NV	Netherlands	0.02	0.03	0.04	69.00	0.27	1.05	8046.23	1.00	0	1.27	0.08	-3.74	
2006	Voltalia SA	France	0.12		444.29	1.00		2.51	40197.38	1.00	0	1.68	0.07	2.45	88.70
2007	Voltalia SA	France	0.16	#REF!	5.23	2.00	45.33	1.96	109065.18	1.00	0	1.49	0.07	2.42	88.00
2008	Voltalia SA	France	0.33	#REF!	15.11	3.00	0.91	0.63	48683.88	1.00	0	2.81	0.08	0.25	87.30

2009	Voltalia SA	France	0.25	#REF!	1.14	4.00	3.80	0.77	115551.47	1.00	0	0.09	0.09	-2.87	87.30
2010	Voltalia SA	France	0.36	#REF!	8.75	5.00	-0.15	0.61	63358.82	1.00	0	1.53	0.09	1.95	86.50
2011	Voltalia SA	France	0.44	#REF!	1.34	6.00	1.04	0.43	17137.03	1.00	0	2.11	0.10	2.19	86.00
2012	Voltalia SA	France	0.32	#REF!	1.34	7.00	0.12	0.52	96639.15	1.00	0	1.95	0.09	0.31	86.00
2013	Voltalia SA	France	0.51	#REF!	3.71	8.00	0.31	0.66	72795.73	1.00	0	0.86	0.10	0.58	83.80
2014	Voltalia SA	France	0.49	#REF!	9.76	9.00	0.56	0.83	214745.51	1.00	0	0.51	0.10	0.96	76.50
2015	Voltalia SA	France	0.55	#REF!	3.34	10.00	0.80	1.00	254247.22	1.00	0	0.04	0.08	1.11	74.90
2016	Voltalia SA	France	0.44	#REF!	1.22	11.00	0.87	0.84	441684.24	1.00	0	0.18	0.08	1.10	71.60
2017	Voltalia SA	France	0.46	#REF!	0.42	12.00	0.39	0.99	594929.58	1.00	0	1.03	0.08	2.29	70.60
2018	Voltalia SA	France	0.51	#REF!	0.29	13.00	0.77	0.88	477140.02	1.00	0	1.85	0.08	1.79	67.20
2019	Voltalia SA	France	0.41	#REF!	0.85	14.00	0.05	1.06	1394341.20	1.00	0	1.11	0.09	1.51	65.59
2020	Voltalia SA	France	0.47	#REF!	0.93	15.00	0.11	1.76	3009089.45	1.00	0	0.48	0.09	-8.11	
2004	Societe Electrique de l'Our SA	Luxembourg	0.12	0.04	0.00	53.00	0.16	0.66	58.95	1.00	0	2.23	0.09	3.61	80.90
2005	Societe Electrique de l'Our SA	Luxembourg	0.11	0.03	0.00	54.00	-0.01	0.69	60.12	1.00	0	2.49	0.09	3.17	
2006	Societe Electrique de l'Our SA	Luxembourg	0.11	0.04	0.00	55.00	0.06	0.80	66.93	1.00	0	2.67	0.11	5.18	
2007	Societe Electrique de l'Our SA	Luxembourg	0.09	0.01	0.00	56.00	-0.05	0.71	73.70	1.00	0	2.31	0.13	8.35	
2008	Societe Electrique de l'Our SA	Luxembourg	0.45	0.02	0.18	57.00	0.15	0.93	70.58	1.00	0	3.40	0.14	-1.28	
2009	Societe Electrique de l'Our SA	Luxembourg	0.46	0.01	0.06	58.00	0.28	0.98	79.68	1.00	0	0.37	0.15	-4.36	
2010	Societe Electrique de l'Our SA	Luxembourg	0.66	0.05	0.05	59.00	-0.12	1.07	87.08	1.00	0	2.27	0.13	4.86	85.40
2011	Societe Electrique de l'Our SA	Luxembourg	0.72	0.00	0.28	60.00	-0.14	1.06	98.81	1.00	0	3.41	0.13	2.54	82.00
2012	Societe Electrique de l'Our SA	Luxembourg	0.74	0.00	0.27	61.00	0.05	0.96	90.90	1.00	0	2.66	0.13	-0.35	81.80
2013	Societe Electrique de l'Our SA	Luxembourg	0.78	0.00	0.03	62.00	-0.10	1.02	118.31	1.00	0	1.73	0.13	3.65	58.40
2014	Societe Electrique de l'Our SA	Luxembourg	0.79	0.00	0.07	63.00	-0.01	0.98	82.42	1.00	0	0.63	0.12	4.30	51.72
2015	Societe Electrique de l'Our SA	Luxembourg	0.74	0.01	0.02	64.00	0.05	0.91	66.80	1.00	0	0.47	0.09	4.31	51.65
2016	Societe Electrique de l'Our SA	Luxembourg	0.71	0.01	0.12	65.00	-0.20	0.85	57.05	1.00	0	0.29	0.09	4.57	21.33
2017	Societe Electrique de l'Our SA	Luxembourg	0.06	0.02	0.05	66.00	0.12	0.30	97.36	1.00	0	1.73	0.08	1.80	20.73
2018	Societe Electrique de l'Our SA	Luxembourg	0.06	0.02	0.04	67.00	0.05	0.20	59.08	1.00	0	1.53	0.09	3.11	20.78

2019	Societe Electrique de l'Our SA	Luxembourg	0.06	0.01	0.07	68.00	-0.06	0.22	62.70	1.00	0	1.74	0.09	2.30	18.10
2020	Societe Electrique de l'Our SA	Luxembourg	0.06	0.01	0.03	69.00	0.07	0.26	97.64	1.00	0	0.82	0.09	-1.31	
2004	Eolus Vind AB (publ)	Sweden	0.10		0.20	14.00				0.00	1	0.37	0.07	4.34	47.00
2005	Eolus Vind AB (publ)	Sweden	0.02	0.02	0.41	15.00	-0.82			0.00	1	0.45	0.06	2.86	47.00
2006	Eolus Vind AB (publ)	Sweden	0.00	0.05	0.10	16.00	5.35			0.00	1	1.36	0.08	4.66	45.00
2007	Eolus Vind AB (publ)	Sweden	0.25	0.08	0.22	17.00	1.12			0.00	1	2.21	0.09	3.44	45.00
2008	Eolus Vind AB (publ)	Sweden	0.15	0.11	0.16	18.00	0.62			0.00	1	3.44	0.11	-0.45	45.20
2009	Eolus Vind AB (publ)	Sweden	0.17	0.08	0.05	19.00	0.33	0.56	65406.56	0.00	1	-0.49	0.09	-4.34	44.00
2010	Eolus Vind AB (publ)	Sweden	0.18	0.09	0.15	20.00	1.08	0.57	89780.09	0.00	1	1.16	0.11	5.95	42.00
2011	Eolus Vind AB (publ)	Sweden	0.15	0.10	0.05	21.00	0.28	0.55	144068.14	0.00	1	2.96	0.12	3.20	41.00
2012	Eolus Vind AB (publ)	Sweden	0.25	0.02	0.12	22.00	0.11	0.47	71323.47	0.00	1	0.89	0.10	-0.59	44.00
2013	Eolus Vind AB (publ)	Sweden	0.17	0.08	0.00	23.00	-0.34	0.29	81842.40	0.00	1	-0.04	0.10	1.19	44.80
2014	Eolus Vind AB (publ)	Sweden	0.26	0.01	0.00	24.00	-0.61	0.51	79642.78	0.00	1	-0.18	0.09	2.66	42.20
2015	Eolus Vind AB (publ)	Sweden	0.15	0.05	0.00	25.00	1.63	0.44	72029.76	0.00	1	-0.05	0.07	4.49	42.90
2016	Eolus Vind AB (publ)	Sweden	0.06	-0.02	0.00	26.00	-0.56	0.28	57587.28	0.00	1	0.98	0.07	2.07	44.20
2017	Eolus Vind AB (publ)	Sweden	0.04	0.02	0.01	27.00	0.47	0.41	67782.44	0.00	1	1.79	0.07	2.57	35.10
2018	Eolus Vind AB (publ)	Sweden	0.19	0.14	0.00	28.00	0.33	0.31	104557.88	0.00	1	1.95	0.08	1.95	34.30
2019	Eolus Vind AB (publ)	Sweden	0.15	0.07	0.05	29.00	0.36	0.56	199658.15	0.00	1	1.78	0.08	1.37	32.00
2020	Eolus Vind AB (publ)	Sweden	0.21	0.10	0.01	30.00	0.21	3.09	717960.81	0.00	1	0.50	0.07	-2.82	
2004	Acciona SA	Spain	0.12	0.03	0.17	7.00		0.30	5585547.04	1.00	0	3.04	0.07	3.12	36.00
2005	Acciona SA	Spain	0.15	0.03	0.18	8.00	0.21	0.52	7068052.11	1.00	0	3.37	0.09	3.65	35.00
2006	Acciona SA	Spain	0.47	0.09	1.26	9.00	0.29	0.81	11582760.83	1.00	0	3.52	0.09	4.10	31.00
2007	Acciona SA	Spain	0.42	0.03	0.24	10.00	0.41	0.79	19639743.80	1.00	0	2.79	0.10	3.60	31.00
2008	Acciona SA	Spain	0.49	0.01	0.36	11.00	0.03	0.60	7715563.41	1.00	0	4.08	0.14	0.89	22.20
2009	Acciona SA	Spain	0.35	0.01	0.57	12.00	-0.15	0.57	8094088.64	1.00	0	-0.29	0.15	-3.76	32.90
2010	Acciona SA	Spain	0.26	0.01	0.16	13.00	-0.13	0.35	4272494.28	1.00	0	1.80	0.14	0.16	24.00
2011	Acciona SA	Spain	0.35	0.01	0.15	14.00	0.00	0.45	5005925.91	1.00	0	3.20	0.15	-0.81	23.50

2012	Acciona SA	Spain	0.44	0.01	0.11	15.00	-0.02	0.53	3780045.52	1.00	0	2.45	0.15	-2.96	23.80
2013	Acciona SA	Spain	0.48	-0.12	0.06	16.00	-0.08	0.55	3278967.27	1.00	0	1.41	0.15	-1.44	22.00
2014	Acciona SA	Spain	0.43	0.01	0.06	17.00	0.03	0.54	3856466.84	1.00	0	-0.15	0.15	1.38	23.42
2015	Acciona SA	Spain	0.45	0.01	0.03	18.00	-0.16	0.63	4889979.16	1.00	0	-0.50	0.12	3.84	24.65
2016	Acciona SA	Spain	0.41	0.02	0.13	19.00	-0.09	0.56	4192393.99	1.00	0	-0.20	0.11	3.03	22.50
2017	Acciona SA	Spain	0.42	0.01	0.11	20.00	0.24	0.57	4669847.08	1.00	0	1.96	0.11	2.97	22.26
2018	Acciona SA	Spain	0.44	0.02	0.09	21.00	0.08	0.60	4607090.19	1.00	0	1.68	0.12	2.43	23.53
2019	Acciona SA	Spain	0.46	0.02	0.18	22.00	-0.09	0.63	5726253.97	1.00	0	0.70	0.10	1.95	22.79
2020	Acciona SA	Spain	0.40	0.02	0.14	23.00	-0.08	0.63	7776229.15	1.00	0	-0.32	0.10	-10.84	
2004	Nordex	Germany	0.20		0.05	19.00	-0.64			1.00	0	1.67	0.09	1.18	28.40
2005	Nordex	Germany	0.03	-0.04	0.03	20.00	4.00	1.21	38939.07	1.00	0	1.55	0.10	0.73	31.00
2006	Nordex	Germany	0.00	0.04	0.04	21.00	0.68	1.64	1167504.42	1.00	0	1.58	0.11	3.82	31.00
2007	Nordex	Germany	0.01	0.08	0.04	22.00	0.59	2.70	3076762.56	1.00	0	2.30	0.12	2.98	30.00
2008	Nordex	Germany	0.03	0.06	0.06	23.00	0.62	0.67	934362.33	1.00	0	2.63	0.14	0.96	30.00
2009	Nordex	Germany	0.12	0.03	0.05	24.00	-0.01	0.76	1002888.50	1.00	0	0.31	0.13	-5.69	26.00
2010	Nordex	Germany	0.13	0.02	0.08	25.00	-0.22	0.36	492251.80	1.00	0	1.10	0.12	4.18	28.40
2011	Nordex	Germany	0.24	-0.05	0.05	26.00	-0.01	0.31	375977.14	1.00	0	2.08	0.13	3.93	
2012	Nordex	Germany	0.21	-0.08	0.05	27.00	0.08	0.16	278571.82	1.00	0	2.01	0.11	0.42	
2013	Nordex	Germany	0.16	0.01	0.05	28.00	0.37	0.53	1010244.70	1.00	0	1.50	0.12	0.44	32.00
2014	Nordex	Germany	0.13	0.03	0.04	29.00	0.21	0.85	1661594.14	1.00	0	0.91	0.11	2.21	29.00
2015	Nordex	Germany	0.14	0.04	0.03	30.00	0.17	1.59	2949557.19	1.00	0	0.51	0.09	1.49	27.00
2016	Nordex	Germany	0.22	0.04	0.03	31.00	0.39	0.66	2195784.14	1.00	0	0.49	0.09	2.23	27.00
2017	Nordex	Germany	0.24	0.00	0.05	32.00	-0.08	0.33	983088.49	1.00	0	1.51	0.09	2.60	25.80
2018	Nordex	Germany	0.21	-0.03	0.05	33.00	-0.16	0.25	859535.81	1.00	0	1.73	0.09	1.27	25.10
2019	Nordex	Germany	0.18	-0.02	0.05	34.00	0.27	0.37	1465005.83	1.00	0	1.45	0.09	0.56	22.40
2020	Nordex	Germany	0.21	-0.03	0.04	35.00	0.44	0.62	2920580.72	1.00	0	0.51	0.10	-4.90	
2004	Vestas Wind Systems A/S	Denmark	0.20	-0.03	0.05	18.00	0.57	0.69	2169520.83	1.00	0	1.15	0.08	2.67	36.00

2005	Vestas Wind Systems A/S	Denmark	0.16	-0.06	0.04	19.00	0.52	0.91	2874771.69	1.00	0	1.82	0.08	2.34	33.00
2006	Vestas Wind Systems A/S	Denmark	0.05	0.03	0.05	20.00	0.09	1.55	7829428.51	1.00	0	1.92	0.10	3.91	54.00
2007	Vestas Wind Systems A/S	Denmark	0.03	0.07	0.07	21.00	0.38	3.04	19934652.06	1.00	0	1.69	0.09	0.91	47.00
2008	Vestas Wind Systems A/S	Denmark	0.02	0.10	0.11	22.00	0.33	1.28	11570649.43	1.00	0	3.42	0.11	-0.51	56.00
2009	Vestas Wind Systems A/S	Denmark	0.04	0.02	0.16	23.00	-0.20	1.07	12379738.87	1.00	0	1.30	0.09	-4.91	47.00
2010	Vestas Wind Systems A/S	Denmark	0.13	0.02	0.11	24.00	0.30	0.76	6416141.16	1.00	0	2.31	0.10	1.87	46.00
2011	Vestas Wind Systems A/S	Denmark	0.12	-0.02	0.13	25.00	-0.11	0.29	2183421.61	1.00	0	2.76	0.10	1.34	42.00
2012	Vestas Wind Systems A/S	Denmark	0.25	-0.13	0.05	26.00	0.14	0.25	1140223.01	1.00	0	2.40	0.08	0.23	37.00
2013	Vestas Wind Systems A/S	Denmark	0.11	-0.01	0.04	27.00	-0.13	0.77	5956300.73	1.00	0	0.79	0.09	0.93	41.00
2014	Vestas Wind Systems A/S	Denmark	0.09	0.06	0.04	28.00	0.13	0.79	8124393.44	1.00	0	0.56	0.09	1.62	38.20
2015	Vestas Wind Systems A/S	Denmark	0.06	0.09	0.04	29.00	0.02	1.41	15411636.45	1.00	0	0.45	0.06	2.34	37.22
2016	Vestas Wind Systems A/S	Denmark	0.05	0.10	0.05	30.00	0.21	1.06	13890855.96	1.00	0	0.25	0.07	3.25	36.60
2017	Vestas Wind Systems A/S	Denmark	0.05	0.09	0.05	31.00	-0.01	0.83	14075600.59	1.00	0	1.15	0.07	2.82	36.21
2018	Vestas Wind Systems A/S	Denmark	0.04	0.06	0.06	32.00	0.06	0.86	14910849.02	1.00	0	0.81	0.07	2.18	32.71
2019	Vestas Wind Systems A/S	Denmark	0.06	0.05	0.06	33.00	0.14	1.08	19739507.72	1.00	0	0.76	0.07	2.85	32.40
2020	Vestas Wind Systems A/S	Denmark	0.07	0.05	0.05	34.00	0.24	2.04	47462312.47	1.00	0	0.42	0.07	-2.73	
2004	Siemens Gamesa Renewable Energy SA	Spain	0.41	0.07	0.09	28.00	-0.08	1.25	2880462.64	1.00	0	3.04	0.07	3.12	36.00
2005	Siemens Gamesa Renewable Energy SA	Spain	0.35	0.06	0.09	29.00	0.32	1.11	3457465.00	1.00	0	3.37	0.09	3.65	35.00
2006	Siemens Gamesa Renewable Energy SA	Spain	0.24	0.06	0.08	30.00	0.38	1.43	5838683.61	1.00	0	3.52	0.09	4.10	31.00
2007	Siemens Gamesa Renewable Energy SA	Spain	0.19	0.03	0.03	31.00	0.31	1.68	9772231.08	1.00	0	2.79	0.10	3.60	31.00
2008	Siemens Gamesa Renewable Energy SA	Spain	0.10	0.04	0.04	32.00	0.42	0.57	4147963.30	1.00	0	4.08	0.14	0.89	22.20
2009	Siemens Gamesa Renewable Energy SA	Spain	0.22	0.02	0.04	33.00	-0.21	0.59	3644276.01	1.00	0	-0.29	0.15	-3.76	32.90
2010	Siemens Gamesa Renewable Energy SA	Spain	0.16	0.01	0.05	34.00	-0.18	0.22	1696769.03	1.00	0	1.80	0.14	0.16	24.00
2011	Siemens Gamesa Renewable Energy SA	Spain	0.24	0.01	0.08	35.00	0.15	0.24	1008079.75	1.00	0	3.20	0.15	-0.81	23.50
2012	Siemens Gamesa Renewable Energy SA	Spain	0.27	-0.09	0.08	36.00	-0.18	0.16	494998.62	1.00	0	2.45	0.15	-2.96	23.80
2013	Siemens Gamesa Renewable Energy SA	Spain	0.27	0.01	0.06	37.00	-0.09	0.45	2335544.38	1.00	0	1.41	0.15	-1.44	22.00
2014	Siemens Gamesa Renewable Energy SA	Spain	0.15	0.02	0.04	38.00	0.22	0.36	2325379.93	1.00	0	-0.15	0.15	1.38	23.42

2015	Siemens Gamesa Renewable Energy SA	Spain	0.12	0.04	0.05	39.00	0.03	0.80	4484093.64	1.00	0	-0.50	0.12	3.84	24.65
2016	Siemens Gamesa Renewable Energy SA	Spain	0.00	0.09	0.06	40.00	0.75	1.00	5507176.40	1.00	0	-0.20	0.11	3.03	22.50
2017	Siemens Gamesa Renewable Energy SA	Spain	0.08	-	0.06	41.00	0.07	0.43	8462827.22	1.00	0	1.96	0.11	2.97	22.26
2018	Siemens Gamesa Renewable Energy SA	Spain	0.31	0.00	0.05	42.00	0.49	0.42	8735077.12	1.00	0	1.68	0.12	2.43	23.53
2019	Siemens Gamesa Renewable Energy SA	Spain	0.14	0.01	0.05	43.00	0.06	0.45	9538922.58	1.00	0	0.70	0.10	1.95	22.79
2020	Siemens Gamesa Renewable Energy SA	Spain	0.34	-0.06	0.06	44.00	-0.08	0.96	17557945.18	1.00	0	-0.32	0.09	-10.84	
2004	PNE AG	Germany	0.50	-0.61	0.11	10.00	-0.18	0.64	33953.63	1.00	0	1.67	0.09	1.18	28.40
2005	PNE AG	Germany	0.65	-0.02	0.03	11.00	0.17	0.79	24812.16	1.00	0	1.55	0.10	0.73	31.00
2006	PNE AG	Germany	0.51	-0.05	0.02	12.00	0.31	1.12	105314.86	1.00	0	1.58	0.11	3.82	31.00
2007	PNE AG	Germany	0.43	0.09	0.19	13.00	-0.38	1.33	176740.43	1.00	0	2.30	0.12	2.98	30.00
2008	PNE AG	Germany	0.62	0.09	0.08	14.00	0.59	0.80	112257.21	1.00	0	2.63	0.14	0.96	30.00
2009	PNE AG	Germany	0.36	0.05	0.26	15.00	0.75	0.59	113316.30	1.00	0	0.31	0.13	-5.69	26.00
2010	PNE AG	Germany	0.41	0.04	0.18	16.00	-0.55	0.56	92142.86	1.00	0	1.10	0.12	4.18	28.40
2011	PNE AG	Germany	0.44	-0.03	0.32	17.00	-0.22	0.77	117783.96	1.00	0	2.08	0.13	3.93	
2012	PNE AG	Germany	0.41	0.08	0.15	18.00	0.60	0.76	131805.56	1.00	0	2.01	0.11	0.42	
2013	PNE AG	Germany	0.49	0.12	0.02	19.00	0.76	0.67	203662.86	1.00	0	1.50	0.12	0.44	32.00
2014	PNE AG	Germany	0.44	-0.04	0.02	20.00	0.46	0.65	208648.19	1.00	0	0.91	0.11	2.21	29.00
2015	PNE AG	Germany	0.53	0.00	0.03	21.00	-0.57	0.65	165281.91	1.00	0	0.51	0.09	1.49	27.00
2016	PNE AG	Germany	0.27	0.15	0.44	22.00	1.26	0.31	184591.28	1.00	0	0.49	0.09	2.23	27.00
2017	PNE AG	Germany	0.36	0.03	0.61	23.00	-0.53	0.40	247777.91	1.00	0	1.51	0.09	2.60	25.80
2018	PNE AG	Germany	0.35	-0.01	0.05	24.00	-0.16	0.45	219417.79	1.00	0	1.73	0.09	1.27	25.10
2019	PNE AG	Germany	0.43	0.00	0.59	25.00	0.38	0.76	343433.68	1.00	0	1.45	0.09	0.56	22.40
2020	PNE AG	Germany	0.55	0.00	0.13	26.00	-0.16	1.29	696032.82	1.00	0	0.51	0.10	-4.90	
2008	ABO Wind AG	Germany	0.60	-		12.00				1.00	0	2.63	0.14	0.96	30.00
2009	ABO Wind AG	Germany	0.05	0.02		13.00	-0.32			1.00	0	0.31	0.13	-5.69	26.00
2010	ABO Wind AG	Germany	0.11	0.08		14.00	0.46			1.00	0	1.10	0.12	4.18	28.40
2011	ABO Wind AG	Germany	0.11	0.07	0.01	15.00	1.68			1.00	0	2.08	0.13	3.93	

2012	ABO Wind AG	Germany	0.11	0.11	0.02	16.00	-0.19			1.00	0	2.01	0.11	0.42	
2013	ABO Wind AG	Germany	0.13	0.04	0.01	17.00	0.35			1.00	0	1.50	0.12	0.44	32.00
2014	ABO Wind AG	Germany	0.14	0.05	0.02	18.00	0.10			1.00	0	0.91	0.11	2.21	29.00
2015	ABO Wind AG	Germany	0.25	0.07	0.03	19.00	-0.31			1.00	0	0.51	0.09	1.49	27.00
2016	ABO Wind AG	Germany	0.23	0.12	0.02	20.00	0.52	0.59	59480.87	1.00	0	0.49	0.09	2.23	27.00
2017	ABO Wind AG	Germany	0.22	0.11	0.01	21.00	0.22	0.56	109602.97	1.00	0	1.51	0.09	2.60	25.80
2018	ABO Wind AG	Germany	0.25	0.07	0.01	22.00	0.07	0.77	121009.54	1.00	0	1.73	0.09	1.27	25.10
2019	ABO Wind AG	Germany	0.31	0.05	0.02	23.00	-0.20	0.84	156521.33	1.00	0	1.45	0.09	0.56	22.40
2020	ABO Wind AG	Germany	0.24	0.05	0.01	24.00	0.20	1.72	513522.75	1.00	0	0.51	0.10	-4.90	
2004	Vergnet SA	France	0.23	0.03	0.01	15.00	0.05			1.00	0	2.14	0.07	2.83	25.80
2005	Vergnet SA	France	0.25	-0.09	0.03	16.00	-0.10			1.00	0	1.75	0.07	1.66	25.10
2006	Vergnet SA	France	0.20	0.04	0.02	17.00	0.56			1.00	0	1.68	0.07	2.45	22.40
2007	Vergnet SA	France	0.03	0.01	0.13	18.00	-0.04	1.26	131660.57	1.00	0	1.49	0.07	2.42	88.00
2008	Vergnet SA	France	0.07	-0.11	0.37	19.00	-0.34	0.47	34714.01	1.00	0	2.81	0.08	0.25	87.30
2009	Vergnet SA	France	0.03	-0.15	0.08	20.00	0.33	0.39	63069.88	1.00	0	0.09	0.09	-2.87	87.30
2010	Vergnet SA	France	0.01	-0.09	0.06	21.00	1.70	0.27	33979.58	1.00	0	1.53	0.09	1.95	86.50
2011	Vergnet SA	France	0.14	-0.24	0.02	22.00	-0.14	0.27	22542.81	1.00	0	2.11	0.10	2.19	86.00
2012	Vergnet SA	France	0.20	-0.13	0.00	23.00	0.61	0.22	14656.18	1.00	0	1.95	0.09	0.31	86.00
2013	Vergnet SA	France	0.36	-0.07	0.01	24.00	-0.50	0.48	15654.64	1.00	0	0.86	0.10	0.58	83.80
2014	Vergnet SA	France	0.26	0.20	0.01	25.00	-0.28	0.40	13084.15	1.00	0	0.51	0.10	0.96	76.50
2015	Vergnet SA	France	0.24	-0.03	0.02	26.00	-0.39	1.64	45408.73	1.00	0	0.04	0.08	1.11	74.90
2016	Vergnet SA	France	0.29	-0.19	0.01	27.00	-0.24	1.22	25966.35	1.00	0	0.18	0.08	1.10	71.60
2017	Vergnet SA	France	0.36	-0.21	0.00	28.00	-0.14			1.00	0	1.03	0.08	2.29	70.60
2018	Vergnet SA	France	0.09	0.03	0.02	29.00	0.04	0.44	14913.86	1.00	0	1.85	0.08	1.79	67.20
2019	Vergnet SA	France	0.01	0.01	0.04	30.00	-0.43	0.44	15541.83	1.00	0	1.11	0.09	1.51	65.59
2020	Vergnet SA	France	0.09	-0.06	0.13	31.00	0.39	1.54	59749.62	1.00	0	0.48	0.09	-8.11	
2005	MDI Energia SA	Poland	0.00	0.14		4.00	-0.58	-0.02	1052.03	0.00	1	2.18	0.06	3.51	18.50

2006	MDI Energia SA	Poland	0.06	-0.05	4.42	5.00	-1.00	3.92	-38630.52	0.00	1	1.28	0.07	6.13	17.30
2007	MDI Energia SA	Poland	0.00	-0.03	30.54	6.00	2.36	4.15	344989.11	0.00	1	2.46	0.08	7.06	16.50
2008	MDI Energia SA	Poland	0.00	-0.07	69.04	7.00	2.24	1.57	402324.42	0.00	1	4.16	0.12	4.20	18.90
2009	MDI Energia SA	Poland	0.02	-0.05	16.54	8.00	0.37	0.80	38601.99	0.00	1	3.80	0.12	2.83	18.10
2010	MDI Energia SA	Poland	0.43	-0.04	87.11	9.00	-0.39	1.10	-94505.17	0.00	1	2.58	0.12	3.74	17.40
2011	MDI Energia SA	Poland	0.44	-0.03	0.78	10.00	21.91	0.66	3436017.51	0.00	1	4.24	0.13	4.76	17.80
2012	MDI Energia SA	Poland	0.52	-0.15	0.06	11.00	0.01	0.65	1962.10	0.00	1	3.56	0.11	1.32	16.40
2013	MDI Energia SA	Poland	0.63	-0.15	0.12	12.00	0.67	0.64	83011.07	0.00	1	0.99	0.11	1.13	17.30
2014	MDI Energia SA	Poland	0.31	0.01	0.00	13.00	2.29	0.24	44631.47	0.00	1	0.05	0.10	3.38	11.68
2015	MDI Energia SA	Poland	0.21	-0.02	0.00	14.00	0.44	1.26	76893.98	0.00	1	-0.87	0.09	4.24	11.41
2016	MDI Energia SA	Poland	0.26	0.05		15.00	-0.26	2.04	-66250.04	0.00	1	-0.66	0.08	3.14	11.25
2017	MDI Energia SA	Poland	0.25	0.04	0.00	16.00	0.12	2.05	26019.57	0.00	1	2.08	0.07	4.83	10.73
2018	MDI Energia SA	Poland	0.33	0.01	0.01	17.00	-0.18	1.78	-32143.96	0.00	1	1.81	0.08	5.35	10.66
2019	MDI Energia SA	Poland	0.25	0.00	0.00	18.00	0.23	1.00	29851.98	0.00	1	2.23	0.08	4.54	11.82
2020	MDI Energia SA	Poland	0.28	0.04	0.01	19.00	0.42	1.16	62650.69	0.00	1	3.37	0.09	-2.70	
2005	ABO Group Environment SA	Belgium	0.53		2.35	3.00				0.00	1	2.78	0.09	2.32	85.00
2006	ABO Group Environment SA	Belgium	0.31	0.00	0.58	4.00	1.94			0.00	1	1.79	0.11	2.55	82.30
2007	ABO Group Environment SA	Belgium	0.24	0.01	0.65	5.00	5.02			0.00	1	1.82	0.12	3.68	83.90
2008	ABO Group Environment SA	Belgium	0.44	-0.15	0.65	6.00	0.69	0.66	91120.07	0.00	1	4.49	0.14	0.45	80.00
2009	ABO Group Environment SA	Belgium	0.59	-0.12	0.58	7.00	0.03	0.75	60920.87	0.00	1	-0.05	0.14	-2.02	77.70
2010	ABO Group Environment SA	Belgium	0.55	-0.05	2.46	8.00	-0.94	0.78	24448.66	0.00	1	2.19	0.12	2.86	79.10
2011	ABO Group Environment SA	Belgium	0.19	-0.14	0.34	9.00	0.03	0.41	11119.41	0.00	1	3.53	0.14	1.69	70.70
2012	ABO Group Environment SA	Belgium	0.29	-0.10	0.57	10.00	-0.63	1.49	9823.06	0.00	1	2.84	0.12	0.74	65.80
2013	ABO Group Environment SA	Belgium	0.29	0.02	0.03	11.00	32.16	0.40	7084.56	0.00	1	1.11	0.12	0.46	64.90
2014	ABO Group Environment SA	Belgium	0.23	0.00	0.03	12.00	0.06	2.06	71864.63	0.00	1	0.34	0.12	1.58	46.73
2015	ABO Group Environment SA	Belgium	0.20	0.01	0.03	13.00	-0.09	1.30	40688.28	0.00	1	0.56	0.10	2.04	45.52
2016	ABO Group Environment SA	Belgium	0.23	0.02	0.04	14.00	0.16	0.73	21777.48	0.00	1	1.97	0.10	1.27	40.93

2017	ABO Group Environment SA	Belgium	0.23	0.03	0.01	15.00	0.22	1.08	44373.99	0.00	1	2.13	0.09	1.62	41.26
2018	ABO Group Environment SA	Belgium	0.25	0.01	0.05	16.00	0.05	0.76	29090.94	0.00	1	2.05	0.09	1.79	42.09
2019	ABO Group Environment SA	Belgium	0.37	0.04	0.04	17.00	0.03	0.78	27723.31	0.00	1	1.44	0.09	1.78	39.55
2020	ABO Group Environment SA	Belgium	0.39	0.04	0.05	18.00	0.05	0.97	56535.25	0.00	1	0.74	0.09	-6.28	
2004	Martifer SGPS SA	Portugal	0.40		0.14	0.00				1.00	0	2.37	0.08	1.79	55.80
2005	Martifer SGPS SA	Portugal	0.45	0.03	0.03	1.00	0.19			1.00	0	2.28	0.09	0.78	53.90
2006	Martifer SGPS SA	Portugal	0.42	0.05	0.14	2.00	0.89			1.00	0	3.11	0.10	1.63	54.50
2007	Martifer SGPS SA	Portugal	0.31	0.05	0.11	3.00	1.03	1.29	1189000.24	1.00	0	2.45	0.12	2.51	55.60
2008	Martifer SGPS SA	Portugal	0.51	0.01	0.36	4.00	0.31	0.77	525572.80	1.00	0	2.59	0.11	0.32	48.50
2009	Martifer SGPS SA	Portugal	0.33	0.08	0.24	5.00	-0.09	0.58	478153.73	1.00	0	-0.84	0.13	-3.12	52.40
2010	Martifer SGPS SA	Portugal	0.36	-0.04	0.07	6.00	-0.07	0.46	198213.85	1.00	0	1.40	0.12	1.74	47.20
2011	Martifer SGPS SA	Portugal	0.40	-0.04	0.08	7.00	-0.02	0.46	137362.47	1.00	0	3.65	0.13	-1.70	44.90
2012	Martifer SGPS SA	Portugal	0.42	-0.05	0.09	8.00	-0.13	0.49	72249.14	1.00	0	2.77	0.13	-4.06	37.20
2013	Martifer SGPS SA	Portugal	0.48	-0.07	0.02	9.00	-0.36	0.56	92738.58	1.00	0	0.27	0.13	-0.92	43.90
2014	Martifer SGPS SA	Portugal	0.48	-0.10	0.07	10.00	-0.30	0.43	22120.16	1.00	0	-0.28	0.14	0.79	44.50
2015	Martifer SGPS SA	Portugal	0.50	0.00	0.02	11.00	-0.06	0.42	24105.93	1.00	0	0.49	0.11	1.79	45.80
2016	Martifer SGPS SA	Portugal	0.69	-0.10	0.02	12.00	-0.14	0.53	18401.34	1.00	0	0.61	0.10	2.02	47.60
2017	Martifer SGPS SA	Portugal	0.63	0.01	0.01	13.00	-0.13	0.51	38240.45	1.00	0	1.37	0.09	3.51	48.10
2018	Martifer SGPS SA	Portugal	0.69	0.00	0.01	14.00	0.23	0.59	48223.63	1.00	0	0.99	0.09	2.85	47.50
2019	Martifer SGPS SA	Portugal	0.57	0.07	0.00	15.00	0.16	0.44	41544.49	1.00	0	0.34	0.10	2.49	46.83
2020	Martifer SGPS SA	Portugal	0.52	0.02	0.01	16.00	-0.05	0.49	46575.21	1.00	0	-0.01	0.09	-7.56	
2006	Centrotherm International AG	Germany	0.00		0.00	0.00				1.00	0	1.58	0.11	3.82	31.00
2007	Centrotherm International AG	Germany	0.00	0.09	0.03	1.00	1.55	3.75	1542782.99	1.00	0	2.30	0.12	2.98	30.00
2008	Centrotherm International AG	Germany	0.00	0.07	0.10	2.00	1.41	0.53	612322.62	1.00	0	2.63	0.14	0.96	30.00
2009	Centrotherm International AG	Germany	0.04	0.04	0.10	3.00	0.29	1.08	1292732.43	1.00	0	0.31	0.13	-5.69	26.00
2010	Centrotherm International AG	Germany	0.04	0.07	0.07	4.00	0.17	0.52	763210.80	1.00	0	1.10	0.12	4.18	28.40
2011	Centrotherm International AG	Germany	0.15	-0.02	0.11	5.00	0.18	0.23	268687.07	1.00	0	2.08	0.13	3.93	

2012	Centrotherm International AG	Germany	0.33	-0.57	0.07	6.00	-0.80	0.13	34622.87	1.00	0	2.01	0.11	0.42	
2013	Centrotherm International AG	Germany	0.19	-0.02	0.01	8.00	-0.16	0.16	125105.71	1.00	0	1.50	0.12	0.44	32.00
2014	Centrotherm International AG	Germany	0.24	0.00	0.01	9.00	0.57	0.05	79386.14	1.00	0	0.91	0.11	2.21	29.00
2015	Centrotherm International AG	Germany	0.25	0.03	0.01	10.00	-0.39	0.17	82736.44	1.00	0	0.51	0.09	1.49	27.00
2016	Centrotherm International AG	Germany	0.02	-0.03	0.01	11.00	0.04	-0.04	31592.29	1.00	0	0.49	0.09	2.23	27.00
2017	Centrotherm International AG	Germany	0.00	0.06	0.01	12.00	-0.28	0.03	50519.00	1.00	0	1.51	0.09	2.60	25.80
2018	Centrotherm International AG	Germany	0.12	0.00	0.00	13.00	0.55	0.17	43687.81	1.00	0	1.73	0.09	1.27	25.10
2019	Centrotherm International AG	Germany	0.09	-0.09	0.02	14.00	-0.38	0.44	88724.20	1.00	0	1.45	0.09	0.56	22.40
2020	Centrotherm International AG	Germany	0.07	-0.05	0.01	15.00	0.10	0.18	71333.84	1.00	0	0.51	0.10	-4.90	
2006	AFC Energy PLC	United Kingdom	0.00			0.00		0.00		0.00	1	2.46	0.10	2.69	22.20
2007	AFC Energy PLC	United Kingdom	0.00	-0.79		1.00		3.48	28742.80	0.00	1	2.39	0.15	2.36	18.50
2008	AFC Energy PLC	United Kingdom	0.00	-0.62		2.00		-0.08	5129.06	0.00	1	3.52	0.15	-0.28	15.30
2009	AFC Energy PLC	United Kingdom	0.00	-0.51		3.00		4.38	24673.54	0.00	1	1.96	0.14	-4.11	24.50
2010	AFC Energy PLC	United Kingdom	0.00	-0.55	3.65	4.00		17.15	200855.88	0.00	1	2.49	0.13	2.07	21.00
2011	AFC Energy PLC	United Kingdom	0.00	-0.54	17.51	5.00	-0.80	6.30	88486.97	0.00	1	3.86	0.13	1.28	45.60
2012	AFC Energy PLC	United Kingdom	0.00	-0.37	1.43	6.00	8.92	5.57	132298.51	0.00	1	2.57	0.14	1.43	51.70
2013	AFC Energy PLC	United Kingdom	0.00	-0.36	0.78	7.00	1.10	8.28	143285.92	0.00	1	2.29	0.15	2.19	29.30
2014	AFC Energy PLC	United Kingdom	0.00	-0.53	0.21	8.00	0.09	2.02	42267.72	0.00	1	1.45	0.17	2.86	
2015	AFC Energy PLC	United Kingdom	0.00	-0.53	0.06	9.00	1.69	13.18	150952.34	0.00	1	0.37	0.13	2.36	
2016	AFC Energy PLC	United Kingdom	0.00	-0.84	0.16	10.00	-0.61	8.59	68787.98	0.00	1	1.01	0.11	1.72	
2017	AFC Energy PLC	United Kingdom	0.00	-0.64	0.83	11.00	-0.78	6.41	87703.00	0.00	1	2.56	0.10	1.74	
2018	AFC Energy PLC	United Kingdom	0.00	-0.60	505.40	12.00	-1.00	3.95	29750.23	0.00	1	2.29	0.12	1.25	
2019	AFC Energy PLC	United Kingdom	0.09	-0.60		13.00		5.00	28405.03	0.00	1	1.74	0.11	1.37	
2020	AFC Energy PLC	United Kingdom	0.01	-0.22		14.00		2.46	151168.39	0.00	1	0.99	0.12	-9.79	
2005	ALGOWATT SPA	Italy	0.00		0.00	0.00	#REF!	0.00		1.00	0	1.99	0.10	0.82	
2006	ALGOWATT SPA	Italy	0.05	0.07	0.08	1.00	25.56	0.00		1.00	0	2.09	0.13	1.79	34.60
2007	ALGOWATT SPA	Italy	0.00	0.00		2.00	1.26	0.00		1.00	0	1.83	0.16	1.49	31.30

2008	ALGOWATT SPA	Italy	0.26	0.03		3.00	2.88	2.62	54693.93	1.00	0	3.35	#####	-0.96	31.30
2009	ALGOWATT SPA	Italy	0.21	0.09	0.01	4.00	0.40	1.22	59383.55	1.00	0	0.77	#####	-5.28	29.80
2010	ALGOWATT SPA	Italy	0.12	0.08	0.01	5.00	1.03	0.67	128936.04	1.00	0	1.53	0.15	1.71	28.00
2011	ALGOWATT SPA	Italy	0.41	0.06	0.17	6.00	0.78	1.09	87871.56	1.00	0	2.78	0.15	0.71	27.00
2012	ALGOWATT SPA	Italy	0.45	0.05	0.18	7.00	-0.68	1.28	103915.32	1.00	0	3.04	0.16	-2.98	26.00
2013	ALGOWATT SPA	Italy	0.60	0.03	0.21	8.00	0.07	1.11	112183.59	1.00	0	1.22	0.15	-1.84	27.00
2014	ALGOWATT SPA	Italy	0.45	0.02		9.00	0.46	0.83	75792.07	1.00	0	0.24	0.13	0.00	31.00
2015	ALGOWATT SPA	Italy	0.43	0.01	0.02	10.00	2.48	0.87	75325.67	1.00	0	0.04	0.10	0.78	28.00
2016	ALGOWATT SPA	Italy	0.44	0.00	0.04	11.00	-0.80	0.72	40713.35	1.00	0	-0.09	0.09	1.29	26.00
2017	ALGOWATT SPA	Italy	0.41	-0.03		12.00	-0.64	0.54	34222.55	1.00	0	1.23	0.10	1.67	24.00
2018	ALGOWATT SPA	Italy	0.31	-0.02		13.00	-0.15	0.39	17192.19	1.00	0	1.14	0.10	0.94	24.00
2019	ALGOWATT SPA	Italy	0.49	-0.12		14.00	-0.40	0.53	21057.57	1.00	0	0.61	0.97	0.29	23.00
2020	ALGOWATT SPA	Italy	0.50	-0.04		15.00	0.27	0.53	19566.18	1.00	0	-0.14	0.66	-8.87	
2004	CropEnergies AG	Germany	1.14	-0.05		0.00				1.00	0	1.67	0.09	1.18	28.40
2005	CropEnergies AG	Germany	0.70	-0.08	1441.99	1.00				1.00	0	1.55	0.10	0.73	31.00
2006	CropEnergies AG	Germany	0.87	-0.19	0.14	2.00	511.97			1.00	0	1.58	0.11	3.82	31.00
2007	CropEnergies AG	Germany	0.19	0.04	0.29	3.00	1.51	1.33	864971.12	1.00	0	2.30	0.12	2.98	30.00
2008	CropEnergies AG	Germany	0.18	0.05	0.78	4.00	0.40	0.67	470931.89	1.00	0	2.63	0.14	0.96	30.00
2009	CropEnergies AG	Germany	0.30	0.01	0.51	5.00	0.81	0.68	279963.02	1.00	0	0.31	0.13	-5.69	26.00
2010	CropEnergies AG	Germany	0.37	0.01	0.09	6.00	0.13	0.87	432099.29	1.00	0	1.10	0.12	4.18	28.40
2011	CropEnergies AG	Germany	0.20	0.05	0.04	7.00	0.19	1.00	729654.11	1.00	0	2.08	0.13	3.93	
2012	CropEnergies AG	Germany	0.12	0.05	0.02	8.00	0.28	0.84	599789.58	1.00	0	2.01	0.11	0.42	
2013	CropEnergies AG	Germany	0.15	0.09	0.02	9.00	0.10	0.97	651430.12	1.00	0	1.50	0.12	0.44	32.00
2014	CropEnergies AG	Germany	0.22	0.02	0.02	10.00	0.17	0.85	595151.30	1.00	0	0.91	0.11	2.21	29.00
2015	CropEnergies AG	Germany	0.25	-0.09	0.04	11.00	0.02	0.64	292975.20	1.00	0	0.51	0.09	1.49	27.00
2016	CropEnergies AG	Germany	0.12	0.07	0.02	12.00	-0.25	0.67	360427.34	1.00	0	0.49	0.09	2.23	27.00
2017	CropEnergies AG	Germany	0.04	0.12	0.02	13.00	0.11	1.22	764243.63	1.00	0	1.51	0.09	2.60	25.80

2018	CropEnergies AG	Germany	0.00	0.09	0.02	14.00	0.15	0.86	664901.71	1.00	0	1.73	0.09	1.27	25.10
2019	CropEnergies AG	Germany	0.00	0.04	0.02	15.00	-0.11	0.78	524783.81	1.00	0	1.45	0.09	0.56	22.40
2020	CropEnergies AG	Germany	0.01	0.12	0.03	16.00	0.10	1.19	895557.18	1.00	0	0.51	0.10	-4.90	
2005	Verbio Vereinigte Bioenergie AG	Germany	0.54	-	0.08	0.00				1.00	0	1.55	0.10	0.73	31.00
2006	Verbio Vereinigte Bioenergie AG	Germany	0.09	0.02	0.12	1.00	-0.13	0.99	1138939.86	1.00	0	1.58	0.11	3.82	31.00
2007	Verbio Vereinigte Bioenergie AG	Germany	0.07	-0.37	0.09	2.00	0.81	0.38	318033.45	1.00	0	2.30	0.12	2.98	30.00
2008	Verbio Vereinigte Bioenergie AG	Germany	0.06	0.02	0.01	3.00	0.75	0.07	88586.83	1.00	0	2.63	0.14	0.96	30.00
2009	Verbio Vereinigte Bioenergie AG	Germany	0.04	-0.01	0.05	4.00	-0.28	0.33	266901.26	1.00	0	0.31	0.13	-5.69	26.00
2010	Verbio Vereinigte Bioenergie AG	Germany	0.15	0.01	0.07	5.00	-0.01	0.52	349742.45	1.00	0	1.10	0.12	4.18	28.40
2011	Verbio Vereinigte Bioenergie AG	Germany	0.19	0.00	0.03	6.00	0.52	0.43	261786.33	1.00	0	2.08	0.13	3.93	
2012	Verbio Vereinigte Bioenergie AG	Germany	0.21	0.01	0.03	7.00	-0.56	0.38	189077.39	1.00	0	2.01	0.11	0.42	
2013	Verbio Vereinigte Bioenergie AG	Germany	0.35	-0.26	0.05	8.00	0.97	0.44	72771.73	1.00	0	1.50	0.12	0.44	32.00
2014	Verbio Vereinigte Bioenergie AG	Germany	0.17	0.02	0.01	9.00	0.09	0.48	162759.26	1.00	0	0.91	0.11	2.21	29.00
2015	Verbio Vereinigte Bioenergie AG	Germany	0.06	0.09	0.02	10.00	-0.26	0.76	234583.06	1.00	0	0.51	0.09	1.49	27.00
2016	Verbio Vereinigte Bioenergie AG	Germany	0.04	0.16	0.02	11.00	-0.02	0.81	370971.09	1.00	0	0.49	0.09	2.23	27.00
2017	Verbio Vereinigte Bioenergie AG	Germany	0.01	0.15	0.03	12.00	0.09	1.34	710291.08	1.00	0	1.51	0.09	2.60	25.80
2018	Verbio Vereinigte Bioenergie AG	Germany	0.00	0.04	0.04	13.00	0.03	0.67	396721.67	1.00	0	1.73	0.09	1.27	25.10
2019	Verbio Vereinigte Bioenergie AG	Germany	0.02	0.13	0.08	14.00	0.09	0.98	557908.81	1.00	0	1.45	0.09	0.56	22.40
2020	Verbio Vereinigte Bioenergie AG	Germany	0.09	0.13	0.08	15.00	0.09	1.02	658026.05	1.00	0	0.51	0.10	-4.90	
2004	Cortus Energy AB	Sweden	0.13		0.21	0.00	1.87			0.00	1	0.37	0.07	4.34	47.00
2005	Cortus Energy AB	Sweden	0.00		0.04	1.00	6.81	3.10	19844.74	0.00	1	0.45	0.06	2.86	47.00
2006	Cortus Energy AB	Sweden	0.00	-0.48	0.03	2.00	-0.62	0.96	11620.88	0.00	1	1.36	0.08	4.66	45.00
2007	Cortus Energy AB	Sweden	0.00	-0.24	0.02	3.00	0.77	0.68	7432.31	0.00	1	2.21	0.09	3.44	45.00
2008	Cortus Energy AB	Sweden	0.00	0.03	0.01	4.00	0.75	0.06	2844.06	0.00	1	3.44	0.11	-0.45	45.20
2009	Cortus Energy AB	Sweden	0.27	-0.37	0.88	5.00	0.28	0.76	12260.37	0.00	1	-0.49	0.09	-4.34	44.00
2010	Cortus Energy AB	Sweden	0.43	-0.08	3686.00	6.00	-1.00	1.12	17108.95	0.00	1	1.16	0.11	5.95	42.00
2011	Cortus Energy AB	Sweden	0.00	-1.18		7.00	1091.09	0.16	1112.14	0.00	1	2.96	0.12	3.20	41.00

2012	Cortus Energy AB	Sweden	0.03	-0.66	0.34	8.00	0.44	0.31	1178.74	0.00	1	0.89	0.10	-0.59	44.00
2013	Cortus Energy AB	Sweden	0.00	-0.28	2.01	9.00	-0.70	0.69	16133.10	0.00	1	-0.04	0.10	1.19	44.80
2014	Cortus Energy AB	Sweden	0.00	-0.28	7.13	10.00	-0.37	0.26	4708.28	0.00	1	-0.18	0.09	2.66	42.20
2015	Cortus Energy AB	Sweden	0.00	-0.62	1.95	11.00	0.16	0.83	4290.46	0.00	1	-0.05	0.07	4.49	42.90
2016	Cortus Energy AB	Sweden	0.00	-0.34	0.53	12.00	-0.61	0.94	11200.26	0.00	1	0.98	0.07	2.07	44.20
2017	Cortus Energy AB	Sweden	0.21	-0.28	11.83	13.00	2.48	1.80	19418.83	0.00	1	1.79	0.07	2.57	35.10
2018	Cortus Energy AB	Sweden	0.11	-1.01	923.53	14.00	-0.96	1.86	27206.98	0.00	1	1.95	0.08	1.95	34.30
2019	Cortus Energy AB	Sweden	0.13	-0.59	74.56	15.00	1.43	7.97	91898.70	0.00	1	1.78	0.08	1.37	32.00
2020	Cortus Energy AB	Sweden	0.69	-0.67	2.80	16.00	2.53	4.02	52525.04	0.00	1	0.50	0.07	-2.82	
2004	ITM Power PLC	United Kingdom	0.16			0.00				0.00	1	1.39	0.06	2.29	20.10
2005	ITM Power PLC	United Kingdom	0.00	-0.26		1.00		7.30		0.00	1	2.09	0.08	2.96	20.50
2006	ITM Power PLC	United Kingdom	0.00	-0.24		2.00		41.11	134537.70	0.00	1	2.46	0.10	2.69	22.20
2007	ITM Power PLC	United Kingdom	0.00	-0.14		3.00		2.94	527649.00	0.00	1	2.39	0.15	2.36	18.50
2008	ITM Power PLC	United Kingdom	0.00	-0.13	126.14	4.00		0.64	257424.67	0.00	1	3.52	0.15	-0.28	15.30
2009	ITM Power PLC	United Kingdom	0.00	-0.19		5.00		-0.16	90638.81	0.00	1	1.96	0.14	-4.11	24.50
2010	ITM Power PLC	United Kingdom	0.00	-0.24		6.00		0.56	26401.42	0.00	1	2.49	0.13	2.07	21.00
2011	ITM Power PLC	United Kingdom	0.00	-0.34	149.16	7.00		3.12	41956.72	0.00	1	3.86	0.13	1.28	45.60
2012	ITM Power PLC	United Kingdom	0.00	-0.53	0.99	8.00	60.17	7.83	96888.51	0.00	1	2.57	0.14	1.43	51.70
2013	ITM Power PLC	United Kingdom	0.00	-0.66	9.60	9.00	-0.82	5.28	121197.22	0.00	1	2.29	0.15	2.19	29.30
2014	ITM Power PLC	United Kingdom	0.00	-0.69	0.82	10.00	12.17	3.04	83851.23	0.00	1	1.45	0.17	2.86	
2015	ITM Power PLC	United Kingdom	0.00	-0.41	0.90	11.00	0.45	3.62	85669.26	0.00	1	0.37	0.13	2.36	
2016	ITM Power PLC	United Kingdom	0.00	-0.29	1.85	12.00	0.11	2.20	86105.11	0.00	1	1.01	0.11	1.72	
2017	ITM Power PLC	United Kingdom	0.00	-0.23	1.43	13.00	0.08	2.67	47928.22	0.00	1	2.56	0.10	1.74	
2018	ITM Power PLC	United Kingdom	0.00	-0.19	2.65	14.00	0.41	2.01	70155.59	0.00	1	2.29	0.12	1.25	
2019	ITM Power PLC	United Kingdom	0.00	-0.21	0.99	15.00	0.36	1.73	150780.42	0.00	1	1.74	0.11	1.37	
2020	ITM Power PLC	United Kingdom	0.08	-0.46	3.27	16.00	-0.30	8.51	107289.71	0.00	1	0.99	0.12	-9.79	
2008	SMA Solar Technology AG	Germany	0.05	0.38	0.11	27.00	238.49	2.25	933186.03	1.00	0	2.63	0.14	0.96	30.00

2009	SMA Solar Technology AG	Germany	0.03	0.27	0.09	28.00	0.30	4.02	4632329.02	1.00	0	0.31	0.13	-5.69	26.00
2010	SMA Solar Technology AG	Germany	0.02	0.37	0.08	29.00	0.96	1.50	3226071.44	1.00	0	1.10	0.12	4.18	28.40
2011	SMA Solar Technology AG	Germany	0.02	0.13	0.10	30.00	-0.08	0.78	1938932.11	1.00	0	2.08	0.13	3.93	
2012	SMA Solar Technology AG	Germany	0.03	0.06	0.07	31.00	-0.19	0.19	870338.25	1.00	0	2.01	0.11	0.42	
2013	SMA Solar Technology AG	Germany	0.06	-0.05	0.06	32.00	-0.34	0.40	1095076.66	1.00	0	1.50	0.12	0.44	32.00
2014	SMA Solar Technology AG	Germany	0.06	-0.15	0.09	33.00	-0.14	0.26	642242.89	1.00	0	0.91	0.11	2.21	29.00
2015	SMA Solar Technology AG	Germany	0.04	0.02	0.05	34.00	0.02	1.33	1949026.82	1.00	0	0.51	0.09	1.49	27.00
2016	SMA Solar Technology AG	Germany	0.03	0.02	0.03	35.00	-0.04	0.44	916201.45	1.00	0	0.49	0.09	2.23	27.00
2017	SMA Solar Technology AG	Germany	0.02	0.03	0.04	36.00	-0.04	0.65	1498334.69	1.00	0	1.51	0.09	2.60	25.80
2018	SMA Solar Technology AG	Germany	0.02	-0.16	0.05	37.00	-0.11	0.27	660235.91	1.00	0	1.73	0.09	1.27	25.10
2019	SMA Solar Technology AG	Germany	0.03	-0.01	0.03	38.00	0.14	0.85	1344340.27	1.00	0	1.45	0.09	0.56	22.40
2020	SMA Solar Technology AG	Germany	0.04	0.03	0.04	39.00	0.14	1.66	2371109.26	1.00	0	0.51	0.10	-4.90	

CURRICULUM VITAE

Fatbardha Morina is an Assistant Lecture of Banking and Finance at Epoka University where she teaches Statistics, Fundamentals of Corporate Finance, and Financial Econometrics. Also, she has worked as a Research Assistant at Epoka University. Her research focus comprises sustainability, renewable energy, firm profitability, and exposure to risk.

She has extensive teaching and research experience in a variety of fields and in different public and private institutions. Over the years she has been part of mobility programs and small-scale projects. Her teaching methodology is student oriented and working methodology result oriented. Mrs. Morina has made a huge contribution at Epoka university in different kinds, in research, student guide, conception and proposal of projects, accreditation working groups, curricula formulation and assessment. Her moto is “Nothing real if not shared” and she strongly believes that the best way to develop your self is researching with the aim to transfer the knowledge to others interested in the same field.