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THE IMPACT OF RENEWABLE ENERGY GENERATION ON THE COST OF ELECTRICITY COMPANIES

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Abstract

The world's leading energy companies are committed to using cleaner forms of energy to reduce harmful environmental impacts around the world. It is obvious, that the transition to energy production from clean sources is also one of the ways to increase competitiveness and obtain additional financial benefits. Moreover, such environmental implementation is actively supported by government programs. The growing amount of research into the impact of renewable energy generation on the company's financial changes, including the company's value, reflects the promise of renewables as a major source. The article examines the motivation of energy companies to enlarge the volume of power generation from renewables. The main purpose of the article is to identify the factors influencing the decision of energy companies to increase the production of "green" energy. For these purposes, two hypotheses are put forward, raising the issue of the significance of state regulation as a factor influencing the transition to renewable energy sources, and the influence of green energy production on the cost of energy companies. As a part of the hypothesis testing, the Tobin coefficient was also used as an indicator, reflecting the readiness of energy companies to change. Linear models on logarithms, including the most significant regressors with respect to independent variables, were chosen to test the hypotheses.

Keywords: Energy companies, renewables, generation, value, transition.

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1. Introduction

Notable climate changes around the world have led the world's leading energy companies to commit to using cleaner forms of energy in order to reduce the harmful effects of fossils on the environment around the world. However, as these companies suggest, the transition to green energy production is also another way to increase competitiveness and obtain additional financial benefits. Moreover, such environmental implementations are actively supported by government programs. As a consequence, there is an increasing amount of research on the influence of “green” energy production on the financial changes of energy companies, including their value. In this regard, the aim of this article is to identify the linkage between environmental production policy and the value of electricity companies.

2. Problem Statement

According to the recent report of McKinsey & Company in 2019, renewable sources and also nuclear, will have increased twice their share in the total energy production by 2050, having jumped from 19% to 34%. It will guarantee the coverage of more than half the electricity demand by 2035 (McKinsey & Company, 2019). Consequently, the International Energy Agency and the U.S. Energy Information Administration (further – EIA) point out the steadily growing demand for electricity produced from renewable sources (International Energy Agency, 2019; EIA, 2019).

EIA, for example, foresees the share of U.S. total utility-scale electricity production from energy companies that use natural gas for energy production will blow up from 34% in 2018 to noticeable 37% in 2019 and 2020. EIA predicts (U.S. Energy Information Administration, 2019), that the share of U.S. electricity production n from coal will most likely reach the level of 25% in 2019 and as a sequence 22% in 2020, falling down from 28% in 2018. Nevertheless, the share of nuclear energy is going to hold its size at about 20% in 2019 and in 2020. Hydropower will get a 7% share of overall generation in the USA according to the expectations for 2019 and 2020, compared to 2018. Non-surprisingly, renewables will cover more than 10% electricity demand in 2019 and will enlarge the coverage to 12% in 2020.

Moreover, 63 % of companies, included to Fortune 100, have established one or even more targets due to their “green” energy policy. Almost half of Fortune 500 companies have elaborated at least one energy goal due to climate changes or environment contamination. The number of them has got up 5 % compared to 2014 report and having achieved the level of 48 percent. Moreover, there’re many companies setting goals to deal only with green energy and renewable sources. All these efforts are undertaken to slow down the rise of global temperature and at least keep this process below 2 degrees Celsius. Nevertheless, the main issue for power industry yet to be disclosed: if there is any financial benefit from switching to renewables instead of fossils?

3. Research Questions

Obviously, it is necessary to answer the question: "What exactly is the factor for electric power companies to transfer generation from traditional to renewable sources?" It is reasonable to assume that companies are resorting to renewable sources in order to diversify production activities, which, in turn, will lead to an increase in the value of the company. On the other hand, the growth of electricity generation

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from renewable sources is growing around the world, finding support from national governments on environmental issues (Bianco, Driha, & Sevilla-Jiménez, 2019). Consequently, significant amounts of financing to stimulate the transition to renewable sources of generation are becoming a kind of factor in the transition of energy companies to environmentally friendly electricity production.

For the purpose of research of motives that force power companies to transfer the generation of the electric power to renewable sources the following hypotheses will be formulated:

Hypothesis 1: The growth of renewable energy generation positively affects the value of the energy company;

Hypothesis 2: The availability of state environmental support has a positive impact on the growth of energy production through renewable sources.

4. Purpose of the Study

The market capitalization of electricity companies and Q-Tobin coefficient were chosen as dependent variables, which is also confirmed by a number of studies (Konar & Cohen, 2001), and (Robinson, Glean, & Moore, 2018). The choice of dependent variables is explained by the fact that the transition to generation from renewable sources allows the energy company to be less dependent on hydrocarbon fuel, as well as to take into account the environmental requirements of national governments. This circumstance, on the one hand, makes the company more resistant to price fluctuations for hydrocarbon fuel (Ruhangag, Zixin, Qingfeng, & Zhuangzhuang, 2018). On the other hand, the availability of generation technologies from renewable sources, along with traditional sources, additionally forms the intangible assets of energy companies through the growth of the value of the company's intellectual capital in General and human capital in particular, which reflects the Q-Tobin coefficient. Two indicators were chosen as the main regressor: the potential volume of energy generation that uses renewables and the share of "green" energy production in the company. A second regressor in the form of a percentage of renewable energy generation is introduced to clarify the results of the study, as it is closely related to the volume of energy generation and may also affect the dependent variable. All the variables are introduced in the table 01.

Table 01. Description of variables used in Stata program

Variable in Stata	Decryption
marketcap (share)	Market capitalization ($)
Q	Tobin's coefficient
renratio	Shares of green energy generation (%)
rengen	Green energy generation volume (GWh)
Roa	Return on assets (%)
opermargin	Operating margin (%)
leverage	Financial leverage (share)
country	Developed/Emerging market
govreg	State regulation

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As control variables, we use those that can affect the value of the company, namely: ROA (Krstis & Tasic, 2014), marginality on operating profit, the level of financial leverage (Duanmu, Bu, & Pittman, 2018). Next, the model will introduce dummy variables, one of which is responsible for the company's belonging to a developed or developing market. It is likely that economically developed markets offer energy companies better access to investment resources than emerging markets, create attractive conditions for the introduction of innovative technologies in the field of electricity generation. Thus, it can become a significant criterion for the market. The second variable, considered as a dummy, takes the value "1" if the region in which the company operates has a statutory low-carbon economy program with precise targets and deadlines.

5. Research Methods

Based on the analysis of the energy industry, it can be concluded that the percentage of energy generation based on renewable energy sources has been growing in recent years, which, in general, reflects the intention of the world community, and not only in terms of electricity production (Anderson-Weir, 2010). In recent years, there has been a steady demand for products for various purposes, produced using "green" energy sources. Energy producers in the traditional way are slower and more reluctant to switch to this type of production because, first of all, the cost of generation. The production of "green" electricity remains quite expensive and technological (Mäkitie, Normann, Thune, & Gonzalez, 2019; Miller, 2013). Therefore, such production is competitive compared to traditional, unless the price of fossil, non-renewable resources is significantly higher than renewable (Chester, 2007; Defeuilley, 2019). Therefore, we can observe fluctuations in the production of "green" electricity depending on the fluctuations in the cost of traditional sources of generation, primarily oil (Zerbib, 2019).

Using Thomson Reuters Eikon databases, 50 companies were selected as a representative group that fit all the criteria of the study. This sample size is due, indeed, not the largest trend of transition to the production of "green electricity" by traditional companies. The period of analysis covers the period from 2014 to 2018, due to the fact that this period falls at the peak of the implementation of green energy, also during this period was the signing of the Paris agreement on maintaining ecological balance by the UN, which affect the environmental behaviour of many governments.

In total, the sample includes companies from 25 countries, 14 developed and 11 developing.

Based on the obtained descriptive statistics, it is possible to deduce the behaviour of variables by companies and years. The standard errors of the Q-Tobin coefficient vary between (2106.46) and within (695.97), showing greater variation among companies than over time. However, the market capitalization indicator, which is a component of Tobin's Q, showed a strong time spread, which indicates the significance of the time period, within which an influential event for the industry may have occurred. Also, the range of market capitalization values is relatively small, which confirms our assumption about the homogeneity of the sample relative to the size of the companies. The percentage of renewable energy generation takes a value from zero, as some companies started producing green energy in the selected period. Government regulation has taken place in most companies, but sometimes not the entire period of time. A linear model in logarithms was chosen as a working model.

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The logarithm of the regression equation means that the coefficients obtained are now interpreted as the elasticity of the percentage change of Yit over the percentage change of Xit. The logarithm ratio of green energy generation may be explained as an effect of the change in the generation share, which indicates how intensively clean technologies are being introduced and developed by companies. The ratio in the logarithm of ROA, operating margin and financial leverage means how much the value of the company will change when the regressor increases or decreases by 1%. So, final logarithm models are as follows:

$$lnmarketcap_{it} = a_1 + lnrenratio_{it} * \beta_1 + Roa * \beta_2 + lnopermargin_{it} * \beta_3 + lnleverage_{it} * \beta_4 + govreg_{it} * \beta_5 + country_{it} * \beta_6 + \varepsilon_{it}$$

$$lnmarketcap_{it} = a_1 + lnrengen_{it} * \beta_1 + lnRoa_{it} * \beta_2 + lnopermargin_{it} * \beta_3 + lnleverage_{it} * \beta_4 + govreg_{it} * \beta_5 + country_{it} * \beta_6 + \varepsilon_{it}$$

$$lnQ_{it} = a_1 + lnrenratio_{it} * \beta_1 + lnRoa_{it} * \beta_2 + lnopermargin_{it} * \beta_3 + lnleverage_{it} * \beta_4 + govreg_{it} * \beta_5 + country_{it} * \beta_6 + \varepsilon_{it}$$

$$lnQ_{it} = a_1 + lnrengen_{it} * \beta_1 + lnRoa_{it} * \beta_2 + lnopermargin_{it} * \beta_3 + lnleverage_{it} * \beta_4 + govreg_{it} * \beta_5 + country_{it} * \beta_6 + \varepsilon_{it}$$

6. Findings

After the functional form was determined, all four models were tested for specification: models with pooled panel data, as far as models with random effects and models with fixed effects. To determine the best specification of the model, the Broich-Pagan tests were performed, which checks the presence of a random individual effect in the model, and the Housman test to check the uncorrelation of the random effect with given factors. In the case of market capitalization models, in both cases, tests confirmed the presence of random effects and their applicability to the model. Thus, in these models there are individual random factors for companies that do not change over time and affect the market capitalization. In the table 02 it's clearly shown that models with a logarithm of market capitalization are better in terms of the number of significant variables.

Table 02. Description of variables used in Stata program

Variable in Stata	re Q ren~n	re Qratio	re_capr~n	re cap r~o
lnrengen	-0.03		0.01	
lnRoa Q	0.16***	0.18	0.14***	0.14***
lnopermargin	0.1	0.01	0.1	0.1
lnleverage	-0.12	-0.08	-0.25***	-0.25***
lncountry	-0.37	-0.6	-2,59***	-2,81***
lngovreg	0.08	0.09	0,21	0,197
lnrenratio		0.001		0,13
con_s	0.15	0.16	27,63***	27,99***
	legend: * p<0.05; ** p<0.01; *** p<0.001			

Source: authors (developed in Stata program).

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So, as a result of econometric work from four declared models, there were two which have better capacity to explain motives of generation «green energy»:

$$lnmarketcap_{it} = a_1 + lnrenratio_{it} * \beta_1 + lnRoa_{it} * \beta_2 + lnopermargin_{it} * \beta_3 + lnleverage_{it} * \beta_4 + govreg_{it} * \beta_5 + country_{it} * \beta_6 + \varepsilon_{it}$$

$$lnmarketcap_{it} = a_1 + lnrengen_{it} * \beta_1 + lnRoa_{it} * \beta_2 + lnopermargin_{it} * \beta_3 + lnleverage_{it} * \beta_4 + govreg_{it} * \beta_5 + country_{it} * \beta_6 + \varepsilon_{it}$$

In the first model the dependent variable is the logarithm of market capitalization, which reflects how many percent capitalization has changed compared to the previous year. Significant factors are lnROA, lnleverage, country and constant. Thus, a 1% change in ROA, on average, increases the market capitalization by 0.14%. And the financial leverage cuts by 0.25%, which seems logical, if the debt to capital becomes too large, it becomes a riskier investment. It turns out that, on average, among traditional energy companies, the share of debt is of great importance. Belonging to a developing country reduces the market value of the company by 2.8%. It would be more correct to conclude that belonging to a developing country ensures the growth of the company, since at the moment these countries have higher rates of economic growth, and investors are more willing to invest there.

In the second model the dependent variable is the same as in the first case. The factors remained the same, except for the main one: now the main independent variable is the nominal volume of green energy generation. Significant variables in the model have not changed, their impact on lnmarketcap remained the same in strength and direction. The selected models showed that our main factors of green energy production did not affect the value of companies from the energy industry. If we take all four models that were originally set, there were no significant impact of generation of energy based on renewable sources the dependent variable.

7. Conclusion

The results of this study did not confirm the hypotheses. Neither the percentage of green energy generation nor its nominal volume showed a significant impact on the value of the selected companies. The analysis of some other regressions pointed out the importance of their influence on the market price of energy companies' shares. The degree of the development of the country also has a positive impact. The constant, that is responsible for the influence of variables unaccounted for in the model, was also significant. It means, that the transfer from fossils to renewables is not only the matter of enterprise value or profitability. There some other important factors and reasons to do it, that yet to be found out.

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