Environmental investments as the basis of "green" economy: empirical evidence from Ukrainian companies

Iryna Vasylchuk[1,*], *Anatolij* Suprun[1,**], *Kateryna* Slyusarenko[1,***], and *Maryna* Sadovenko[1,****]

[1]State University of Economics and Technology, 16 Medychna Str., 50005, Ukraine

Abstract. Investments in environmental protection are crucial for achieving the goals of building green economy. The purpose of the study is, firstly, to assess the state and trends of Ukrainian companies investments for environmental purposes; secondly, to identify the determinants of the impact on the volume of environmental protection investments; finally, to determine presence / absence of a link between environmental investments and financial performance of companies. The initial data for the study were obtained from published statistical reports for the period from 2010 till 2019. Methods of analysis for testing hypotheses are descriptive and correlation-regression ones. It was found out that the selected independent variables (belonging to environmentally damaging activities and revenue of the companies) are positively correlated with the volume of costs and investments in environmental protection of Ukrainian companies. However, for the independent variable "financial results" a negative correlation was obtained. The hypothesis of environmental investments positive impact on the financial profitability of companies has not been confirmed. Environmental policy in Ukraine concerning implementation of "green" growth strategy is defined as a reflective one due to a number of economic and political factors.

1 Introduction

The "green" economy is a key factor for the implementation of sustainable development concept on the background of more efficient resource and energy consumption, cutting of CO_2 emissions, reduction of harmful effects on the environment and progress of a socially integrated society [1]. The OECD estimates that investment in modern, smart and clean infrastructure in the next decade is a critical factor for sustainable economic growth. Achieving the set environmental goals of sustainable development requires 6.3 trillion USD of investment in infrastructure annually until 2030 in the global dimension [2]. Destructive climate change on the planet can be prevented under the condition of joint efforts only.

The analysis of professional publications revealed that scientists use several concepts to describe the phenomenon of investment in environmental measures, which can be combined under the "umbrella" brand "green investment": ecological investment [3–5], environmental protection investment [6], "green" investment [1, 7–10], environmental protection expenditure [11], etc. Until recently, Ukrainian authors' research on environmental issues was based on terminology from statistical reports, where environmental expenditures are considered to be the sum of current expenditures and capital investments directed to environmental protection. Capital investments in environmental protection are treated as investments in the manufacture for own use or purchase of tangible and intangible assets, the cost of capital repairs and modernization, carried out to protect the environment [12].

In recent years, with the increase of environmental awareness and business activity, the expansion of environmental protection investment areas range and the emergence of new "green" financial instruments, the concept of "green" investment was introduced in the academic discourse. Consequently, they are currently viewed from the standpoint of an entrepreneurial approach, which provides long-term benefits from environmental activities, both financial and non-financial ones. There is an increasing tendency to interpret such investments as entrepreneurial capital (material, intellectual, raw materials, fixed assets and technology), which is directed to the construction of a facility or production of goods / services / technologies with ultimate goal to have a positive impact on the environment (e.g. level of pollution) with the simultaneous restoration or maintenance of the natural capital level [1].

At the same time, the "green investment" brand has a broader understanding and includes both investments in "green" companies through financial intermediaries through various financial instruments and public investments in environmental projects and direct business investments in environmental protection projects. For the purposes of this study, the generalized term "environmental protection investment" is used, meaning the companies expenses for their own environmental protection projects in.

---
*e-mail: vasylchuk_ip@duet.edu.ua
**e-mail: suprun_aa@duet.edu.ua
***e-mail: slusarenko_kv@duet.edu.ua
****e-mail: sadovenko_mm@duet.edu.ua

The analysis of the professional literature dealing with the problem revealed that domestic scientists focus their attention on the analysis of statistical data on trends in environmental investment in Ukraine [4], sources of their funding [3], [13], state of environmental taxation [14], models for optimizing environmental investment strategies of industrial enterprises [15], etc. The researches of foreign scholars generally concern not only the analysis of environmental protection expenditure trends in Europe and the world [11], but also the relationship between "green" investments and firm performance in the context of Corporate Social Responsibility (CSR) on the example of different jurisdictions and activities [9, 10, 16, 17], the impact of financial markets on development of "green" economy [18]. Ukrainian studies turned out to have no determinants of environmental investment in business and their impact on the financial performance of companies. Besides filling this gap it is important to identify the latest trends in Ukrainian companies environmental protection investment and their activities aimed at meeting environmental requirements of sustainable development, which is manifested through increased investment.

Therefore, the overarching research issues to be studied are as follows:

1. What is the state and trends in the Ukrainian companies investment for environmental purposes?

2. What factors affect the amount of costs (investments) in environmental protection?

3. Do the volumes of investments in environmental protection affect the profitability of Ukrainian companies?

Our study examined relationships among ecological investment and financial indicators for Ukrainian companies on the basis of proposing appropriate hypotheses and testing them using econometric analysis methods, which is new for the Ukrainian discourse, but not new for the world practice.To obtain answers to above mentioned questions, two methods of analysis are used, such as descriptive analysis of aggregated statistics for the period 2010–2019 and correlation-regression analysis of statistics in terms of economic activities of companies from 2015 till 2019.

The theoretical underpinnings for analysis come in the form of legitimacy theory, institutional theory, stakeholder theory, resource-based view, slack resources theory and the good management theory.

2 Theoretical framework and literature review

With the spread of the of sustainable development concept, the management of many companies are convinced that the integration of environmental goals in strategic decision-making and environmental measures on an ongoing basis encourage the creation of economic benefits for the company. At the same time, some managers still consider investing in the environment to be a "necessary evil" and wonder why they are to carry out environmental activities and incur unnecessary costs. The answer to this question can be obtained through taking into consideration the provisions of legitimacy theory, institutional theory, stakeholder theory and resource based view.

The theory of legitimacy substantiates that the implementation of environmental activities and coverage of its results in non-financial reporting depends on the intensity of social and political pressure that companies face in the process of their activities. This is especially true for companies that place a significant burden on the environment and are eco-sensitive activities. Companies strive for a balance between their own and society values. In a situation when such a balance is achieved, a "social contract" between the company and society virtually exists. If society has evidence that a company does not work according to the terms of the "social contract", then such a company will have a negative assessment by society [19]. With such behavior, society may terminate the contract with the company. The canceled social contract is called the "legitimacy gap" [20–22]. Therefore, the company must strive to ensure that its activities meet social norms and expectations. Responsible company behavior can reduce possible fines and ensure the company right for existence [23]. It has been established that while attempting to prevent the loss of legitimacy, companies with poor environmental performance try to publish as much positive information about environmental protection in non-financial statements as far more environmentally friendly companies [20].

While the theory of legitimacy focuses on communication with society, the theory of stakeholders focuses on communication with different groups of stakeholders. Stakeholder theory is the most important approach to explain how measures in the company environmental activities provide its higher financial performance [24]. This theory postulates that it is not enough for managers to focus solely on the needs of shareholders, it is of paramount importance to take into account the interests of internal and external stakeholders. They affect the company reputation, confirm its legitimacy and affect its financial performance directly due to mechanisms to reducing / increasing demand for products and providing / not providing funds to financial activities. It is maintained [25, 26] that, the company is able to achieve an acceptable level of financial performance only through active management of relations with key stakeholders.

Institutional theory provides further explanation at the intersection of stakeholder theory and legitimacy theory and argues that institutions are an important components of business environment. It describes the mechanisms by which a company seeks to reconcile society's perceptions of its activities with societal values and norms, that is, which way the company seeks to institutionalize them. In this context, the argument of M. Porter is important, who affirms that profitability and pollution reduction are not mutually exclusive goals. In his view, pollution is a waste of resources (e.g. energy, materials), and, therefore, efforts to reduce pollution (e.g. through improved products or processes) can not only reduce the negative impact on

the company environment, but also strengthen its competitiveness. He suggests that well-designed environmental legislation can stimulate innovation and increase competitiveness [27]. In other words, the more we institutionalize "Be Green!" narrative as a society norm and the more environmentally friendly behavior is spread among companies, the more severe the stakeholders punishment is for a company with environmentally harmful behavior. This issue is especially relevant for large companies, involved in mining, agriculture, transport, processing which are, undoubtedly, significant "polluters" of the environment.

The resource based approach postulates the positive impact of the company environmental performance on its financial performance. According to this approach, companies consider stakeholder activities as a strategic investment [28, 29]. By investing in such a strategy, companies create assets that are valuable, rare, and have no substitutes, such as leadership and positive reputation. These assets, in their turn, provide the company with a competitive advantage and potentially higher profitability [30]. The company efforts aimed at reducing environmental impact and improving relationships with environmental stakeholders can also create a competitive advantage. A company which is successful in managing natural resources through innovation in environmental products can reduce costs, cut risks, improve reputation, increase employee motivation and, thus, rocket revenues.

3 Hypotheses development

Several hypotheses are to be tested in order to answer the second research question on environmental determinants of environmental protection investment (EPI) determinants and the presence / absence of relationship between environmental protection investment and financial performance.

According to the reviewed literature, the relationship between environmental protection investment and companies sales and profitability could be positive, negative or neutral. Thus, reducing energy use and pollutant emissions gives opportunity for more efficient use of resources [27, 31], and increasing environmental protection investment has a positive effect on company product sales and favors increasing its efficiency [17, 32]. One of the most important aspects of the relationship between environmental investment and company financial performance is its causality, i.e. the direction of causation. There are two management theories explaining the causality of this relationship such as the theory of good management (Good Management Theory) and the theory of surplus resources (Slack Resource Theory) [33]. Both theories suggest that there is a positive relationship between environmental investment and a company financial performance. The Good Management Theory is based on the assumption of high relationship existence between environmental performance and effective stakeholder management. Effective environmental measures improve relationships with key stakeholder groups, such as the local community, customers, employees, investors or local government. Unlike

the theory of good management, the theory of surplus resources has the opposite argument. According to it, the company high revenues and its financial results contribute to increased investment. The availability of surplus financial resources provides opportunity for the company to use these resources for investing in environmental projects [33–36].

Taking into consideration the above mentioned theoretical provisions and the results of previous empirical research [9, 28, 32, 37], we postulate that: 1) Ukrainian companies can enjoy positive relationship between financial performance and environmental protection investment (based on the slack resource theory and on good management theory); 2) companies which carry out environmentally non-friendly activities, increase the volume of environmental protection investment.

It should be pointed out that two types of dependent variable are to be tested such as total environmental protection expenditures and capital investments for environmental protection. The argument in favor of such a division is that the vast majority of companies, one way or another, incur current environmental costs under the pressure of external stakeholders and regulations. It can be interpreted as reflexive behavior. At the same time, long-term capital investments in environmental protection and increasing their volume may be the evidence of serious companies intentions to upgrade business processes for future resource saving. Therefore, such activities can be perceived as the integration of environmental goals of sustainable development into the companies long-term strategy characterizing their proactive position.

3.1 Industry profile and environmental protection investment

Companies, carrying out activities significantly damaging the environment, are under considerable pressure from stakeholders, such as government environmental inspectorates, local communities, politicians, and workers. As a result, corporate management must bring its corporate standards and values into line with public expectations in order to obtain a "license to operate" according to the theory of legitimacy. The increase of civic consciousness due to the spread of the paradigm of sustainable development contributes to the transformation into the norm of environmentally friendly behavior of corporations, which corresponds to the principles of institutional theory.

Ukraine is an industrialized country with a powerful mining and processing complex, represented by companies of relevant activities. Such companies make significant emissions of harmful substances into the air, pollute the land and water, require significant amounts of water consumption and energy resources. Besides, Ukraine has developed agriculture, which requires a large area of arable land, water abstraction from rivers for irrigation, application of herbicides and mineral fertilizers, violating the environment severely. Therefore, agricultural companies are expected to increase investment in environmental protection by all means. The transport industry also belongs to environmental pollutants. It is no wonder that society

expects such companies to do much more to protect the environment. Therefore, the classification of the company as involved in environmentally harmful activities is an important factor influencing the volume of environmental investment [9]. The study suggests the following hypotheses:

H1.a: there is a positive relationship between the company's involvement in environmentally damaging sectors of the economy and total environmental protection expenditure (determinant – environmentally damaging economic activities).

H1.b: there is a positive relationship between the company's involvement in environmentally damaging sectors of the economy and long-term environmental protection investment (determinant – environmentally damaging economic activities).

3.2 Sales and environmental protection investment

In Ukrainian reality, companies with significant revenues have more financial resources which can be used for environmental protection expenditure. First of all, revenue is a source of covering the current costs of environmental protection. Previous studies showed that, in the periods when revenue is falling, even large companies reduce capital investment, especially in environmental protection [3, 38]. At the same time, according to the theory of legitimacy and resource based view, companies strive to gain a reputation as a "good citizen", so they pursue environment-related policies [29] and invest significant resources in protecting the environment of areas where their production is located.

With the adoption of the Sustainable Development Goals (Sustainable Development Goals – 2030, adopted by the UN in 2015), more and more large Ukrainian companies are reporting an increase in both current expenditures and long-term capital investments in environmental protection [38]. From the standpoint of the slack resource theory, companies should direct more financial resources to achieve certain strategic goals of sustainable development, including environmental ones. Taking into consideration all the above mentioned, we can derive the hypotheses:

H2.a: there is a positive relationship between the volume of revenue from companies sales and the volume of total environmental protection expenditure (determinant – company sales).

H2.b: there is a positive relationship between the volume of revenue from companies sales and the volume of long-term environmental protection investment (determinant – company sales).

3.3 Financial performance and environmental protection investment

As well as in case of significant revenues, a company that consistently generates high profits similarly owns available financial resources. These surplus resources can be used to increase capital investment in environmental protection, as the most common source of financing for long-term investment is long-term borrowings and equity.

Therefore, in the "replete" years, companies begin projects on resource efficiency, modernization of equipment and improvement of technological processes. Thus, the volume of profits has a positive effect on the volume of environmental protection investment. From the standpoint of the slack recourse theory, this study proposes the following hypotheses:

H3.a: there is a positive relationship between volumes of net profits and volumes of total environmental protection expenditure (determinant – company net profit).

H3.b: there is a positive relationship between volumes of net profit and volumes of long-term environmental protection investment (determinant – company net profit).

3.4 Environmental protection investment and financial performance

From the viewpoint of good management theory, increasing investment in environmental protection will help save natural resources through the use of more efficient resource-saving technologies. This will have a positive effect on reducing costs and, consequently, will increase the financial efficiency of the company. In addition, the reduction of pollution and waste leads to a reduction in environmental fines and, consequently, increases its financial results. Moreover, the constant attention of company management to environmental issues contributes to the formation of a positive image of the company and enhances its reputation. In turn, positioning the company as one that sells environmentally friendly products increases the commitment of a wider range of customers, making a positive impact on the company volume of production. These arguments give us opportunity to put forward the following hypothesis:

H4.a: there is a positive relationship between long-term environmental protection investment and financial performance (determinant - environmental protection investment).

4 Research Method

This study employed six variables: industry profile, company sales, company net profit, return on assets, long-time environmental protection investment, total environmental protection expenditure. The sample is formed on the basis of data from statistical reports on the activities of economic entities in Ukraine for the period 2015–2019 in terms of economic activities [39].

In this study, the dependent variable, which is environmental protection investment (EPI) is considered in two contexts: both as total environmental protection expenditure and as long-term component environmental protection expenditure (long-term environmental protection investment). Accounting of these costs as capital expenditures is based on the effect they produce over more than one year. On the contrary, current environmental expenditure is accounted for as intermediate consumption (they have effect only within a current year). Therefore, long-term environmental protection investment indicators were used in the analysis as indicators with lag ($n + 1$).

In order to test hypothesis *H4* financial performance (FP) is measured by ROA (after tax earnings divided by total assets). It is postulated that it is positively affected by already made long-term capital investments, so ROA was presented as an indicator with a lag ($n + 1$).

The independent variables selected for regression analysis have already been tested for other jurisdictions and are based on the results of previous empirical studies published [9, 10, 16, 17, 33, 40, 41]. Since the analysis is performed on indicators from statistical reports, the analogue for the dependent variable company sales used company turnover indicator. Industry profiles (environmentally damaging industry) are considered as a dummy variable which refers to low environmentally damaging industry or highly environmentally damaging industry (highly environmentally damaging industry is scored by one, otherwise zero). According to the NACE classification highly environmentally damaging industries (EDI) include agriculture (A), industry (B, C, D, E), transport (H), construction (F). The data were analyzed using linear regression based on the following models:

Model 1:

$$EPI = \alpha_i + \beta_{1i} * EDI + \beta_{2i} * S + \beta_{3i} * NP + \varepsilon_i \quad (1)$$

Model 2:

$$FP = \alpha_i + \beta_{1i} * EPI + \varepsilon_i \quad (2)$$

where *EPI* represents environmental protection investment; *EDI* shows environmentally damaging industry; *S* is a company' sales; *NP* is a company' net profit; *FP* is financial performance.

Correlation-regression analysis was used to test hypotheses about the relationship between environmental protection investment and their determinants.

5 Results and discussion

Descriptive data analysis. In order to answer the first research question we used the method of indicators descriptive analysis characterizing state and trends of environmental protection expenditure in Ukraine. Indicators are derived from statistical reports for a period from 2010 till 2019 [12, 39]. The analysis shows that there is a positive trend in environmental protection expenditure (in nominal terms), both in aggregate ones and in terms of components over the past 10 years (table 1). It should be emphasized that that table 1 shows the data on the total costs incurred both within government programs and by businesses. In the total environmental protection expenditure, the largest share is made up of current expenditures, which ranges from a minimum value of 62.8% in 2019 to a maximum value of 78.96% in 2010. Correspondingly, there is a tendency to increase the share of long-term capital investments, the share of which made up a record of 37.17% in 2019. It serves as evidence that priorities of environmental policy in the country have changed towards increasing projects creating long-term effects.

We can observe very small share of total environmental protection expenditure in the total GDP of the country – from 1.5% to 1% with a downward trend (table 2).

At the same time, for Europe (EU-27) such expenditures are steadily 2% of GDP [42]. In 2018 national expenditure on environmental protection as a percentage of GDP decreased to 1%, which is less than 2 times compared to the European Union. This situation does not allow us to talk about the seriousness of the government efforts aimed at transition Ukraine to a "green" agenda for the period up to 2030. By no means we can observe the improvement of the situation in terms of "total environmental costs per capita", as there is a steady trend towards depopulation in Ukraine. Over ten years, nominal environmental spending per capita has increased almost fivefold, but real growth, taking into account depopulation and inflation, is only 3 times as high. In fact, environmental spending per capita in Ukraine makes as little as 35 US dollars for the whole period of 2019. Most scholars and practitioners point out that the reasons for this situation are the presence of "chronic" social problems in the country that require priority funding, permanent crisis in Ukrainian economy, production falling in recent years, which all results in lack of financial resources to solve environmental problems.

It is a common knowledge, the main "agent of change" in the economy of each country is the business that implements, develops and finances innovative projects and activities. As part of total capital investment in environmental protection, business investment accounted for the vast majority until 2018, although since 2016, there was a period of significant decrease in business investments in long-term environmental projects (Table 3). In 2019 EU-27 invested EUR 51 billion into assets essential for providing environmental protection services and about EUR 31 billion (60% of total environmental protection investments) was spent by corporations [42].

If we compare the share of environmental capital investments of economic entities with total investments for the same period, we can see that their share is insignificant and decreases from 4.5% in 2016 to 1.7% in 2019. The share of such investments in the GDP of Ukraine (0.23% in 2019) and in the total environmental protection expenditure of economic entities (0.8% in 2019) is too small and tends to decrease. In Europe, the share of environmental protection investments in total investments of corporations was also relatively low in this period and amounted to 1.7% only in 2019, which is, nevertheless, much more than in Ukraine.

Thus, we can make a conclusion that there is chronic underfunding of environmental spending in the country and decrease of business interest in implementing long-term environmental projects. This does not give us opportunity to claim about active implementation of environmental goals of sustainable development by Ukrainian companies.

Hypotheses testing is based on regression analysis. To answer the questions about the determinants defining the amount of costs and investments in environmental protection, a regression analysis was performed according to the identified *Hypotheses 1-3*. Descriptive statistics are given in table 4. According to statistics on economic activities of business entities in Ukraine, we were able classified as few as 4 types of ecologically damaging industries out of

Table 1. Dynamics of environmental protection expenditures in Ukraine from 2010 till 2019

Year	Total environmental protection expenditure (TEPE)	Capital investments for environmental protection		Operating cost for environmental protection	
		UAH million	% from total costs	UAH million	% from total costs
2010	13128.1	2761.5	21.04	10366.6	78.96
2011	18490.5	6451.0	34.89	12039.4	65.11
2012	20514.0	6589.3	32.12	13924.7	67.88
2013	20377.9	6038.8	29.63	14339.1	70.37
2014	21925.6	7959.9	36.30	13965.7	63.70
2015	24591.1	7675.6	31.21	16915.5	68.79
2016	32488.7	13390.5	41.22	19098.2	58.78
2017	31492.0	11025.6	35.01	20466.4	64.99
2018	34392.3	10074.3	29.29	24317.9	70.71
2019	43735.9	16255.7	37.17	27480.2	62.83

Table 2. Indicators of environmental productivity in Ukraine for 2010–2019

Year	Total environmental protection expenditure (TEPE), UAH million	Nominal GDP, UAH million	TEPE as percentage of GDP, %	Average annual population, thousands people	Total environmental expenditure per capita, UAH
2010	13128.1	1082569	1.2	45865	286.2
2011	18490.5	1316600	1.4	45693	404.7
2012	20514	1408889	1.5	45577	450.1
2013	20377.9	1454931	1.4	45483	448.0
2014	21925.6	1566728	1.4	43722	501.5
2015	24591.1	1979458	1.2	42836	574.1
2016	32488.7	2383182	1.4	42668	761.4
2017	31492	2982920	1.1	42477	741.4
2018	34392.3	3558706	1.0	42269	813.7
2019	43735.9	3974564	1.1	42019	1040.9

Table 3. Indicators of capital investments for environmental protection by business entities in Ukraine, 2015-2019

Year	Environmental protection investment (EPI), UAH million	Nominal GDP, UAH million	EPI as percentage of GDP, %	Capital investments, UAH million	EPI as percentage of capital investments, %	Total environmental protection expenditure (TEPE), UAH million	TEPE as percentage of GDP, %
2015	7268.7	1979458	0.37	213478.1	3.40	23780.5	1.20
2016	12810.9	2383182	0.54	281667.9	4.55	31082.6	1.30
2017	9866.6	2982920	0.33	359159.8	2.75	29276.1	0.98
2018	8985.3	3558706	0.25	471115.5	1.91	32368.6	0.91
2019	8990.4	3974564	0.23	524474.1	1.71	32359.6	0.81

19 according to the NACE (31% of all observations), but in 2019 their expenditures for environmental protection amounted to more than 90% of all the annual expenditures. The standard deviation is quite significant for all indicators, due to the above mentioned problems and significant variation in data.

The next step is the results of multiple regression analysis for the most common environmental investment factors in the scientific literature. It is worth emphasizing that revenues and net income, which are the main source of financing capital investment and current expenditures, were identified as determinants of the impact on environmental expenditures. Correlation analysis did not reveal a close relationship between them (multiple $R = 0.139$,

$R^2 = 0.019$), which allows these indicators to be included as independent variables.

While characterizing the results of regression analysis with three independent variables for all costs (table 5), it should be pointed out that significant factors influencing the volume of total environmental protection expenditure were sales revenue (Coef = 0.0045833***, Standard error = 0.0008195), net profit (Coef = -0.034506**, Standard error = 0.0168399) and companies belonging to environmentally dirty industries (Coef = 5372.1979***, Standard error = 1694.7341). The following factors are also significant for long-term environmental protection investment: sales revenue (Coef = 0.001506***, Standard error = 0.00028678), net profit (Coef = -0.01929**, Standard error = 0.00589308) and belonging of companies to envi-

Table 4. Descriptive statistics

Variable	Min	Max	Mean	SD
Sales	0	3764364.90	540815.25	962630.03
Net Profit	-188267.9	109288.81	2323.16	45818.90
ROA	-8.1	34.7	8.94	9.34
Environmentally damaging industry (Dummy)	0	1	0.308	0.466
Total environmental protection expenditure	0	30174.50	2405.15	7639.96
Long-term environmental protection investment	0	12563.20	650.90	2455.81

ronmentally dirty industries (Coef = 1945.76***, Standard error = 593.067134). However, the adjusted coefficients of determination (Adj. R^2) for the model at 49% level indicate a sufficient explanatory power of the estimated model. The acceptability of this model for this study is based on the view [43, 44] that a high R^2 value is not necessary for the social sciences and humanities. According to [44] R^2 value 0.12 or below indicate low, between 0.13 to 0.25 values indicate medium, 0.26 or above and above values indicate high effect size.

It should be borne in mind that that although all three ratios are significant, the relationship between environmental investment and revenue and between environmental investment and net profit is low. The reason is previously mentioned trend to finance environmental costs on a residual basis. There is a negative relationship for the net profit determinant, which refutes *hypothesis H3*. This means that an increase in profit per unit of measurement leads to a slight decrease in the level of environmental investment.This result can be explained by the low volume of capital investment in environmental protection (60-70% of total expenditures), the chronic unprofitability of companies, and the financing of current expenditures mainly by revenues.The most influential determinant is belonging to environmentally damaging industries, which can be explained from the standpoint of legitimacy theory, stakeholder theory and slack resource theory. Based on the calculations, we can derive a model of multiple regression with weight coefficients:

$$\text{Total environmental protection expenditure} =$$
$$= -1646.389 + 5372.1979EDI+$$
$$+0.0045833S(t-1) + (-0.034506)NP(t-1) \quad (3)$$

$$\text{Longterm environmental protection investment} =$$
$$= -591.893 + 1945.76EDI+$$
$$+0.001506S(t-1) + (-0.01929)NP(t-1) \quad (4)$$

Thus, we can conclude that *hypotheses 1-2* are confirmed and *hypothesis 3* is disproved for Ukrainian companies. The main type of analysis used to test the determinants was based on the methods of linear regression by the method of least squares. Least squares regression is based on several assumptions, in particular, such as linear dependence between variables, independence of regression residues, normality of distribution of variables and regression residues, homoskedasticity and absence of multicollinearity. These assumptions were verified by appropriate tests. The main problem that causes the lack of independence between the regression residues is the presence of autocorrelation, which is inherent in regression based on time series. It was considered in this analysis, the autocorrelation did not come out. White's test was used to check for heteroskedasticity, and the variance inflation factor was used to check for multicollinearity, whose value should not exceed 10 in accordance with a rule. The calculated values of the variation factor showed no problems with multicollinearity.

Testing of *Hypothesis 4* on the impact of environmental investment (capital investment) on the financial performance of companies by the method of pairwise correlation gave negative results, indicating a lack of relationship (multiple R = 0.086, R^2 = 0.007). Thus, the hypothesis is rejected, which means that company managers do not take into account the provisions of the theory of good management in their decisions to implement investment projects aimed at environmental protection, and still do not consider such investments to be a factor improving the reputation and profitability of companies.

It should be pointed out that the determinants selected for analysis were limited by the type of collected data, as statistical reports in Ukraine do not provide more detailed and diverse information. At the same time, there are individual companies, for which other important factors may be taken into account, in particular, such as form of ownership, belonging to the signatories of the UN Global Compact, certification according to environmental standards, etc. The fact that companies are classified as environmentally damaging industries is not controversial, although previous research [27, 31] shows that such companies may resort to a "greenwashing" strategy instead of real activity.

6 Conclusion

The research is devoted to finding answers to questions about the state of environmental costs and investments in Ukraine and the impact of factors on environmental investments on the example of Ukrainian companies. The analysis revealed that despite the nominal increase in environmental spending, their share in GDP is insignificant. The share of capital investment by companies has dropped dramatically in recent years. It does not give opportunity to draw optimistic conclusions about the creation of a basis for the implementation of the policy of "green" growth in Ukraine.

The main factors influencing the volume of environmental investment were the following: the attitude of companies to environmentally damaging industries, income

Table 5. Results of multiple regression (Dependent = environmental investment)

Variables		Coef	SD	t-stat	p-value	Result
Dependent variable (total environmental protection expenditure)						
Constant		-1646.389	957.36622	-1.7197067	0.0919285*	No hypothesis
Environmentally damaging industry		5372.1979	1694.7341	3.16993559	0.0026548***	Confirmed
Sales (t-1)		0.0045833	0.0008195	5.59291762	$1.043 \cdot 10^{-6}$ ***	Confirmed
Net Profit	(t-1)	-0.034506	0.0168399	-2.0490573	0.0459441***	Not confirmed
Adj. R^2				0.497		
F-stat				17.78		
F-stat	(p-value)			$6.7 \cdot 10^{-8}$		
Dependent variable (Long-term environmental protection investment)						
Constant		-591.893	335.027448	-1.7667	0.083636469*	No hypothesis
Environmentally damaging industry		1945.76	593.067134	3.280843	0.001932279***	Confirmed
Sales (t-1)		0.001506	0.00028678	5.251055	$3.41097 \cdot 10^{-6}$ ***	Confirmed
Net Profit	(t-1)	-0.01929	0.00589308	-3.27306	0.001976216***	Not confirmed
Adj. R^2				0.497918		
F-stat				17.85903502		
F-stat (p-value)				$6.38 \cdot 10^{-8}$		

Note: *Significant at 10%, **Significant at 5% , ***Significant at 1%

(revenue) of companies and net financial results. The hypothesis on the impact of capital investment in environmental protection on the financial performance of companies was also tested. Regression analysis methods were used to test the hypotheses. According to the results of the analysis, all three identified factors have an impact on the volume of environmental investment of companies, but the most important factor is the attitude of companies to environmentally damaging industries. The hypotheses about the relationship between the financial results of companies and environmental investments and the impact of environmental investments on the financial performance of the companies were not confirmed.

Summing up the study, we can state that the results of environmental activities of economic entities in Ukraine can be explained only from the standpoint of slack resource theory, since companies invest in long-term environmental projects only in the presence of slack financial resources. None of the provisions of the theories of legitimacy theory, stakeholder theory and institutional theory are used as fundamental ones in the development of corporate strategies. Only a small proportion of companies in Ukraine develop sustainable development strategies and compile relevant reports. In Ukraine, when determining the remuneration for managers, appropriate indicators are not set for the implementation of the Sustainable Development Goals, and therefore, the theory of good management does not work. The environmental activity of the vast majority of Ukrainian companies is mostly declarative, and the behavior of companies from these positions is reflexive. In total, we can conclude that Ukraine belongs to the poor countries, whose main task is to survive. Under such conditions, a country lacks the funds and political will to pursue a genuine environmental policy, and the vast majority of companies are guided by the interests of profit maximization.

To draw more substantiated conclusions as a direction of future research, it is advisable to conduct an analysis based on non-financial reporting of a large sample of companies, which is to provide a more accurate picture.

References

[1] K. Markevich, ed., *Zeleni investytsi u stalomy rozvytku: svitovij dosvid ta ukrayinskyj kontekst (Green Investments in Sustainable Development: World Experience and Ukrainian Context* (Razumkov centre, Kyiv, 2019), ISBN 978-966-2050-13-4, https://razumkov.org.ua/uploads/article/2019_ZELEN_INVEST.pdf

[2] OECD, Tech. rep., OECD Publishing (2017), http://dx.doi.org/10.1787/9789264273528-en

[3] I.P. Petrenko, Naukovyj visnyk Mizhnarodnogo gumanitarnogo universytetu **2**, 62 (2018)

[4] O.V. Latysheva, Ekonomichnyj visnyk Donbasu **51**, 59–65 (2018)

[5] O.I. Vyshnytska, Visnyk Sumskoho derzhavnogo universytetu, Seriya "Ekonomika" **2**, 51–58 (2013)

[6] C. Zhao, T. Xiang, H. Peng, Theoretical Economics Letters **8**, 3395–3410 (2018)

[7] G. Inderst, C. Kaminker, F. Stewart, Tech. Rep. 24 (2012), https://www.oecd.org/environment/WP_24_Defining_and_Measuring_Green_Investments.pdf

[8] N.V. Zakharchenko, Ekonomichnyj visnyk **1**, 166–180 (2019)

[9] A. Chariri, G. Ratna Sari Br Bukit, O. Bethary Eklesia, B.U. Christi, M. Tarigan D, *Does Green Investment Increase Financial Performance? Empirical Evidence from Indonesian Companies* (E3S Web of Conferences, 2018), Vol. 31, p. 09001

[10] X. Su, Emerging Markets Finance and Trade **0**, 1 (2020)

[11] E. Broniewicz, ed., *Environmental Management in Practice* (IntechOpen, 2011), ISBN 978-953-307-

358-3, `http://www.intechopen.com/books/environmental-management-in-practice/`

[12] Tech. rep., State Statistics Service of Ukraine (2019), `http://www.ukrstat.gov.ua/druk/publicat/`

[13] S.Y. Yadukha, Visnyk Xmelnyczkogo nacionalnogo universitetu **3**, 277–281 (2013)

[14] U.Z. Kostyuk, Innovacijna ekonomika **1**, 181–186 (2015)

[15] N.V. Kameneva, Aktualni problemy ekonomiky **1**, 348–360 (2016)

[16] S.I. Kim, H. Shin, H. Shin, S. Park, Sustainability **11**, 4445 (2019)

[17] C. Bühringer, U. Moslener, U. Oberndorfer, A. Ziegler, Research Policy **41**, 442–451 (2012)

[18] R. Adamo, D. Federico, A. Notte, Investment Management and Financial Innovations **11**, 134–145 (2014)

[19] M. Milne, D.M. Patten, Accounting Auditing & Accountability Journal **15**, 372–405 (2002)

[20] J.C. Chen, D.M. Patten, R. Roberts, Journal of Business Ethics **82**, 131–144 (2008)

[21] C.H. Cho, D.M. Patten, Accounting, Organizations and Society **32**, 639–647 (2007)

[22] C.H. Cho, D.M. Patten, R.W. Roberts, The Journal of Business Ethics **67**, 139–154 (2006)

[23] Y. An, H. Davey, I.R. Eggleton, Journal of Intellectual Capital **12**, 571–585 (2011)

[24] R.E. Freeman, *Strategic management – A stakeholder approach* (Boston, 1984)

[25] S. Miles, Business and Society **1**, 21 (2017)

[26] J.S. Harrison, R.E. Freeman, M.C.S. de Abreu, Review of Business Management **17**, 858 (2015)

[27] M.E. Porter, C. van der Linde, Harvard Business Rewiew pp. 120–134 (1995), reprint 95507

[28] B.M. Ruf, K. Muralidhar, R.M. Brown, J. Janney, K. JandPaul, Journal of Business Ethics **32**, 143–156 (2001)

[29] M.V. Russo, P.A. Fouts, Academy of Management Journal **40**, 534–559 (1997)

[30] X. Luo, C.B. Bhattacharya, Journal of Marketing **70**, 1 (2006)

[31] S. Ambec, P. Lanoie, Academy of Management Perspectives **22**, 45–62 (2008)

[32] S. Brammer, A. Millington, Strategic Management Journal **29**, 1325–1343 (2008)

[33] H. Fauzi, K. Idris, Issues in Social and Environmental Accounting **3** (2009)

[34] J.E. Mattingly, L. Olsen, Journal of Leadership & Organizational Studies **25**, 481–498 (2018)

[35] S.A. Waddock, S.B. Graves, Strategic Management Journal **18**, 303–319 (1997)

[36] S.A. Waddock, S.B. Graves, Business & Society **36**, 250–279 (1997)

[37] G.A. Mill, Journal of Business Ethics **63**, 131–148 (2006)

[38] I. Vasylchuk, A. Sokolov, Investyciyi: praktyka ta dosvid **1**, 46–52 (2021)

[39] Tech. rep., State Statistics Service of Ukraine (2020), `http://www.ukrstat.gov.ua/druk/publicat/kat_u/2020/zb/11/DSG_2019.pdf`

[40] T. Artiach, D. Lee, D. Nelson, J. Walker, Accounting & Finance **50**, 31 (2010)

[41] I. Vasylchuk, Biznes-Inform **1**, 153–162 (2016)

[42] Tech. rep., Eurostat (2020), `https://ec.europa.eu/eurostat/statisticsexplained/`

[43] J. Cohen, Current Directions in Psychological Science **1**, 98 (1992)

[44] F. Moksony, Szociolygiai Szemle pp. 130–138 (1990)