

Corporate Venture Capital as a Way of Investing in Sustainable Development Projects by Fuel and Energy Companies

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Abstract The research aims to analyze the portfolios of venture corporate funds of fuel and energy companies and evaluate their effectiveness as a strategy for financing sustainable development projects. The research methodology consisted of synthesis, comparative analysis, classification, and statistical and mathematical methods. The authors identified the main types of sustainable startups funded through corporate venture funds of fuel and energy companies and the statistical significance of the differences between the average values of the ESG rating and the environmental, social, and governmental scores of companies using corporate venture funds and those that do not. The conclusions obtained on the positive impact of corporate venture funds on ESG scores and the effectiveness of environmental performance of energy companies have theoretical significance for further research and development of econometric models. Additionally, the results have practical applications for the management of energy organizations in developing a strategy for financing ESG projects and choosing investment tools.

Keywords: corporate venture capital, ESG, fuel and energy sector, sustainable development projects, financing strategy

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The deteriorating environmental situation over the past few decades, the gradual depletion of various fuels and resources, and the global character of the ESG agenda are the main drivers for investing in sustainable development projects in the fuel and energy complex.

Energy production accounts for 76% of all greenhouse gas emissions, including direct production of electricity for industrial and household needs (30.4% of global emissions), fuel combustion by vehicles (15.9%), industrial production (12.4%), construction and maintenance of buildings (5.5%), and other areas. Considering the global decarbonization course and the commitment of countries to achieve carbon neutrality by the middle of this century, ignoring

the need to transform the classical business models adopted in the fuel and energy complex can increase the company's exposure to risks in the future and jeopardize the competitiveness of the business (Yushkov & Drozdova, 2020).

Simultaneously, implementing sustainable development projects that could give the company competitive advantages requires developing and adopting technological innovations (Shilova, 2015). In recent decades, the open innovation process model has been actively developed, one of the most widely used forms of which is corporate venture capital (CVC).

The CVC programs are not a recent practice for global fuel and energy companies. For example, oil and gas majors (e.g., Chevron, Shell, and Total Energies) have been running these programs since the late 1990s -early 2000s. The industry's average age of corporate venture funds is just under ten years. Some scientists believe that corporate venture capital programs are more suitable for industries experiencing rapid changes, which also applies to the fuel and energy sector (Döll et al., 2022).

This paper aims to evaluate the use of corporate venture funds as one of the strategies for investing in ESG projects by fuel and energy companies and make a conclusion about its impact on corporate indicators of sustainable development.

To achieve that goal, the following research tasks were set:

1. To analyze the investment portfolios of corporate venture funds of the fuel and energy companies and identify the main areas of funded projects;
2. To compare the ESG performance of companies in this industry using corporate venture capital programs and companies that use other ways of investing in sustainable development projects.

Materials and Method

As one of the forms of an open innovation process, corporate venture capital has been discussed by Chesbrough (2002), Anokhin et al. (2016a, 2016b), Dushnitsky & Lenox (2005), Dushnitsky & Shaver (2009) etc.

The distinctive features of corporate venture programs from the other forms of venture investment are that a commercial company is a key or sole investor. It focuses on maximizing financial return and achieving strategic business goals through investments (Casanova et al., 2018).

Several researchers study venture capital as a way of financing a company's sustainable development and improving ESG indicators, including Alakent et al. (2020), Bendig et al. (2022), Cheng et al. (2022), Li et al. (2021), Liao et al. (2014), Maiti (2022), and Yang et al. (2022).

Much less research has been devoted to studying strategies of corporate venture funds in relation to startups in the field of sustainable development and their impact on the ESG result of companies. Livieratos and Lepeniotis (2017) analyzed the trends and strategies of corporate venture funds of four European energy companies. The analysis revealed that among the areas of funded startups, all corporate venture funds studied have projects in green technologies,

renewable energy sources, energy storage, and the development of industrial safety systems. Additionally, the paper concludes that corporate venture funds in energy companies are created primarily to achieve strategic rather than financial goals.

According to Hegeman & Sørheim (2021), investing in green startups through corporate venture funds is a common practice among companies of all sizes. The main incentive for this kind of investment is the possibility of decarbonization and increased environmental performance. It is worth noting that half of the companies studied by the authors belong to the fuel and energy sector.

Battisti et al. (2022) assessed corporate venture capital's impact on corporate social responsibility indicators to create a sustainable competitive advantage. Based on the compilation and testing of the regression model, it is concluded that the use of corporate venture capital programs is positively correlated with the environmental and social indicators of companies. However, we note that the study is based exclusively on the analysis of European and American companies, and the developed model does not have a high level of accuracy.

Thus, the issue of using corporate venture capital as a method of investing in sustainable development projects and the specifics of its use by companies in the fuel and energy complex remains poorly studied in the scientific literature.

We have developed two hypotheses that will be tested in the framework of this research:

- H1: Companies implementing CVC show higher ESG scores;
- H2: The use of CVC has a greater impact on the environmental performance of companies due to the large number of invested areas of projects related to this type.

The research methodology included methods of synthesis, comparative analysis, classification, and mathematical methods, which will be described in detail below.

To achieve the research objective, the means of the samples were compared for four variables: the aggregate ESG rating and environmental, social, and corporate governance scores. The Kramer-Welch t-test, also known as a two-sample t-test with different variances, was chosen as a method of data analysis. The choice in his favor was determined by the following:

- 1) Independence of samples;
- 2) The normal distribution of data, which was separately proved in the Jarque–Bera test;
- 3) Presumably unequal variances in the samples.

Several scientists believe that the Kramer-Welch criterion can be used “by default” to compare the average values of two independent samples because otherwise, it is necessary to prove the homogeneity of the samples before choosing between the Student's t-test and the Kramer-Welch t-test (Orlov, 2015).

The research objects are 100 world's largest fuel and energy companies by capitalization. After data collection, companies whose ESG rating information was unavailable were excluded from the initial sample. As a result, two samples were formed. In the first sample, companies

have a corporate venture fund with green, social, or transitional projects in their portfolio (the number of observations is 30). In the second sample, organizations do not use this method of financing sustainable development projects (60 observations).

Data on the presence or absence of corporate venture funds, as well as projects funded by them, were obtained from the official websites of companies, aggregator sites, media sites, and other open sources. For simplicity and uniformity of the analysis, other corporate venture capital programs were not considered, for example, accelerators, incubators, or participation in joint funds.

The ESG rating developed by S&P Global was used to assess the company’s sustainable development performance. The choice of this rating of this agency is due to the fact that the assessment is carried out not only based on public reports of companies but also on the analysis of verified corporate information, data received from the media and stakeholders, and a corporate questionnaire. On a 100-point scale, the company is evaluated separately according to the environmental (E), social (S), and corporate governance (G) components. Then, an integrated ESG assessment of the company is derived, which is the arithmetic mean of the E, S, and G estimates.

The hypothesis was tested at the significance level $\alpha=0.05$.

Results

The main areas of funded sustainable startups in the structure of energy company’s CVC transactions are presented in Figure 1.

Green projects	Social projects	Transition projects
Renewable energy sources CCUS and DAP projects Electric transport Electricity storage ...	“Deserted” production Industrial safety systems based on AI and ML	Reduction of emissions in production process Improving energy efficiency

Figure 1

Investment portfolios of energy company’s corporate venture funds analysis.

Source: Compiled by the authors

The authors identified some specific features of projects during the analysis:

- 1) Most projects are aimed at improving the environmental performance of the company, which is due to the industry specifics;
- 2) A high proportion of transition projects, which is due to the presence in the sample of companies from developing countries, for which the implementation of this type of projects is the basis of the decarbonization strategy;
- 3) All funded projects are technological and highly innovative.

Having made sure that fuel and energy companies consider their corporate venture funds as one of the ways to invest and develop green, transition, and social projects, we will proceed to evaluate the effectiveness of this strategy.

In the box plot diagram (Figure 2) for the samples and their pairwise comparison for each studied indicator, it can be seen that in each case, the average and median values are higher for a sample of companies with a corporate venture fund. Additionally, the lowest values for each indicator were achieved precisely in the samples without CVC. At the maximum values, there is no unambiguous trend.

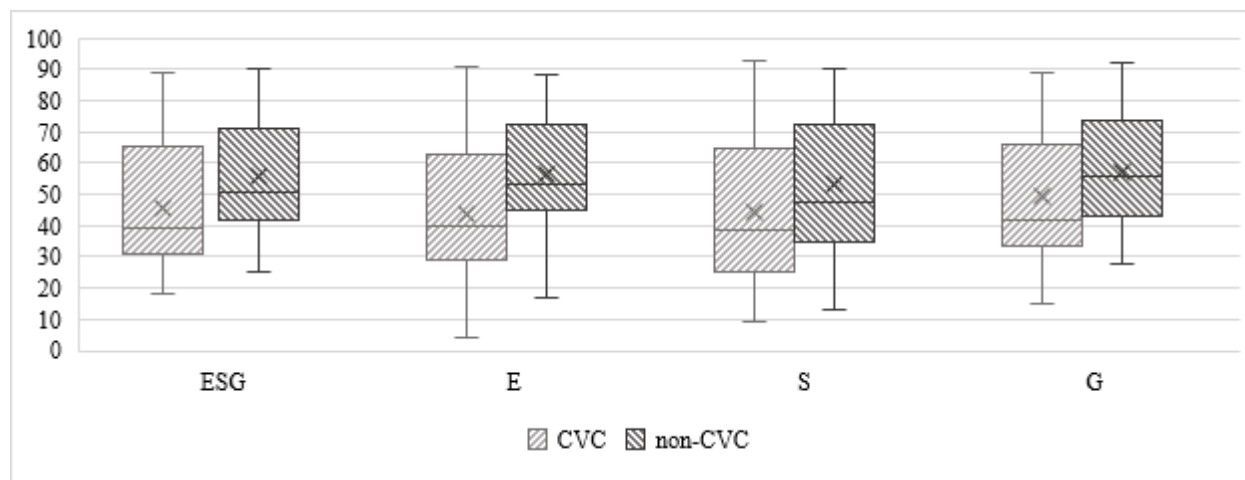


Figure 2

The box plot diagram

Source: Compiled by the authors

The same conclusions can be drawn from the descriptive data statistics presented in Table 1. Additionally, it shows that the sample of companies that have a CVC has a smaller standard deviation, as well as a smaller variance than the sample without a CVC.

Table 1

Descriptive statistics and testing samples for normal distribution

	ESG		E		S		G	
	CVC	non-CVC	CVC	non-CVC	CVC	non-CVC	CVC	non-CVC
<i>Observations</i>	30	60	30	60	30	60	30	60
<i>Mean</i>	55.7	45.783	56.567	43.9	53.267	44.417	56.967	49.4
<i>Median</i>	50.5	39.5	53.5	40	47.5	38.5	56	42
<i>Minimum</i>	25	18	17	4	13	9	28	15
<i>Maximum</i>	90	89	88	91	90	93	92	89
<i>Standard deviation</i>	18.674	20.101	18.513	20.859	21.802	22.845	18.307	19.669

<i>Sample variance</i>	348.7	404.4	342.73 7	435.10 8	475.30 6	521.908	335.137	386.85 4
<i>Kurtosis</i>	-1.03	-0.979	-0.609	-0.732	-1.083	-1.008	-0.96	-1.045
<i>Skewness</i>	0.248	0.492	-0.08	0.342	0.209	0.509	0.286	0.372
<i>T-statistics</i>	1.635	4.818	0.496	2.508	1.686	5.132	1.562	4.111
<i>P-value</i>	0.441	0.09	0.78	0.286	0.43	0.077	0.458	0.128
<i>Normal distribution</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Compiled by the authors

The next analysis stage was to evaluate the statistical significance of the differences in the mean values.

For the Kramer-Welch t-test, one of the requirements is the normal distribution of data in the samples, for which independent proof is needed. To this purpose, the Jarque-Bera test was conducted, which is based on the indicators of kurtosis and skewness.

As a result, all P values corresponding to the calculated t-statistics turned out to be higher than the significance level $\alpha = 0.05$. Therefore, there is no reason to reject the null hypothesis about the normal distribution of data in every case.

The last stage was the calculation of the Kramer-Welch t-test. The results are presented in Table 4. At the significance level $\alpha = 0.05$, null hypotheses about the equality of the average values for the ESG rating and the environmental indicator were rejected. Therefore, it was concluded that the use of a corporate venture fund by fuel and energy companies had a positive impact on these factors.

Table 2

Kramer-Welch T-test

	ESG	E	S	G
<i>Observed value of t-statistics</i>	2.314131	2.931002	1.78644	1.802671
<i>Critical value of t-statistics</i>	1.998972	1.997138	1.999624	1.998972
<i>P-value</i>	0.023988	0.004659	0.078998	0.0763
<i>Accepted hypothesis</i>	H1	H1	H0	H0

Source: Compiled by the authors

The opposite conclusions can be drawn for the social and corporate government factor. Based on the initial data, there is no reason to reject null hypotheses. Therefore, the assumption about the positive impact of using corporate venture capital to finance sustainable development projects has not been confirmed. However, it is critical to note that the P-value in both cases did not significantly exceed the significance level $\alpha = 0.05$ accepted in the study, respectively, to make a conclusion about the impact of corporate venture capital on these indicators, it is advisable to conduct further research based on large samples.

Discussion

The results of the analysis and the findings can be used to determine variables and develop econometric regression models in future studies. Additionally, the work has practical value for the management of energy companies: the findings can be applied in the process of searching for an optimal ESG strategy and defining ways to invest in sustainable projects.

However, we have to point out the following limitations of the research:

- 1) The analysis was carried out based on one ESG rating; conducting a t-test based on other ESG scores may give other results;
- 2) The financial performance factor of the CVC was not considered;
- 3) The time of existence of the CVC was not considered;
- 4) Other factors that affect the company's ESG results and its evaluation are not considered;
- 5) The study does not answer the question of whether this method of financing sustainable development projects is more effective than others.

Further analysis and study of corporate venture funds as a strategy for investing in ESG projects by fuel and energy companies can be aimed at eliminating these limitations.

Conclusion

Thus, during the portfolio analysis of corporate venture funds' investments by fuel and energy companies, it was found that companies use this strategy to finance a wide range of social, green, and transition projects.

Based on comparing the mean values of ESG scores of companies with a corporate venture capital program and organizations that do not use this strategy of investing in sustainable development projects and testing the statistical significance of the identified differences, it was concluded that the use of corporate venture funds by fuel and energy companies positively affects the overall ESG business performance, and to a greater extent, the degree of influence on the environmental assessment is traced.

Simultaneously, the analysis did not identify the statistical significance of the differences between the samples in the results of the social and corporate government factors. However, since the P-value in both cases slightly exceeded the significance level determined, the result obtained can be disproved in further studies on larger samples.

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