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The Impact of ESG Controversies on Bank Value and Risk-taking

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Abstract

ESG performance is one of the most important non-financial factors investors pay attention to when valuing a bank. Previous studies, devoted to bank ESG performance, rely solely on ESG ratings. The contribution of this paper to the existing literature is investigation of a new measure of ESG performance – ESG controversies. ESG controversies are covered in the media negative news that reflect a bank failure in ESG performance. The goal of this paper is to investigate the influence of negative ESG news on market value and stability of companies in a banking sector.

A cross-country sample of 134 banks and data on 1,200 controversies from 2016 to 2020 are used in this study. Our results provide evidence that ESG controversies negatively affect bank value and have no impact on its stability. However, the effect on share prices is not unified: it is stronger for banks that are in the scope of investor attention, and this relation is observed for developed markets with high freedom of press exclusively. Moreover, investors take into consideration the reason of ESG controversy occurrence. They react strongly to negative ESG news, related to community and workforce.

Keywords: bank ESG performance, ESG controversies, bank value, bank stability, value creation with non-financial data

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Introduction

Value creation concept is defined as a company's ability to generate future positive cash flows. Whereas stability can be interpreted as the provision of a consistent low-volatility flow. Historically, the main determinants of this cash flow were the financial and operating metrics of a specific business. In recent times investors pay attention to the companies' corporate social responsibility. Such responsible behavior is currently evaluated in terms of ESG (Ecological, Social, Governance) – a concept that includes a combination of factors, reflecting the involvement of the company in solving environmental, social and corporate governance issues.

ESG has two facets in terms of the value creation concept. Firstly, it creates value as a company, performing strongly on ESG, receives a positive reputation among investors, clients and government. Nevertheless, ESG activities can also destroy value and lead to high profit volatility because they require high costs, sometimes incurred simultaneously. Moreover, ESG issues are not exclusively positive: negative ESG news, covered in the media and called ESG controversies, can occur and destroy value when company is not responsible in its ESG[1] practices. Consequently, the total effect of ESG on value and stability of future cash flows is ambiguous and should be investigated further.

Nowadays, more companies are moving towards sustainable practices, incorporating ESG issues into their long-term strategies and reporting their sustainable achievements. This issue is currently relevant for banks as well. According to R. Bischof et al. [1], banks can no longer ignore ESG as it creates reputational and competitive advantages over their peers and becomes a "license to operate," as it was called by BlackRock CEO Larry Fink.

Even though, being a financial intermediary and an acting company, a bank does not have a huge direct negative effect on the environment, it does have a significant twofold impact on society. First, as D. Schoenmaker [2] emphasizes, financial institutions and banks accumulate money and should avoid investing in companies that produce negative effects on society. This concern exists mostly in regard to a bank's client portfolio. And second, according to F. Gangi et al. [3], a bank should incorporate ESG strategies into its own practice, as it has certain social and environmental influence, which mostly concerns bank employees. Consequently, the ESG concept is unique and different for banks and production firms, which is why it should be investigated separately.

Notwithstanding, there is no strict government regulation of ESG reporting and acting; companies and banks receive a certain evaluation of their ESG performance, reflected in an ESG rating from a range of rating agencies. Moreover, companies receive huge media coverage that nowadays pays a lot of attention to the level of firm sustainability, and the discovered violations of ESG practices are immediately publicized. Large-scale coverage of ESG in the media is becoming a powerful tool for influencing companies via public opinion. Since in the existing literature authors found contradictory results in regard to the relationship between ESG and bank value, in our research, following S. Glossner [4], we presume that ESG negative news are more informative compared to conventional ratings.

The goal of this paper is to establish the direction of influence of negative ESG news on a bank's value and risk-taking. Based on previous findings on production firms, we believe that ESG controversies should have the same effect on banks. Namely, ESG controversies are negatively reflected in banks' market prices and stability. In this paper we also question whether this effect is constant for diverse types of controversies and groups of banks.

This paper fills the gap in the existing literature. First, it contributes to the field of studies devoted to the impact of bank ESG performance on market prices and risk profiles. The second gap that is filled by this paper is the investigation of the impact of negative ESG news on bank value and stability. This is the novelty of the paper, since previous studies devoted to bank ESG performance rely solely on ESG ratings; nevertheless, an understanding of the role of ESG disputes in market value and stability is crucial for different parties.

The results of this paper will provide an understanding of the level of incorporation of ESG policies and disputes into market valuation and banks' risk-taking. It can provide bank management with useful insights about the level of influence of negative ESG actions taken by a bank on the value creation process and possible effects for bank shareholders and stakeholders. It is relevant for investors, since they can receive benefits or incur losses depending on share price movements due to ESG negative news announcements. As a result, this research can be used by bank management, investors, news agencies and policy makers.

A panel data econometrics approach is used in this research. The paper is based on a cross-country sample of 134 banks in 2016–2020, selected based on their market capitalization and data availability. The financial data is taken from Bloomberg, ESG ratings and controversies are gathered from Thomson Reuters, World Bank and Google Trends are used for macroeconomics and bank visibility data, respectively.

The paper is organized as follows. The first section covers the existing empirical studies devoted to ESG practices and its influence on bank value and stability. In the second section we develop the hypotheses. In the third section an empirical test of these hypotheses, result interpretation and the robustness check are presented. The end section contains the conclusions and limitations of the paper.

[1]Examples of ESG controversies for banks are presented in Appendix 1.

Literature review of the recent findings on the interrelation between ESG and value creation

To investigate the relationship between ESG controversies, on one side and bank value and risk-taking, on the other hand, we explored the existing findings in literature. First, we identified the role of ESG in value creation. Second, we discussed the concept of ESG for commercial banks and examine the existing studies devoted to ESG negative news. And finally, the effect of ESG on bank stability is examined.

The role of ESG non-financial factors in a value creation process

According to B. Van Bergen' et al. [5] KPMG report, cash flows that make up a company's value did not historically include the effect of externalities the company produces. Firms had not been punished for negative externalities (poor working conditions, environmental pollution) or rewarded for positive ones (environmentally friendly business, workforce protection, strong corporate governance). Nevertheless, this concept is disappearing, and externalities are being internalized. This opens up new opportunities to create positive value, and at the same time produces risks if a company is facing negative externalities. From B. Van Bergen' et al. [5] point of view, in order to "unlock value creation opportunities" it is necessary for investors and leaders to implement these new dynamics.

D. Schoenmaker [2] presents a framework for sustainable finance that takes into consideration financial, social and environmental returns simultaneously, rather than the purely financial side of value maximization. Three stages of sustainable financing are presented. On the first level (Sustainable Finance 1.0), financial companies avoid investing in "sin" companies[2]. In the second stage (Sustainable Finance 2.0), firms include social and environmental issues in their value creation mechanism. And finally, in Sustainable Finance 3.0, companies move from investing in ESG for the purpose of risk avoidance to aiming to create positive value. In the latter stages, companies move from financial value maximization to integrated value maximization that incorporate financial value, social and environmental impacts. Consequently, a society moves from pure value creation due to profit maximization, on the one side, and, on the other side, from ESG investing to ESG value creation in order to avoid risks.

Despite the society moves towards more general value creation, financial value creation is still one of the crucial parts of integrated value. McKinsey [6] developed five links to value creation by profit maximization with strong ESG performance:

1) More sustainable products attract more customers, leading to top-notch growth. Greater revenue increases business value.
2) Implementing ESG practices presupposes cost reduction through lower energy and water usage costs. This is another factor that leads to higher net income and future value.
3) Being green helps to receive government subsidies and support. This issue is highly relevant for banks as the value at stake is typically 50–60%, it is the most regulated industry with capital requirements and consumer protection.
4) Strong ESG strategy attracts motivated employees and talents. People are one of the core assets that create bank value through product diversification and capital allocation.
5) More sustainable machinery and equipment lead to better capital allocation and higher return on invested capital.

From another side, according to R. Bénabou and J. Tirole [7], poor ESG performance may destroy value, due to the exclusive managerial focus on short-term goals. It can increase short-term profits as there is no spending on ESG, nevertheless, it leads to ESG incidents, reputational damage, loss of trust and poor social capital [7; 8].

Consequently, companies are moving away from short-term profit extraction to long-term value creation using ESG practices and incorporating them into long-term company strategy [2; 9]. Good ESG performance, first of all, strengthens a company's reputation among investors and customers by demonstrating its concerns for the society, its employees and the future of the planet. Secondly, it enhances strong share performance due to financial value creation as it increases revenue, lowers costs and reduces cost of capital.

The influence of ESG performance on bank value

There is a huge scope of literature devoted to the influence of ESG on firm performance. G. Friede et al. [10] generalized conclusions from more than 2200 empirical studies. The author found that 62.6% of meta-analysis studies and 47.9% of vote-count studies reveal a positive impact of ESG on a firm's financial performance. In addition, the share of positive results is larger in emerging markets.

Some of the articles devoted to the interconnection between ESG and firm performance are related to value creation, but this scope of literature is much weaker. Mostly, researchers found a positive impact of ESG performance on company value and confirmation of the fact that investors incorporate ESG performance into share pricing on different markets and samples [11–14]. However, due to its specifics the banking industry is usually excluded from the analysis.

Indeed, it is important to understand that the ESG performance of financial institutions and banks, measured by

[2] Companies are called as "sin" if their products or services have negative effect on human health or well-being.

ESG rating, is slightly different from the ESG performance of production firms. Banks do not pollute the environment or produce huge emissions as industrial firms. The main determinants of strong performance are their care for their employees and a bank portfolio that excludes "sin" industries.

To understand the exclusiveness of a bank's ESG performance, we used the Sustainability Accounting Standards Board (SASB) materiality map that highlights the most relevant ESG topics by industry group. The aim of this concept is to create industry-specific material ESG components that listed companies should report. There are 5 most relevant categories in ESG reporting for commercial banks:

1) **Data Security**: proper risk management in regard to the protection of personal information;
2) **Access & Affordability**: providing access to bank products to broad categories of customers;
3) **Product Design & Lifecycle Management:** incorporation of ESG parameters into products and services granted;
4) **Business Ethics:** bank performance and involvement in corruption, fraud, bribery and other unethical actions;
5) **Systemic Risk Management**: bank concerns regarding its impact on the entire system and economy, reduction of negative risks to the system.

Consequently, the commercial bank industry is rather specific in terms of ESG reporting and performance. This can lead to varying directions of impact of ESG performance on value creation.

The literature devoted to the analysis of ESG performance on bank value is limited, compared to to studies of industrial firms. Notwithstanding, the results of their analysis are quite controversial. Most of the authors that used a cross-country sample of banks or a United States sample found a positive overall relation between ESG and bank value [9; 15–17]. Some papers [18–20] analyze that specific samples of emerging markets and European banks, report that this dependence is not straightforward. In emerging markets, the relation is non-linear: up to a certain threshold, investors react positively to ESG by increasing value, but further on they become indifferent and do not value banks' ESG activities. C. Di Tommaso and J. Thornton [19] founds that in Europe high ESG has a direct negative effect on value, but a positive indirect effect due to the resulting reduction of risks.

Moreover, the effect is not homogeneous. Firstly, M.M. Miralles-Quirós et al. [15] and A. Buallay [16] showed that this effect was not consistent with different ESG pillars: the social pillar has a negative effect on value, while the ecological and governance pillars exhibit a positive effect. Secondly, the authors using a cross-country sample of banks [15; 17] report that there is no homogeneity across certain bank characteristics, such as bank size and country specifics.

Some authors investigated the direct relationship between certain aspects of ESG (corporate governance, board structure and diversity) and bank value. For example, H. El-Chaarani et al. [21] and R. Bubbico et al. [22] found a positive relationship between the diverse features of strong corporate governance (board diversification, shareholder rights protection, disclosure, lack of political pressure) and bank value.

Consequently, the existing empirical studies do not offer a unique view on the interconnection between a bank's ESG scores and its value. Moreover, the results show strong diversification across bank and market characteristics. The aim of our study is, first of all, to test the interconnection between ESG and value. Secondly, we try to overcome the inconclusiveness in existing studies by adding another variable of ESG controversies that, according to S. Glossner, affects bank share pricing more than the ESG score itself, as it captures more investor attention [4].

The impact of ESG controversies on firm value

In several studies that examine the impact of ESG on firm value, authors incorporate a new ESG performance variable – ESG controversies. ESG controversies are covered in the media ESG-related negative news that follow a company's violation of social requirements for a responsible business. According to Thomson Reuters (TR) methodology, controversies are divided into 23 categories and include community, management, shareholder and other disputes [23]. Such negative news contains risks for company reputation and raise doubts regarding future firm performance from the investor's point of view.

What is more important, ESG controversies have a stronger effect on value relative to the ESG conventional rating since the ESG rating itself incorporates many criteria and poorly predicts future ESG misbehavior [4]. Moreover, ratings of different rating agencies are contradictory [24–26]. ESG incidents usually reveal a company's past behavior, realization of relative ESG risks and perception of controversies by investors. As a result, ESG controversies could be more informative compared to ESG conventional ratings.

In most of the articles, the main conclusions regarding ESG controversies and value are consistent [4; 27–30]: ESG controversies lead to a negative reaction of investors and, consequently, distract company value. This happens as investors expect a recurrence of such events in the future, and reflect it in lower earnings expectations, higher costs and, correspondingly, lower value [31]. However, A. Aouadi and S. Marsat [32] found that ESG controversies positively affect company value, being a way to attract investor attention to company shares.

Despite the existence of a certain effect of controversies on value, it is not a long-lasting one. Namely, on a sample of firms listed on the NYSE B. Cui and P. Docherty [27] proved that ESG controversies affect value during a certain period after a shock (ESG controversy) occurred, and share prices revert to previous values in one quarter. P. Krüger [29]

found that 21-day CAR (cumulative abnormal return) after such news is –1.31%.

The results regarding the level of reaction are controversial: S. Glossner [4] found that there is an underreaction to news, leading to underinvestment in ESG by management as market does not reflect such information. Meanwhile, B. Cui and P. Docherty [27] and P. Chollet and B.W. Sandwidi [33] reveal that overreaction takes place. Nevertheless, all authors argue that the opportunity to receive abnormal returns opens up for investors when the controversy happens. That is why the research of market reaction to ESG controversies could be useful for investors, managers and market makers.

Some authors found that the effect is not homogeneous across the sample [28; 32]. A. Aouadi and S. Marsat [32] states that results of their study hold only for firms that receive a high degree of attention firms. Authors included several control variables (firm visibility, press freedom index, size) and showed that controversies affect value only for those firms that are in the scope of investor attention, are large and situated in countries with a high level of press freedom. J.B. Wong and Q. Zhang [28] demonstrate the diversification of results across industries. Namely, there is no effect for "sin" companies, while for such industries as banking, candy, or steel production there exists a negative effect of controversies on value.

According to P. Chollet, B.W. Sandwidi [33] and G. Serafeim, A. Yoon [34], another sort of heterogeneity is a type of negative event. G. Serafeim and A. Yoon [34] found that there is an investor reaction solely to material ESG issues, social capital, and no such reaction exists to human capital issues. P. Chollet and B.W. Sandwidi [33] discovered that investors react to employees or environment alerts.

However, ESG controversies can lead to certain bias and overperformance due to existing information inefficiency. As mentioned by G. Dorfleitner et al. [35], it is better for small companies to have no controversies covered by the media because the investor can miss a company's ESG problems and not incorporate this negative effect in value. The authors calls these companies "small sinners," since while they actually have some problems, but due to their size and media coverage, these problems can be overlooked and not factored into share prices. Thus, investors incorporate ESG in company value for firms with high customer awareness [36]. According to Refinifiv [23], TR ESG controversy score incorporates this market capitalization bias, which leads to large capitalization companies suffering more, as they receive more media attention. The size is reflected in the severity weight, by which the number of controversies is multiplied. It is equal to 0.33 for large, 0.67 for mid-size and 1 for small cap companies [23].

Consequently, there is a rather unified view on negative ESG news in existing studies: there is a negative effect on share prices, since investors treat pessimistic news as a threat to a company's reputation and future prospects. Nonetheless, the banking industry is poorly covered in recent studies devoted to ESG controversies: only J.B. Wong and Q. Zhang [28] included the banking sector in the sample, and there are no articles devoted purely to banking sector. This study aims to fill this gap. As it was proven above, financial institutions are a special case in terms of ESG performance. Banks are also unique in terms of controversies, according to G. Serafeim and A. Yoon [34], who noted the materiality concept in investors' perception of controversies. According to the ESG materiality map, environmental disputes are not fully relevant for a bank, since controversies regarding water, paper or energy usage efficiency are too rare. Mostly social and governmental negative news, as well as issues regarding bank investments in environmentally unfriendly projects or companies contribute to ESG controversies for a bank, as demonstrated in Appendix 2. For that purpose, we examined the banking sector separately.

The role of ESG performance in a bank's risk-taking behavior

For banks, ESG issues are not purely an ethical question: there is a new type of risk nowadays, namely, an ESG risk [37]. To reflect this type of risk in their portfolio, banks should incorporate new measurement and scoring techniques. In case of ESG policy violation or incorrect portfolio compilation, banks become reluctant to take ESG risks that can distract their stability.

There are two general views on the relationship between bank risk-taking and ESG performance [38]: risk reduction and overinvestment. The risk reduction argument is rooted in the stakeholder theory. The logic is in the reduction of risks due to value creation with a strong reputation or the creation of "moral capital." Another argument stems from agency theory. According to that, managers overinvest in ESG practice and ESG reporting to satisfy different KPIs, which lead to increased risks. Consequently, from a theoretical view there is no unique answer as to the direction of ESG influence on bank performance.

Empirical studies that examine this issue using banks as an example [3; 19; 38], prove the first theoretical argument. Analysis of different samples confirms that bank fragility and risk-taking are lower for banks with high ESG scores. What is more important during financial crisis banks, having high ESG scores and long history of ESG reporting, are more stable [38].

Authors proved the relationship between different ESG pillars. C. Di Tommaso, J. Thornton [19] and W.S. Leung et al. [39] proved that the risk reduction is stronger in regard to the G-pillar. Risks decrease with a smaller, more independent, gender-diverse board of directors, and with directors having the power to consider the shareholders' interests. On the contrary, D. Anginer et al. [40] found that shareholder-friendly corporate governance leads to higher systemic risk for banks. F. Gangi et al. [3] found that risks are lower for highly environmentally committed banks, i.e., in regard to the E-pillar.

In the existing literature there are no articles devoted to the interrelation between ESG controversies and bank risks.

However, there are several papers devoted to firm risk and ESG controversies. M.H. Shakil [41] proved that ESG controversies have a moderating effect on the relationship between ESG performance and financial risk on a sample of oil & gas companies. Namely, ESG controversies limit the effect of the negative relationship between ESG scores and risk.

Hypothesis development

In this section, based on the literature review provided earlier, we developed five hypotheses for our empirical research that fill the above-described gaps in the existing literature.

Hypothesis 1. ESG controversies have a negative effect on bank value.

Following the existing literature [27–30], we presume that ESG controversies have a strong negative effect on value and risks that moderates the positive impact of ESG. This happens as investors who receive negative information regarding ESG question a bank's reputation and reflect these perceptions in future cash flows and share price. We suppose that investors mainly pay attention to ESG-related disputes covered in the media than to formal ESG ratings, according to S. Glossner [4].

Hypothesis 2. Investors reflect all types of ESG controversies equally in value.

Notwithstanding, previous studies [33; 34] report several differences in the investors' perception of controversies for firms, we assume that investors treat different controversy types equally in case of banks, as they mostly reflect banks' relationships with the community and different groups of stakeholders.

Furthermore, we understand that media coverage and a country's level of development are important. That is why to avoid bias in our conclusions we developed several control factors that capture these effects: bank visibility and the level of press freedom in the country.

Hypothesis 3. ESG controversies have an indirect effect on bank value depending on bank visibility.

Some firms receive more media attention [35]. As a result, controversies are more frequent for them and do not affect value as much as a single controversy for a firm that receives a low degree of attention. In our research, following previous studies [32; 42], we reflect bank visibility that is based on real investor attention to a particular bank.

Hypothesis 4. ESG controversies have an indirect effect on bank value depending on freedom of press in the country of domicile.

The second factor that leads to a potential result bias comprises the country specifics, reflecting the level of press freedom in a certain state. This can lead to ESG controversies not being covered by media, and consequently, not reflected in share price [32]. We split our sample to check whether the effect on value holds for different groups.

Hypothesis 5. ESG controversies moderate the relationship between ESG performance and bank risks.

According to previous empirical studies [3; 19; 38], we assume that ESG should have a positive effect on bank stability, corresponding to the stakeholder theory. However, according to M.H. Shakil [41], ESG controversies should lessen this effect.

The empirical test of these hypotheses is provided in the next section based on a cross-country sample of banks.

Research methodology

In this section we performed our own empirical study devoted to ESG controversies and their impact on bank performance based on a sample of banks from different countries.

Data and sample

A cross-country quarterly data for largest banks from 2016Q1 to 2020Q4 (20 quarters) is analyzed. The borders of the sample period are set by data availability of the ESG controversies variable. In TR, detailed information about the number of controversies and their content is available only for the last 5 years. We have formed a sample of over 200 largest banks by market capitalization (last calendar year market capitalization > $0.5 bln.). The banks were selected based on GICS industry classification: Sector – Financials, Industry – Banks. Due to data unavailability or substantial portion of missing values, a number of banks was deleted. Finally, a sample of 134 banks was obtained. The data was collected from Thomson Reuters, Bloomberg, World Bank and Google Trends.

Model specification

The dependent variables for hypothesis 1–4 are presented by Tobin's Q and Market Capitalization to Book Value (MC to BV), according to previous empirical studies devoted to the research of bank value (Model (*)). We use two dependent variables to cross-check the results. Tobin's Q is a ratio of a bank's market value to the replacement cost of its assets. It is usually used as a proxy for bank value [15; 19; 32; 43]. According to Y. Jiao [44], the advantage of this metric is its determination based not only on financial statements, but on future expectations as well. If Tobin's Q is greater than one, it means that the company is creating value, otherwise value is being destroyed. MC to BV measures a bank's market value relative to the book value of equity. This ratio is used in line with Tobin's Q as a proxy of value [32; 45].

To check the fifth hypothesis, a separate Model (**) is estimated with a Z-score dependent variable that reflects bank stability in terms of bankruptcy risk [46]. Z-score shows the level of bank stability and measures the distance from default [47–49]. The higher the Z-score value, the lower the probability of the default and the more stable the bank is. It is interpreted as the number of standard deviations needed to exhaust the capital [50]. This ratio is calculated as:

$$Z-\text{score}_{it} = \frac{(\text{ROA}_{it} + \text{CAR}_{it})}{\sigma(\text{ROA}_{it})},$$

where ROA is return on assets, CAR – capital to assets ratio and $\sigma(\text{ROA}_{it})$ – standard deviation of ROA as a proxy of return volatility. According to previous empirical studies, we have calculated the standard deviation of ROA for several previous years that are available, in our case – 2 years. According to K. Schaeck and M. Čihák [51], this allows to avoid the description of ROA volatility by capital level and profitability only. Following previous research, we used the natural Z-score logarithm as the distribution is skewed.

The main models are presented as follows:

$$\text{Value}_{it} = \beta_0 + \beta_1 \text{ESG}_{it} + \beta_2 \text{X}_{it} + \beta_3 \text{Z}_{it} + \varepsilon_{it} \quad (*)$$

$$\text{Z}-\text{score}_{it} = \beta_0 + \beta_1 \text{ESG}_{it} + \beta_2 \text{X}_{it} + \beta_3 \text{Z}_{it} + \varepsilon_{it}, \quad (**)$$

where Value_{it} represent bank value measured by either Tobin's Q Ratio or MC to BV. $\text{Z}-\text{score}_{it}$ is a metric that indicate bank stability. ESG_{it} includes ESG Score and ESG controversies ratio. X_{it} is a set of bank-specific control variables. Z_{it} is a set of country-specific variables that is included when a cross-country sample is analyzed to control for macroeconomic changes in the country of domicile. The description of variables and their usage in different hypotheses checks are presented in Appendix 2.

ESG score calculated by TR measures company performance based on 3 Pillars; ten main topics are weighted within each pillar (Figure 1). ESG combined score (ESG*C* score) inflate ESG score on significant controversies during a period that influenced a company [23]. In our further empirical research, a lag of ESG score is used as the score becomes available to investors after the end of calendar year, and they can incorporate this information into the next year's market prices.

Figure 1. TR methodology in ESG score calculation

ESGC score			
ESG score			ESG controversies
Environmental 1. Recourse use 2. Emissions 3. Innovation	Social 1. Workforce 2. Human rights 3. Community 4. Product responsibility	Governance 1. Management 2. Shareholders 3. ESG strategy	Controversies score based on 23 topics

Source: [23].

The ESG controversies score reflects the effect of ESG negative news. Controversies are reported separately as a list for each company over the last 5 years, allowing to work with uncontaminated data and adjusting it according to our own hypothesis. Furthermore, data was cleared from recent controversies that occurred after the reporting date but are reflected in current year till the next rating is published. Consequently, either ESG Combined score or ESG score with separate controversies variable will be used in further analysis to avoid a replication of data in several variables.

As it is reflected in G. Dorfleitner et al. [35] and H. Servaes, A. Tamayo [36], some information inefficiency regarding ESG controversies exists. Even though finding a solution to this issue is not the purpose of this paper, since it reflects the method to determine ESG controversies, we have made appropriate adjustments. We do not use the TR methodology [23] of applying severity weights for firms with different capitalization because of artificial weighting. In our paper, we introduce such variables as firm visibility and level of press freedom in the country, incorporated by A. Aouadi and S. Marsat [32].

As it was proven by B. Cui and P. Docherty [27] on a sample of non-financial firms, returns mean-revert 90 days after the controversy occurred, that is why the effect of ESG controversy, if it exists, should be reflected for banks as well on a one-quarter horizon, which we use further. Longer lag analysis is not necessary, as the negative effect of a controversy disappears.

X_{it} or a set of bank-specific control variables includes *profitability* measure (ROA, ROE or Profit margin), *size* of the bank, *credit risk, capital adequacy, business model, leverage* and *liquidity.*

To check the third hypothesis, the measurement of firm *visibility* (Google search volume index, GSV) is included. It is usually used in empirical papers as a proxy for investor attention and firm visibility [32; 52; 53]. The data was collected manually for each bank from the Google trends database. The index reflects bank popularity as a search query, with the index of 100 being the most popular, and 0 – the least popular. The index is reported monthly. To calculate a quarterly index, bring it to the quarterly basis we have computed the average GSV for each quarter.

Z_{it}, or a set of country-specific variables, includes *GDP growth, inflation* and a dummy variable that is equal to one for *developed* markets. A *Press freedom index* (*PFI*) variable reflects the freedom of press in the country and is included to test the fourth hypothesis. This variable shows the level of press freedom in the country and is published by Reporters Without Borders on an annual basis and then

reported by World Bank. Lower values correspond to the highest level of press freedom.

Preliminary data analysis

In this section we provide preliminary data analysis that consists of summary statistics, correlation analysis and a sample diversification analysis.

The initial data contains some unusual items that are treated as outliers and can bias future estimates. That is why the initial analysis using box plots was performed. We dropped 2 banks, as the Tobin's Q ratio was too high for them. Some values that were randomly missing were filled using linear interpolation methods to avoid loss of data.

To test for normality, a skewness-kurtosis test, which computes skewness, kurtosis and then combines these two tests into one test statistic, was used. A rejection of normality was observed.

The computed descriptive statistics after outlier deletion are presented in Table 1. Certain conclusions regarding dependent variables and variables of interest can be made:

- On average banks are traded higher than their book value, which proves the existence of a premium that can include the contribution of non-financial factors;
- ESG controversies occurred in 16% of the observations, while the number of controversies is rather volatile;
- The sample is heterogeneous in terms of countries, with 52% of banks operating in the developed market;
- Capital adequacy contains a lot of missing values, which is why it is not considered in subsequent analysis.

Table 1. Descriptive statistics

	Obs	Mean	Median	St. Dev.	Min	Max
Tobin's Q Ratio	2,680	1.03	1.01	0.06	0.92	1.43
MC to BV	2,680	1.22	1.14	0.59	0.14	3.99
Ln (Z-score)	2,680	4.82	4.87	0.87	0.00	7.87
ROA	2,680	1.03	0.93	0.63	–1.37	3.94
ROE	2,680	10.94	10.73	5.00	–27.69	30.97
Size	2,680	538.70	143.60	823.20	6.53	5,109
NPL to Total Loans	2,680	2.06	1.41	2.17	0.00	17.17
Capital adequacy	2,275	12.86	12.22	2.91	8.05	33.43
Provisions to Total Loans	2,680	0.75	0.46	0.81	–0.29	4.83
Business model	2,680	58.61	60.65	12.03	21.00	81.76
Equity to Assets	2,680	8.90	8.71	3.44	2.98	30.39
Cash to Total Assets	2,680	6.70	5.60	5.99	0.07	42.19
Profit Margin	2,680	27.16	27.42	17.24	–294.00	109.50
ESG Controversies	2,680	0.45	0	1.47	0	21
ESG Controversies Dummy	2,680	0.16	0	0.37	0	1
ESG	2,680	60.62	63.34	18.49	2.98	94.48
ESGC Score	2,680	56.07	57.74	17.03	2.98	89.66
GDP growth	2,680	1.56	2.24	3.53	-11.15	8.26
Inflation	2,680	1.74	1.62	2.14	-2.54	29.51
Developed	2,680	0.52	1	0.50	0	1
PFI	2,680	33.21	25.69	17.73	7.6	78.92
GSV	2,680	13.68	8	15.86	0	97.33

Source: Author's calculations.

The descriptive statistics does not allow us to detect the distribution of ESG controversies across the sample, which is why additional calculations were made. In Table 2, means and frequencies of observations for Tobin's Q and MC to BV in terms of ESG controversies were examined. ESG controversies occurred in 440 out of 2680 observations (16.4%). Moreover, means of variables are higher when controversies are absent, which can be a signal of value-distracting effect of controversies. Finally, we reported a sample of 1,204 ESG controversies (for more details, see Appendix 3).

Table 2. Tobin's Q and MC to BV by ESG Controversies

ESG Controversies Dummy	Tobin's Q		MC to BV		Frequency
	Mean	St. Dev.	Mean	St. Dev.	
0	1.0312	0.0636	1.2754	0.5992	2246
1	1.0004	0.0319	0.9562	0.4537	434

Source: Author's calculations.

Correlation analysis was also conducted. The results are presented in Appendix 5. There is a high positive significant correlation between Tobin's Q and MC to BV, which implies that both metrics can equally serve as a proxy for value. The high correlation between ROA, ROE and Profit Margin shows that the use of all three variables can cause multicollinearity problems, so only one metric should be used. ESG controversies have low, but statistically significant negative correlation with two metrics of value and ln (Z-score), meaning that an inverse relationship exists. Moreover, ESG controversies have positive moderate correlation with the size of the bank, implying that large banks may face more controversies than small ones. ESG total score and combined score also has a significant negative correlation with Tobin's Q and MC to BV and a correlation close to zero with ln (Z-score). However, pairwise correlations are not highly informative as they ignore other factors and do not take into account the division into groups. That is why more a complex regression analysis will be conducted in the next section.

Empirical models estimation

The sample requires panel data estimation, that is why we have initially run three models: pooled, fixed effects (FE) and random effects (RE). Pooled ordinary least squares (OLS) model is the most restricted as it presupposes similar patterns in all banks in all moments in time. In the FE model, each bank has a certain component α_i, which is invariant in time and reflects the influence of unobserved characteristics: $y_{it} = \alpha_i + x'_{it}\beta + \varepsilon_{it}$. As a result, the model cannot estimate time-invariant parameters separately as they are absorbed by α_i. In the RE model these individual effects α_i are treated as random, meaning that α_i are not correlated with explanatory variables.

Further, several tests were used to choose an appropriate model. The Breusch-Pagan Lagrange multiplier test for the presence of an individual random effect is used to choose between RE model and pooled regression. We found a strong rejection of the null hypothesis which results in RE model. The Wald test tests the hypothesis that all individual effects are equal to zero. It is used to choose between the FE model and the pooled model. The strong evidence of significance of individual effects was found, which is an argument in favor of the FE model. And finally, the Hausman test confirms the existence of a correlation between individual effects and explanatory variables. It helps to choose between the FE and RE models. As a result, according to the rejection of the null, FE model is the most adequate specification form for all models estimated below. The results of these tests are reported in Appendix 4 for Model 1. For all other models, the same procedure was performed, and the results are consistent with those reported above.

The FE models were then tested for the presence of heteroskedasticity, autocorrelation and multicollinearity. The multicollinearity test was conducted with the variance inflation factor (VIF) for panel data. The standard cutoff of 8 was used. Due to high multicollinearity, such variables as business model and NPL to Total Loans were deleted, and total assets were used instead of log of assets as a size proxy.

To test for heteroskedasticity in panel data, a modified Wald statistic for groupwise heteroskedasticity in the residuals was used. The strong rejection of the null (p-value close to zero) reflects the presence of heteroskedasticity, which should be corrected further.

The test for serial correlation of the first order (Wooldridge test) with the null of no autocorrelation in the residuals was performed. The null hypothesis was rejected, implying that a serial correlation should be corrected. The Pasaran test with the null hypothesis of cross-sectional independence was used to test for the presence of spatial autocorrelation. The null was rejected, meaning the presence of cross-sectional dependance. The results of all tests for Model 1 are reported in Appendix 4; the same procedure was performed for other models.

The presence of two types of autocorrelations requires double clustering: both by bank and by time. S.B. Thompson [54] argues that more robust standard errors lead to better performance of test statistics by reducing bias, but increase variance. That is why this method should be considered properly. As an example of a need for double-clustering, the author mentions regressions where some variables vary by firm and others – by time (for example, macroeconomic indicators). In this case single clustering

will eliminate the autocorrelation problem for one group of variables only (firm-specific or macroeconomic indicators) and will not solve the problem for the other group of variables.

And our sample contains regressors that vary both by bank (financial indicators) and by time (inflation, GDP, PFI). In addition, the ESG Score is constant during every four quarters for each bank, since it is reported on an annual basis. That is why Driscoll-Kraay standard errors (DK s.e.) were used [55] to correct the highlighted problems. They are applicable when the error structure is assumed to be heteroskedastic, time is autocorrelated up to a certain lag and correlated between the groups (when there is no cross-sectional independence and spatial autocorrelation is detected).

Table 3 reports a set of FE models with DK s.e.: Model 1 with ESGC Score and Model 2 with ESG Controversies and ESG Score.

Table 3. The effect of ESG controversies on bank value

	Model 1		Model 2	
VARIABLES	Tobin's Q Ratio	MC to BV	Tobin's Q Ratio	MC to BV
Profitability	–0.00019	0.00104	-0.00018	0.00137
	(0.0003)	(0.0037)	(0.0003)	(0.0036)
Size	0.00003***	0.00009*	0.00002***	0.00008*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Loan provisions	–0.01511***	–0.11610***	-0.01506***	–0.11534***
	(0.0022)	(0.0228)	(0.0023)	(0.0234)
Leverage	–0.00472***	–0.06326***	-0.00468***	–0.06270***
	(0.0010)	(0.0112)	(0.0010)	(0.0112)
Liquidity	0.00059*	0.00305	0.00057*	0.00225
	(0.0003)	(0.0035)	(0.0003)	(0.0035)
ESG Controversies			-0.00123***	–0.01566***
			(0.0003)	(0.0030)
ESG Score			0.00016	0.00155
			(0.0001)	(0.0013)
GDP growth	0.00443***	0.04462***	0.00453***	0.04527***
	(0.0004)	(0.0045)	(0.0004)	(0.0042)
Inflation	0.00082	0.01952*	0.00081	0.01941*
	(0.0010)	(0.0095)	(0.0010)	(0.0096)
ESGC Score	0.00006	0.00160*		
	(0.0001)	(0.0008)		
Constant	1.05251***	1.60163***	1.04752***	1.60521***
	(0.0148)	(0.1834)	(0.0170)	(0.2138)
Observations	2,680	2,680	2,680	2,680
Number of groups	134	134	134	134

The table reports a set of FE models with DK s.e.: Model 1 with ESGC Score and Model 2 with ESG Controversies and ESG Score variables.

Standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculations. 1-year lags of ESGC and ESG scores are used.

The effect of ESG Scores on bank value is statistically insignificant at 5% for MC to BV and for Tobin's Q in all specifications. The effect of ESG controversies is consistent in all model specifications: at a 5% level of significance, it has a negative effect on value in the current quarter. Consequently, the results for banks in terms of ESG controversies correspond to most of the literature devoted to producing firms, and our first hypothesis is not rejected.

The received result is an approval of investors' overreaction to negative news and salience theory [27; 56]. According to S.E. Taylor and S.C. Thompson [57], salience theory presupposes "disproportionate weighting" when the attention is directed to one set of information, and this set receives more weight. Thus, according to our results, the bank's entire ESG performance or positive ESG news can be within the "silent" set of information unless a negative event occurs, receives media coverage and becomes part of the information set with huge weighting by investors. As a result, investors overreact to negative ESG news considering that such events can occur in the future, and a bank is subject to ESG risks. This can be a confirmation of market inefficiency.

Diverse types of controversies

To check the second hypothesis, we aggregated the ESG controversies variable into three categories from the original seven ones, including 23 subcategories [23]: Community and Workforce, Product Responsibility, Shareholders. *Community* controversies reflect anti-competitive behavior, business ethics, tax fraud issues, and public health. It is the largest group, as it forms 69% of the sample. *Human rights* issues include problems of child labor and general human rights. *Management* disputes are about the inordinately high board compensations. *Product responsibility* is linked to company products or services, customer safety, privacy and product access (15%). *Recourse use* includes issues relevant to the company's use of natural resources. *Shareholders* issues are related to accounting issues, insider dealing, shareholder rights (6%). *Workforce* controversies reflect workforce diversity, health and safety, and wages (8%).

We combined Community and Workforce types into one category, as these types have similar patterns of a company concerned with social issues and people. In addition, due to the small number of observations of certain controversies, we added them to other categories based on their meaning: Resource use and Human Rights – to Community, and Management – to Shareholders. The latter is described by the relationship of these two types to corporate governance issues.

Estimation results are presented in Table 5 (Model 3). One group of controversies matters for bank share pricing: Community and Workforce. The variable is statistically significant at 5% level and reflects a decrease in value when these controversies occur. Consequently, the second hypothesis should be rejected according to the results received on our sample.

According to G. Serafeim and A. Yoon [34], one should look at SASB materiality map when considering different ESG news topics. Notwithstanding, product responsibility is one of the key aspects in bank materiality; investors do not react to such ESG news.

The received results partially correspond to the previous articles [33; 34], which mentioned that investors mostly react to social and environmental alerts and do not react to human capital issues. However, E-pillar issues are rare for financial institutions. Indeed, our sample captures only 1% of environmental controversies related to financing of oil companies. In contrast to the paper by G. Serafeim and A. Yoon [34], we observe the uniqueness of the banking sector, as investors do react to workforce issues (which mostly focus on human capital) as human capital is one of a bank's growth drivers.

Consequently, investors react to bank ESG controversies differently: they weight social and workforce negative news and are on average indifferent to product responsibility and shareholder controversies. Moreover, we have found an inconsistency for banks in terms of investor perception of material ESG issues, as not all material ESG controversies are reflected in share prices. These results do not correspond to controversy types, being reflected in share prices of producing firms.

The influence of bank visibility

We conducted a test for slope homogeneity of the ESG controversies coefficient. It is presented using the standardized version of Swamey's test for slope homogeneity for panel data described by M. Hashem Pesaran and T. Yamagata [58]. The null hypothesis is the slope homogeneity. The test compares two models: a restricted model with weighted FE estimator (that implies slope homogeneity) and an unrestricted cross-sectional unit specific OLS regression. Due to high test statistics and p-value = 0.000 for specifications with both dependent variables, the null about slope homogeneity is rejected. That is why we subsequently tested several hypotheses that check the sources of slope heterogeneity. These reasons are different levels of bank visibility and PFI in different countries.

In this section we test the hypothesis that states that the impact of controversies depends on the bank visibility level. The model that incorporates the influence of ESG controversies in the calculation of the GSV index is presented in Table 4 (Model 4). We incorporate the interaction of GSV and ESG controversies. From now the effect of controversies on value is mediated by bank visibility.

Results that are statistically significant at a 5% level strongly confirm the third hypothesis. The more popular the bank is (the higher its GSV), the stronger the negative effect of controversies on value. It means that the effect of ESG issues is stronger for banks that are in the scope of investor and public attention. For banks that are highly unpopular the effect is so small that it can be almost neglected.

Consequently, our results for the banking industry demonstrate the same bias as the existing results for industrial

firms described by G. Dorfleitner et al. [35]. Investors react poorly to controversies that occur in low-attention firms and overreact to disputes related to high-attention firms. There is a certain information inefficiency, which results in high degree of media coverage of ESG controversies for banks with high media coverage and investor attention. As a result, investors overreact to this news and share prices decline.

Table 4. The effect of ESG controversies on bank value: diverse types of ESG controversies and the effect of bank visibility

	Model 3		Model 4	
VARIABLES	Tobin's Q Ratio	MC to BV	Tobin's Q Ratio	MC to BV
Profitability	–0.00018	0.00126	–0.00019	0.00136
	(0.0003)	(0.0036)	(0.0003)	(0.0036)
Size	0.00002***	0.00008	0.00002***	0.00009*
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Loan provisions	–0.01508***	–0.11533***	–0.01502***	–0.11484***
	(0.0023)	(0.0232)	(0.0023)	(0.0232)
Leverage	–0.00466***	–0.06282***	–0.00474***	–0.06347***
	(0.0010)	(0.0112)	(0.0010)	(0.0111)
Liquidity	0.00057*	0.00230	0.00054	0.00182
	(0.0003)	(0.0035)	(0.0003)	(0.0034)
ESG Score	0.00016	0.00156	0.00015	0.00152
	(0.0001)	(0.0013)	(0.0001)	(0.0013)
GDP growth	0.00453***	0.04523***	0.00452***	0.04520***
	(0.0004)	(0.0043)	(0.0004)	(0.0043)
Inflation	0.00081	0.01951*	0.00080	0.01923*
	(0.0010)	(0.0095)	(0.0010)	(0.0095)
Controversies	–0.00127***	–0.01310***		
Community + Workforce	(0.0004)	(0.0030)		
Controversies	–0.00180	–0.01778		
Product Responsibility	(0.0013)	(0.0154)		
Controversies	–0.00044	–0.03231		
Shareholders	(0.0012)	(0.0205)		
ESG Controversies			–0.00003***	–0.00037***
#GSV			(0.0000)	(0.0001)
Constant	1.04752***	1.60653***	1.04783***	1.61004***
	(0.0171)	(0.2138)	(0.0169)	(0.2127)
Observations	2,680	2,680	2,680	2,680
Number of groups	134	134	134	134

The table reports a set of FE models with DK s.e.: Model 3 incorporates the effect of diverse types of controversies, Model 4 checks the influence of ESG controversies on value considering bank visibility.

Source: Author's calculations.

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Evidence from country's level of press freedom

In this section we test the fourths hypothesis. To capture the additional effect of press freedom in a country, we introduce an additional variable, namely, PFI. 25% and 75% quartiles were taken for the two sub-samples with lowest and highest average PFI values (Table 5).

Table 5. PFI – Percentiles

5%	25%	50%	75%	95%
10.25	**23.93**	25.13	**42.15**	78.39

Source: Author's calculations.

The results of a model with low and high PFI estimation are presented in Table 6 (Model 5). ESG controversies have a negative statistically significant effect on value for banks, whose countries of domicile have high press freedom (low PFI values). The coefficient becomes positive, but statistically insignificant at the 5% level for countries with low press freedom, meaning that ESG controversies do not affect value. The presence of a relationship for the banking sector solely in countries with high degree of press freedom is consistent with the result for production firms described by A. Aouadi and S. Marsat [32], nevertheless, the direction of influence is opposite.

Consequently, except for the attention bias on the bank level, detected via Model 4, there is another bias on the country level. As companies in countries with high press freedom receive more media coverage, investors receive more information and react to ESG controversies.

Table 6. The effect of ESG controversies on bank value: sample split by PFI

	Model 5			
	Press Freedom Index			
VARIABLES	Tobin's Q Ratio		MC to BV	
	LOW	HIGH	LOW	HIGH
Profitability	0.00016	–0.00188**	0.00658	–0.01499**
	(0.0006)	(0.0008)	(0.0060)	(0.0062)
Size	0.00006***	–0.00000	0.00044**	–0.00007
	(0.0000)	(0.0000)	(0.0002)	(0.0001)
Loan provisions	–0.02772***	–0.01414***	–0.24659***	–0.12231***
	(0.0053)	(0.0040)	(0.0466)	(0.0297)
Leverage	–0.00274	–0.01261***	–0.07216***	–0.10603***
	(0.0022)	(0.0010)	(0.0216)	(0.0137)
Liquidity	0.00031	–0.00284*	0.00493	–0.01546
	(0.0003)	(0.0015)	(0.0041)	(0.0125)
ESG Score	–0.00002	–0.00006	–0.00160	–0.00241**
	(0.0002)	(0.0001)	(0.0022)	(0.0011)
GDP growth	0.00329***	0.00475***	0.04586***	0.03508***
	(0.0005)	(0.0004)	(0.0055)	(0.0038)
Inflation	0.00717*	0.00108	0.07339	0.03058**
	(0.0041)	(0.0012)	(0.0449)	(0.0108)
ESG	–0.00002***	0.00009	–0.00023***	0.00174*
Controversies #GSV	(0.0000)	(0.0001)	(0.0001)	(0.0008)

VARIABLES	Model 5 Press Freedom Index Tobin's Q Ratio LOW	Tobin's Q Ratio HIGH	MC to BV LOW	MC to BV HIGH
Constant	1.01129***	1.20305***	1.55884***	2.71789***
	(0.0403)	(0.0210)	(0.4426)	(0.2284)
Observations	1,160	700	1,160	700
Number of groups	58	35	58	35

The table reports a set of FE models with DK s.e.: Model 5 provides the evidence of the sample split on 2 sub-samples, based on low and high PFI.

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Source: Author's calculations.

ESG controversies and bank stability

We have constructed 3 models. In all models the lagged value for controversies was included in line with the current period as we assume that controversies can affect bank stability on a six-month horizon. Model 6 includes the one-quarter lag of the ESG controversies variable interacted with the ESG score. This model tests the fifth hypothesis regarding the moderating effect of controversies on bank risk. Model 7 includes the interaction between ESG controversies on the one hand, and GSV index and ESG score on the other. Model 8 reflects the difference in the level of press freedom in different countries. The results are presented in the Table 7.

Table 7. The effect of ESG controversies on bank stability

VARIABLES	Model 6	Model 7	Model 8 PFI LOW	Model 8 PFI HIGH
Size	0.0002	0.0002	0.0001	0.0003
	(0.0003)	(0.0003)	(0.0004)	(0.0004)
Profitability	–0.0062***	–0.0061***	–0.0087***	–0.0014
	(0.0011)	(0.0011)	(0.0015)	(0.0028)
Loan provisions	–0.3421***	–0.3446***	–0.5908***	–0.2154**
	(0.0941)	(0.0944)	(0.1248)	(0.0785)
Asset growth	0.0641	0.0646	0.3402	–0.2571
	(0.2630)	(0.2638)	(0.2610)	(0.2995)
Liquidity	–0.0341***	–0.0342***	–0.0305**	–0.0356**
	(0.0081)	(0.0083)	(0.0123)	(0.0149)
ESG Controversies #	0.0002		0.0002	0.0004
ESG Score	(0.0002)		(0.0002)	(0.0006)
ESG Controversies$_{(t-1)}$ #	0.0003*		0.0002	0.0001
ESG Score	(0.0001)		(0.0002)	(0.0006)

VARIABLES	Model 6	Model 7	Model 8 PFI LOW	Model 8 PFI HIGH
ESG Score	0.0086***	0.0088***	0.0015	0.0127***
	(0.0020)	(0.0020)	(0.0031)	(0.0028)
GDP growth	0.0344*	0.0346*	0.0236	0.0389*
	(0.0185)	(0.0186)	(0.0211)	(0.0186)
Inflation	–0.0024	–0.0023	–0.0016	–0.0009
	(0.0244)	(0.0244)	(0.0474)	(0.0261)
ESG Controversies #		0.0001		
GSV		(0.0003)		
ESG Controversies #		0.0005		
$GSV_{(t-1)}$		(0.0004)		
Constant	4.7922***	4.8013***	5.1398***	4.5507***
	(0.2500)	(0.2514)	(0.1912)	(0.2909)
Observations	2,545	2,545	1,311	1,234
Number of groups	134	134	69	65

The table reports a set of FE models with DK s.e.: Model 6 with one-quarter lag of ESG controversies variable interacted with ESG score and ESG score, Model 7 with ESG controversies interacted with GSV index and ESG score and Model 8 with ESG controversies interacted with ESG score and difference in press freedom in different countries.

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Source: Author's calculations.

ESG controversies do not have a moderating influence on the relationship between the ESG score and bank stability, and do not have a deferred effect due to its statistical insignificance at the 5% level. This result is constant across all model specifications, meaning consistency across sub samples. Bank stability is affected by more fundamental factors, such as the bank's business model and performance, but some disputes covered in the media do not influence a bank's operating performance and do not lead to a reduction in the ESG-positive influence on risks, thus no moderating effect is noted on a six-month horizon.

In addition, we have found an interesting effect of ESG scores. In the first 2 models, the coefficient is positive and highly statistically significant, which indicates that banks with higher ratings are more stable and less risky in terms of distance from default. This is the argument for ESG not creating create value but decreasing risks. And this positive relationship corresponds to the empirical studies [3; 19; 38].

However, the subsequent sample split in Models 3 and 4 shows that this effect in not constant for all banks. This effect exists for banks in countries with low press freedom, but for banks in countries with high press freedom, there is no significant effect on stability. It can be explained as follows: for the latter, the requirements have been high over a long period of time, and these banks have followed an ESG strategy. However, for banks in emerging markets, high scores are rare, and this is a way to attract new clients and investor attention, increase profits and decrease risks.

Robustness check

To check the validity and consistence of our results we performed a robustness check by[3]:

1) Using the system GMM approach to reflect endogeneity concerns. Following C. Di Tommaso and J. Thornton [19], we presumed that our model may suffer from the endogeneity problem, since banks with higher valuation are reluctant to have higher ESG scores (inverse causality is possible). We conducted a robust estimation collapsing the number of instruments [59]. Endogenous variables lag of the dependent variable and ESG score were used. 2 tests were conducted: the Arellano-Bond

[3] Results are reported in Appendix 6.

test for autocorrelation and the Sargan test for overidentifying restrictions. Test results confirm that there is no autocorrelation and restrictions are valid due to high p-values – Model A;

2) Using the Bloomberg ESG rating instead of TR scores to check the validity of results – Model B;
3) Applying a sample variation over the time period to check the stability of obtained results by deleting the COVID-19 pandemic period (four quarters of 2020), since during the pandemic bank risks and investor attitude towards investments were biased – Model C;
4) Using the Developed variable instead of PFI to split the sample. Developed and PFI are highly negatively correlated and have a significant correlation of –0.62 (Appendix 5). It means that the results of the sample split could provide equivalent results. Nevertheless, we conducted a robustness check of the results received for the sample split by PFI, as variables capture different aspects of country characteristics – Model D.

In all specifications we received equivalent results:

- There is a statistically significant negative effect of controversies on bank value, the result is consistent for both dependent variables;
- ESG scores do not affect value;
- There is negative statistically significant at 5% effect of ESG controversies interacted with GSV on value measured by both dependent variables in developed markets and there is no effect in emerging markets;
- There is no moderating effect of ESG controversies on risk-taking that is statistically significant at 5% in either market.

The only discovered difference is as follows: in Model B we received inverse results in terms of the ESG rating itself when incorporated in value regression. There is a positive influence of ESG scores on value for both specifications that is statistically significant at 5%. It can be described due to specifics of rating formation by different agencies. As it was described in recent papers [24–26], ratings provided by agencies can give substantially different results since the ESG pillar weighting method is not universal. Even when adjustments for explicit differences in definitions of CSR ratings are made, their results do not correspond to each other. According to these studies, the correlation of ratings is low as well. For this reason, investors and managers should be aware of discrepancies in the rating methodologies when considering ratings.

Consequently, the results obtained through the robustness check confirm the main conclusions of this paper regarding ESG controversies, and in most cases prove the effect of ESG scores on bank value and risk-taking.

Conclusions

In this paper we introduce a new ESG controversies variable that describes banks' compliance with socially approved ESG practices. The focus was exclusively on the banking sector due to the uniqueness of ESG practices for this type of companies, described by SASB materiality map. We confirm that in case of banks ESG controversies are more important for investors than an ESG conventional rating itself, unlike for production firms, according to S. Glossner [4]. This metric negatively influences bank valuation and has no effect on fundamental stability. In addition, we have tested the hypotheses regarding diverse types of controversies, the effect of bank visibility and country specifics. The main results obtained in this study are valid according to the robustness check conducted in the course of research.

We have found a negative effect of ESG controversies on bank value, meaning that investors react negatively to bank involvement in ESG disputes. The effect depends on bank visibility: the higher the investor interest in the bank, the stronger the negative response of the share prices. This happens due to information inefficiency as banks that are in the scope of attention receive more media coverage, investors dispose more information and reflect this information in share prices. Moreover, investors react exclusively to several types of controversies, i.e., community and workforce controversies, and do not reflect other ESG negative news in share pricing.

According to the obtained results, the reaction to news depends on market specifics as well, such as the level of press freedom and the level of country development. Namely, there is an effect of ESG negative news on bank value in countries with high degree of press freedom and level of development. This can happen due to the higher attention to ESG practices in such countries and more efficient information available to different parties.

In terms of reflection of ESG disputes on a bank's risk-taking, we did not find any significant approval of the initial hypothesis. Since ESG controversies are more a reputational issue, bank stability as a fundamental part of bank business is not affected by temporary losses of reputation neither in short-term, nor on longer-term horizon.

In this paper we investigated bank ESG practices separately, since banks' ESG performance is different from that of production firms, as mentioned above. Introduction and statistical significance of the new ESG controversies variable can describe the inconclusive results received for the relationship between bank value, stability and ESG performance. Moreover, we have found different effects of controversies for banks. Firstly, investors react to various types of controversies, and they are not necessarily in line with the SASB materiality map [60]. Secondly, controversies do not have a moderating effect on bank stability, which is the foundation of bank business.

Although we have conducted in-depth research of the reflection of ESG controversies in bank business, this study has several limitations and there is room for future research. The first limitation is data availability: we use a dataset of controversies for the five-year period from only one data source – Thomson Reuters. Notwithstanding, controversies are published by other agencies, and they do

not include the banking sector. Moreover, we rely solely on Thomson Reuters methodology in classifying certain news as a controversy. Secondly, this study provides a more general understanding of ESG controversies, nevertheless, it can be useful to make a time-series or conduct case study analysis and provide conclusions about the impact of the duration and volume of ESG disputes on prices.

There is space for future research. Firstly, despite ESG controversies, it can be useful to conduct research and compare the impact of positive and negative ESG news on a sample of banks, following the results obtained by P. Krüger [29] for production firms. Secondly, another proxy of ESG controversies could be found or constructed by a researcher to approve the validity of the results obtained in this paper.

This study provides useful insights into bank management, investors and policymakers. For these parties it is important to understand how bank valuation and fundamental stability are affected by reputational losses due to ESG policy violation. Moreover, investors and companies can lose or make money on share price fluctuations, when ESG controversy occurs, and market reacts to such news.

Overall, ESG is a relatively new topic, and a unified viewpoint in regard to it has not yet been formed by investors, clients and governments because a rather short period has passed since its implementation. However, it is especially important to incorporate ESG practices and goals into companies' and banks' long-term strategies. Today ESG controversies and their coverage by the media are becoming a powerful tool for influencing companies that do not follow ESG, pollute environment and do not care for their employees, as the negative consequences of their activities will be immediately reflected in their share prices. Even though there is still no universal impact on share prices in all countries or an effect on stability, it is already becoming a powerful tool of affecting the bank strategy, performance and share pricing.

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Appendixes

Appendix 1. Several examples of ESG controversies

1) **Type of controversy:** Shareholder.
Main party: Goldman Sachs.
Year: 2010.
Goldman Sachs was obliged to pay $550 mln. to government and 2 other banks (Deutsche Industriebank and Royal Bank of Scotland) for fraudulent deals with derivatives and deception of investors.

2) **Type of controversy:** Community, Anti-competition controversy.
Main party: Bank of Nova Scotia.
Year: 2020.
Bank of Nova Scotia had to pay over $7 mln. for preci ous metals price manipulation.

3) **Type of controversy:** Product Responsibility, Privacy controversies.
Main party: Sberbank.
Year: 2019.
Sberbank has investigated a potential client data leak.

4) **Type of controversy:** Workforce, Diversity and Opportunity Controversies.
Main party: Bank of America.
Year: 2020.
Justice Department induced Bank of America to resolve claims of disability discrimination and pay compensation to victims.

5) **Type of controversy:** Community, Business ethics.
Main party: Danske Bank.
Year: 2017.
Danske Bank was fined for money-laundering.

6) **Type of controversy:** Resource use, Environmental controversy.
Main party: HSBC.
Year: 2017.
Greenpeace challenged HSBC due to financing palm oil companies.

Appendix 2. Description of variables

	Variable	Source	Measure	Definition	Hypothesis[4]
	Tobin's Q Ratio	Bloomberg	Share	Ratio of a bank's market value to the replacement cost of its assets. Estimated as (Market Capitalization + Total Liabilities + Preferred Equity + Minority Interest) / Total Assets	1, 2, 3, 4
	Market Capitalization to Book Value	Bloomberg	Share	Measures relative value compared to the bank's market value	1, 2, 3, 4
	Z-score	Author's calculation	Units	Return on assets plus capital to assets ratio divided by standard deviation of ROA	5
Bank specific variables	ESG Score	Thomson Reuters	Units	Measure of ESG performance of a bank weighted on 3 pillars: Environmental, Social, Governance	1, 2, 3, 4, 5
	ESG Controversies	Thomson Reuters	Units	Number of ESG controversies during a quarter	1, 2, 3, 4, 5
	ESG Combined Score	Thomson Reuters	Units	Measure that combines ESG score with ESG controversies to provide an evaluation of a company's sustainability performance	1
	Return on Assets	Bloomberg	%	Measure of a bank's profitability. Shows how much income can be generated relative to the asset base	1, 2, 3, 4, 5
	Return on Common Equity	Bloomberg	%	Measure of a bank's profitability. Shows how much income can be generated relative to equity base	1, 2, 3, 4, 5
	Size	Bloomberg	bln. RUB.	Measured by logarithm of total assets or total assets	1, 2, 3, 4, 5
	Credit risk	Bloomberg	%	Measure of credit portfolio quality. Is calculated as Non-Performing Loans to Total Loans	1, 2, 3, 4, 5
	Capital adequacy	Bloomberg	%	Is measured by Tier 1 Common Equity Ratio	1, 2, 3, 4, 5
	Loan provisions	Bloomberg	%	Measure management expectations of future loan losses. Is calculated as Provisions for Loan Losses to Total Loan	1, 2, 3, 4, 5
	Business model	Bloomberg	%	Measured by the ratio of Total Loans to Total Assets. Reflects the percentage of assets used for providing traditional banking services	1, 2, 3, 4, 5
	Leverage	Bloomberg	%	Measured by the ratio of Common Equity to Total Assets	1, 2, 3, 4, 5
	Liquidity	Bloomberg	%	Measured by the ratio of Cash to Total Asset	1, 2, 3, 4, 5
	Growth of assets	Bloomberg	%	Measures the speed of bank development. Calculated as the ratio of assets in the current period to the previous one minus 1	5
	Firm Visibility	Google Trends	Units	Is measured by Google Search Volume Index. Shows the level of bank popularity and investor attention. Ranges from 0 to 100 with 100 being the most popular search	3
Country specific variables	Press Freedom Index	World Bank	Units	Shows the level of press freedom in each country. Score ranges from 0 to 100, with values close to zero having more freedom	4
	GDP growth	World Bank	%	Measure the level of total country-specific economic conditions and growth opportunities	1, 2, 3, 4, 5
	Inflation rate	World Bank	%	Measure macroeconomic and price fluctuations in the home country	1, 2, 3, 4, 5
	Developed	MSCI	Dummy	Equals 1 if the country is considered developed according to MSCI classification and 0 for emerging	4

Source: Author's analysis.

[4] The number of hypotheses where the variable is used in regression model estimation.

Appendix 3. Number of controversies by type

Community	**832**	**69.1%**
Anti-competition controversy	329	27.3%
Business Ethics controversies	365	30.3%
Critical controversies	7	0.6%
Intellectual Property controversies	5	0.4%
Public Health controversies	1	0.1%
Tax Fraud controversies	125	10.4%
Management	**5**	**0.4%**
Management Compensation controversies	5	0.4%
Product Responsibility	**186**	**15.4%**
Consumer Complaints controversies	100	8.3%
Privacy controversies	50	4.2%
Product Access controversies	5	0.4%
Product Delays	1	0.1%
Product Recall	2	0.2%
Responsible Marketing controversies	28	2.3%
Resource Use	**9**	**0.7%**
Environmental controversies	9	0.7%
Shareholders	**76**	**6.3%**
Acing controversies	3	0.2%
Auditor Early Resignation	2	0.2%
Insider Dealings controversies	4	0.3%
Profit Warnings	16	1.3%
Shareholder Rights controversies	51	4.2%
Workforce	**96**	**8.0%**
Diversity and Opportunity controversies	17	1.4%
Employees Health & Safety controversies	2	0.2%
Management Departures	50	4.2%
Strikes	8	0.7%
Wages Working Condition controversies	19	1.6%
Total number of controversies	**1204**	**100.0%**

Source: Author's calculations.

Appendix 4. The tests result

Breusch-Pagan Lagrange multiplier test

H0: Variance across entities is zero

	Tobin's Q	MC to BV
chibar2(01)	10749.49	9037.82
Prob > chibar2	0.0000	0.0000

Source: Author's calculations.

Wald test

H0: All individual effects are equal to zero

	Tobin's Q	MC to BV
F (133, 2537)	64.41	59.92
Prob > F	0.0000	0.0000

Source: Author's calculations.

Hausman test

H0: Difference in coefficients not systematic

	Tobin's Q	MC to BV
chi2(9)	227.00	223.46
Prob > chi2	0.0000	0.0000

Source: Author's calculations.

Modified Wald statistic for groupwise heteroskedasticity

H0: Homoscedasticity

	Tobin's Q	MC to BV
chi2 (134)	91886.85	47262.90
Prob > chi2	0.0000	0.0000

Source: Author's calculations.

Wooldridge test for time autocorrelation

H0: There is no first order autocorrelation

	Tobin's Q	MC to BV
F (1, 133)	201.928	167.659
Prob > F	0.0000	0.0000

Source: Author's calculations.

Pasaran test for cross-sectional independence (spatial autocorrelation)

H0: Cross-sectional independence

	Tobin's Q	MC to BV
Statistic	49.369	64.998
Prob	0.0000	0.0000

Source: Author's calculations.

Appendix 5. Correlation analyses

	Tobin's Q Ratio	MC to BV	LN (Z-score)	ROA	ROE	Size	Credit risk	Capital adequacy	Loan Provisions	Business model	Leverage	Liquidity	Profit Margin	ESG Controversies	Controversies Dummy	ESG score	ESGC score	GDP growth	Inflation	Developed	PFI	GSV
Tobin's Q Ratio	1																					
MC to BV	0.944***	1																				
LN (Z-score)	0.074***	0.104***	1																			
ROA	0.634***	0.612***	0.129***	1																		
ROE	0.479***	0.565***	0.190***	0.788***	1																	
Size	−0.320***	−0.366***	0.049*	−0.319***	−0.165***	1																
Credit risk	−0.154***	−0.209***	−0.317***	−0.051*	−0.151***	−0.004	1															
Capital adequacy	0.270***	0.206***	−0.060**	0.213***	0.069**	−0.110***	0.126***	1														
Loan provisions	−0.043*	−0.068**	−0.164***	0.177***	0.084***	0.002	0.386***	−0.026	1													
Business model	0.214***	0.257***	0.136***	0.405***	0.234***	−0.545***	−0.055**	0.062**	−0.068**	1												
Leverage	0.434***	0.371***	0.115***	0.708***	0.212***	−0.406***	−0.001	0.233***	0.180***	0.485***	1											
Liquidity	−0.157***	−0.233***	−0.052*	−0.206***	−0.074***	0.233***	−0.001	0.096***	−0.108***	−0.223***	−0.385***	1										
Profit Margin	0.336***	0.383***	0.168***	0.507***	0.588***	−0.108***	−0.194***	0.155***	−0.169***	0.214***	0.231***	0.007	1									
ESG Controversies	−0.117***	−0.126***	−0.129***	−0.198***	−0.191***	0.348***	−0.016	0.024	−0.055**	−0.363***	−0.176***	−0.040	−0.128***	1								
Controversies Dummy	−0.181***	−0.195***	−0.151***	−0.287***	−0.246***	0.401***	0.050*	0.005	−0.037	−0.430***	−0.273***	0.015	−0.179***	0.690***	1							
ESG score	−0.345***	−0.342***	−0.146***	−0.345***	−0.246***	0.322***	0.169***	0.071***	0.032	−0.295***	−0.357***	0.089***	−0.299***	0.272***	0.330***	1						
ESGC core	−0.227***	−0.202***	−0.020	−0.115***	−0.019	0.002	0.159***	0.072***	0.073***	0.064**	−0.158***	0.075***	−0.136***	−0.189***	−0.124***	0.773***	1					
GDP growth	0.163***	0.193***	0.260***	0.179***	0.265***	0.042*	−0.040	−0.095***	−0.083***	0.117***	0.066**	−0.033	0.206***	−0.025	−0.093***	−0.107***	0.016	1				
Inflation	0.101***	0.115***	−0.032	0.245***	0.208***	−0.010	0.040	−0.014	0.389***	0.023	0.172***	−0.099***	−0.032	0.009	−0.017	0.031	0.072***	0.263***	1			
Developed	−0.099***	−0.066**	−0.162***	−0.399***	−0.321***	0.083***	−0.187***	−0.093***	−0.498***	−0.240***	−0.280***	−0.020	−0.172***	0.229***	0.270***	0.086***	−0.145***	−0.262***	−0.172***	1		
PFI	−0.017	−0.060**	0.225***	0.276***	0.282***	0.250***	0.038	−0.126***	0.426***	0.059**	0.154***	0.165***	0.212***	−0.173***	−0.200***	−0.228***	−0.063**	0.327***	0.151***	−0.654***	1	
GSV	−0.167***	−0.214***	−0.180***	−0.141***	−0.211***	0.175***	0.294***	0.098***	0.127***	−0.278***	-0.115***	0.016	−0.260***	0.316***	0.330***	0.396***	0.157***	−0.148***	0.088***	0.079***	−0.190***	1

Source: Author's calculations.

Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

Appendix 6. Robustness check

	Model A			Model B			Model C			Model D					
VARIABLES	Tobin's Q Ratio	MC to BV	LN (Z-score)	Tobin's Q Ratio	MC to BV	LN (Z-score)	Tobin's Q Ratio	MC to BV	LN (Z-score)	Tobin's Q Ratio	MC to BV	LN (Z-score)	Tobin's Q Ratio	MC to BV	LN (Z-score)
Lag of the	0.0568	0.1746	1.0608***												
dependent variable	(0.1088)	(0.1239)	(0.0555)												
Profitability	−0.0070*	−0.0661*	−0.0092***	−0.0002	0.0014	−0.0060***	−0.0005	−0.0020	−0.0078***	−0.0003	0.0018	−0.0087***	−0.0004	−0.0024	−0.0007
	(0.0040)	(0.0344)	(0.0034)	(0.0003)	(0.0036)	(0.0012)	(0.0004)	(0.0048)	(0.0008)	(0.0005)	(0.0048)	(0.0012)	(0.0007)	(0.0054)	(0.0032)
Size	0.0000	0.0002	0.0000	0.0000***	0.0001	−0.5533**	0.0000	−0.0000	0.0010***	0.0000*	0.0001	−0.0001	0.0000**	0.0000	0.0005
	(0.0000)	(0.0004)	(0.0001)	(0.0000)	(0.0000)	(0.2315)	(0.0000)	(0.0001)	(0.0002)	(0.0000)	(0.0002)	(0.0004)	(0.0000)	(0.0000)	(0.0004)
Loan Provisions	−0.0398	−0.2494	−0.2556*	−0.0149***	−0.1139***	−0.3466***	−0.0116***	−0.0876***	−0.1350*	−0.0221***	−0.1866***	−0.6185***	−0.0117***	−0.0885***	−0.2051***
	(0.0297)	(0.2624)	(0.1435)	(0.0023)	(0.0234)	(0.0885)	(0.0029)	(0.0261)	(0.0741)	(0.0062)	(0.0571)	(0.1258)	(0.0032)	(0.0240)	(0.0654)
Leverage	0.0036	−0.1103		−0.0048***	−0.0640***		−0.0056***	−0.0748***		−0.0040*	−0.0772***		−0.0059***	−0.0711***	
	(0.0045)	(0.0683)		(0.0011)	(0.0112)		(0.0016)	(0.0155)		(0.0020)	(0.0184)		(0.0010)	(0.0088)	
Liquidity	0.0072*	0.0361	−0.0324	0.0006*	0.0021	−0.0337***	0.0003	0.0053	−0.0444***	−0.0001	−0.0013	−0.0304***	−0.0004	−0.0013	−0.0264
	(0.0037)	(0.0288)	(0.0266)	(0.0003)	(0.0031)	(0.0100)	(0.0004)	(0.0039)	(0.0084)	(0.0003)	(0.0030)	(0.0082)	(0.0008)	(0.0062)	(0.0177)
Controversies	−0.0136**	−0.1197**		−0.0013***	−0.0159***		−0.0005**	−0.0128***							
	(0.0056)	(0.0700)		(0.0004)	(0.0031)		(0.0002)	(0.0038)							
ESG Score	0.0005	0.0067	0.0056*	0.0004**	0.0040**	0.0134***	0.0003**	0.0028*	0.0102***	−0.0001	−0.0018	−0.0010	0.0001	0.0012	0.0123***
	(0.0007)	(0.0068)	(0.0031)	(0.0002)	(0.0015)	(0.0037)	(0.0001)	(0.0015)	(0.0017)	(0.0001)	(0.0013)	(0.0044)	(0.0001)	(0.0009)	(0.0033)
GDP growth	0.0065***	0.0692***	0.0413***	0.0047***	0.0466***	0.0244	0.0048***	0.0492***	0.0384*	0.0022***	0.0310***	0.0170	0.0054***	0.0454***	0.0350*
	(0.0009)	(0.0095)	(0.0102)	(0.0004)	(0.0042)	(0.0173)	(0.0011)	(0.0115)	(0.0193)	(0.0005)	(0.0051)	(0.0201)	(0.0004)	(0.0041)	(0.0182)
Inflation	0.0043	0.0881*	−0.0782	0.0010	0.0208**		0.0004	0.0130	0.0394**	0.0117***	0.1332***	0.0366	−0.0001	0.0109	−0.0028
	(0.0046)	(0.0486)	(0.0478)	(0.0010)	(0.0095)		(0.0011)	(0.0098)	(0.0183)	(0.0037)	(0.0412)	(0.0666)	(0.0011)	(0.0106)	(0.0259)
Assets growth			0.4434			0.4578			−0.0248			0.4231			−0.4259
			(0.4245)			(0.3058)			(0.2479)			(0.2483)			(0.2780)
ESG Controversies			−0.0001			0.0004			0.0001			0.0002			0.0002
# ESG Score			(0.0002)			(0.0003)			(0.0002)			(0.0002)			(0.0007)
ESG Controversies			−0.0002			0.0004*			0.0003*			0.0002			−0.0003
# ESG Score (t-1)			(0.0002)			(0.0002)			(0.0002)			(0.0002)			(0.0007)
ESG Controversies #			−0.0001							−0.0000***	−0.0004***		0.0001	0.0013*	
GSV										(0.0000)	(0.0001)		(0.0001)	(0.0007)	
Constant	0.9367***	1.9477**	0.0588	1.0421***	1.5588***	11.6365***	1.0601***	1.7037***	4.1688***	1.0320***	1.6790***	5.3817***	1.0907***	1.9307***	4.4386***
	(0.1314)	(0.8023)	(0.4571)	(0.0166)	(0.2039)	(2.8605)	(0.0281)	(0.3095)	(0.1685)	(0.0295)	(0.3037)	(0.2604)	(0.0163)	(0.1594)	(0.3169)
Observations	2,546	2,546	2,545	2,676	2,676	2,541	2,144	2,144	2,010	1,400	1,400	1,330	1,280	1,280	1,215
Number of groups	134	134	134	134	134	134	134	134	134	70	70	70	64	64	64

The table reports a set of models: Model A – system GMM approach, Model B – FE models with DK s.e. that uses Bloomberg ESG rating, Model C – FE models with Driscoll-Kraay standard errors that is estimated without period of COVID-19 pandemics, Model D – FE models with Driscoll-Kraay standard errors that uses Developed variable instead of PFI.
Source: Author's calculations
Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01.

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The Impact of the EU Carbon Border Adjustment Mechanism on Russian Exporters

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Abstract

The European Union's commitment to achieve carbon neutrality by 2050 led EU states to develop a new legal stimulus mechanism allowing to reduce greenhouse gas emissions: the 'Carbon Border Adjustment Mechanism' ('CBAM'). First introduced in July 2021, the CBAM anticipates an imposition of a special carbon import duty on companies that import certain goods and materials into the EU, with the amount of such duty calculated based on the amount of GHG emissions emitted into the atmosphere in relation to such products.

CBAM constitutes a part of today's environmental agenda of the EU, but it obviously places additional financial burden on the shoulders of exporters, including those from Russia, for many of whom the EU has been a strategic market for a long period of time.

This article provides a summary of findings made as a result of research of available publications that addresses a potential impact of CBAM on the value and financial metrics of those Russian exporters. The authors aim to demonstrate the results of calculations of the additional burden placed on the exporters which arise from CBAM through an analysis of the structure of the export, identification of the economic sectors most affected by CBAM, calculation of a carbon export duty to be potentially paid at the border of the Eurasian Economic Union, as well as calculation of required government support for the exporters.

This article further evaluates the impact of CBAM while factoring in amendments that were still not covered in comprehensive research papers at the time of publication of the particular research analysed herein. Additionally, a detailed analysis of goods exported to the EU and impacted by CBAM is conducted for the first time, including a list of significant commodity nomenclature codes which are stipulated in the relevant legislation. Finally, recommendations on potential reactions to the impositions of CBAM and their effects on the future growth of the Russian economy are also provided.

In December 2021, the European Commission proposed a set of stringent amendments to the CBAM draft legislation, expanding the list of goods affected, broadening the emissions scope and accelerating the timeline for implementation of the CBAM. In June 2022 the European Commission agreed to compromise on less-stringent wording which goes outside the scope of this article. The details of proposed amendments assessed in this article thus represent the stricter version of language considered during the review process of the European Commission.

Keywords: economics of regulation, trade and environment, environmental taxes and subsidies, government policy, valuation of environmental effects, international fiscal issues

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Introduction

In July 2021 the European Commission of the EU presented a legislative initiative package regulating environmental protection as a part of the strategic package of climatic measures known as 'Fit for 55' [1]. The primary objectives of 'Fit for 55' are the reduction greenhouse gas emissions in the EU 55% from 1990 levels, and achieving carbon neutrality by 2050.

The Carbon Border Adjustment Mechanism (CBAM) initiative occupies the central position in the package. Officially, CBAM is an instrument promoting decarbonization of European imports, but in practice it is a mechanism for tax burden leveling aimed at making companies which export their products to the European Union pay for greenhouse gas emissions which take place during the manufacture of such products. The price calculated is equal to the one paid by EU domestic manufacturers according to the EU Emission Trading System. The intention is to arrange payment of the carbon duty through selling special environmental certificates to third country importers. The number of certificates will be calculated on the basis of the declared carbon footprint of the imported products.

The proposals of the European Commission were presented in draft legislation 2021/0214(COD) of 14.07.2021 [2] (hereinafter the "Draft Legislation"). However, as early as 21.12.2021 an official speaker on CBAM of the Committee on the Environment of the European Parliament – Mohammed Chahim – offered a series of amendments to the Draft Legislation [3] which scaled-up regulation, reduced the time period for its implementation, and strengthened the role of the single central authority regulating CBAM in decarbonization of the European economy (hereinafter referred to as the "Amendments").

The final drawing up and approval of the wording of the CBAM was one of priorities defined by the government of France when it held the presidency of the Council of the European Union in the first half of 2022 [4, p. 5], and it will remain one of the main issues on the agenda in the second half of the year when the Czech Republic holds the presidency. At the beginning of January 2022 a project of stricter Amendments was presented for consideration in the European Parliament. However, as a result of arduous discussions on 22.06.2022, a compromise on the articulations of formulas to take effect in the short term were approved, which provided for the reduction of emissions to a greater extent by 2030. The next step is discussion of the Draft Legislation in autumn of 2022 in the form of a trialogue – negotiations between the European Committee, European Parliament and the Council of the European Union. This paper considers a tougher version of the relevant Amendments discussed during the first half of 2022.

CBAM is applied to certain goods from eight sectors: aluminium, cement, steel, electricity production, fertilizers and ammonia, plastic, hydrogen, and organic chemistry. It cannot be ruled out that later on the list of the sectors covered by CBAM will be expanded. According to resolution of the European Committee 2019/708 [5] coal mining, crude oil production, extraction of ferrous metal ores, nonferrous metal ores, mineral raw materials for chemical industry and fertilizer manufacturing, manufacture of chemical pulp, paper and carton, basic chemical compounds, and glass were all added to the list of sectors with the highest risk of greenhouse gas leakage between 2021 to 2030.

Initially the Draft Legislation contemplated the following three-phase implementation of the mechanism [6, p. 16]:

- 2023–2025 – a transition period when importers have to report the carbon footprint of the imported products;
- 2026–2034 – a period of CBAM development (partial application) when the tax load on the importers is gradually increased simultaneously with abolition of free allowances for carbon dioxide emissions;
- after 2035 – a period of full effect of CBAM when the carbon duty is imposed on importers and is calculated on the basis of a 100% carbon footprint of the imported products.

According to the Amendments considered in this paper (with tougher measures proposed than those finally adopted by the European Commission) a fast-track implementation of CBAM was planned in line with the same logic: 1) a transition period (2023–2024); 2) a period of CBAM development (2025–2028); 3) the full effect of CBAM (after 2028). Although the compromise reached in June 2022 establishes the time limits of the transition period of 2027–2032 it cannot be ruled out that the EU will embark on a course of a fast-track implementation of the mechanism taking into consideration the ambitious character of the objectives to be achieved according to the strategy of European economic development articulated in the 'Green Deal' [7].

The emission trading system (hereinafter "ETS") was established and started functioning in the EU in 2005, and the current fourth phase of its development (targeted for completion in 2030) began in 2021. Manufacturers located in the EU are participants of the ETS. They are obliged to declare annually the carbon footprint of produced products and pay for it on the basis of the market emission allowance price for 1 ton of CO_2 equivalent defined by the ETS after deduction of the free allowances allocated by the European regulator. The amounts of free allowances differ depending on the industry sector and are reduced by the regulator each year.

According to the Amendments considered in this paper it was proposed to phase out free allowances completely by the end of 2028 applying a special "CBAM factor" to the established target emissions (benchmarks): 90% – in 2025, 70% – in 2026, 40% – in 2027 and 0% – by the end of 2028. An update of benchmark values for the years 2021–2025 of Phase 4 of the EU ETS published by the European Committee on 12.10.2021 (the latest update at the time of this research) [8] states the list of product benchmarks for 2021–2025.

The carbon footprint of imported products is defined on the basis of the methodology first proposed as early as 2001 in the Greenhouse Gas Protocol [9] by the World Resources Institute together with the World Business Council for Sustainable Development) [10]. According to the offered methodology, greenhouse gas emissions are conventionally divided into direct and indirect ones and are broken down into three categories. Scope 1 covers direct emissions released during the company's operations in the manufacture of products. Scope 2 encompasses indirect emissions associated with electric power generation which has been used to manufacture products/conduct corporate operations. Scope 3 covers other indirect emissions released from secondary processes, for example, product warehousing, logistics, waste disposal.

In compliance with the Amendments, the whole carbon footprint is subject to declaration and payment: Scope 1, 2, and 3. Under the initial wording of the Draft Legislation importers did not pay for energy-related emissions (Scope 2). At the same time, they plan to apply CBAM not just to carbon dioxide emissions (CO_2) but sometimes to nitrogen oxide (NO) and to perfluorocarbons (C_xF_y). Therefore, emissions of these compounds will be converted into CO_2 equivalent to calculate the unified equivalent taxation basis (the so-called CO_2 equivalent).

The accompanying document [11] to the Draft Legislation defined the principle of carbon duty calculation and relative to each imported product it may be written in a simplified form as follows:

$$CBAM_i = \left(e_i - f_{CBAM} \cdot \beta_i\right) \cdot P \cdot V_i,$$

where $CBAM_i$ – the carbon duty paid by the importer on the basis of the declared carbon footprint of product i, in Euro;

e_i – the actual (declared) specific level of greenhouse gas emissions related to imported product i converted into carbon dioxide applicable to product i in tons of CO_2 equivalent per 1 ton of the imported product;

f_{CBAM} – "CBAM factor" in %, the share of free EU allowances for emissions which corresponds to the CBAM factor offered by the Amendments to the Draft Legislation. The number of free allowances is reduced in the period of CBAM development and equals zero in the period when the mechanism comes to full effect;

β_i – the benchmark, target CO_2 emissions for product i (carbon intensity) defined by the European Committee for 2021–2025, i.e. before the period of partial effect of CBAM, t of CO_2 equivalent per 1 t of imported product;

P – the price of the EU environmental certificate for CBAM (in Euro) which allows to "discharge" the amount of emissions equal to 1 t of CO_2;

V_i – the quantity of import of product i in relation to a certain commodity nomenclature code of the EU classification (combined commodity nomenclature (CN codes)).

If the importer can provide to the European regulator the evidence that a part of the carbon footprint has been paid in the country of manufacture of the product imported in the EU, the volume of the carbon footprint subject to payment will be reduced correspondingly. In fact, this is possible only for the countries with their own emission trading system or a domestic carbon export tax which have been acknowledged by the EU or the countries with the functioning EU ETS (Iceland, Liechtenstein, Norway, Switzerland).

The top-level logic (the calculation "roadmap") which guided the authors was implemented through an eight-step sequence, each step deriving from the previous one.

Step 1: calculation of indicators of Russian export of the products subject to CBAM. As long as CBAM is applied to certain products instead of industry sectors, in this research we analyzed the volume of Russian export and the corresponding volume of European import, export and domestic production related to such products (hereinafter the "Products") including valuation of Trade Import and Export Classification (TIEC) of databases of the Russian Federal Customs Service and CN codes and European Committee of PRODCOM classification which correspond to them. Data analysis showed that in relation to the products covered by CBAM Russian export in 2021 amounted to: 0.049 mln tons of cement products; 13.017 TWhr; 2.309 mln tons of fertilizers and 0.637 mln tons of ammonia; 11.511 mln tons of ferrous metallurgy products – semi-finished products of iron and flat-rolled products accounted for 24% of them, direct reduced iron products – for 19%, cast iron and cast iron products – for 5.3%; 2.153 mln tons of aluminium and aluminium products while raw aluminium accounted for 90% of the whole amount; 3.184 mln tons of organic chemistry products; 0.823 mln tons of plastic materials and plastic products; hydrogen was not exported.

Step 2: evaluation of import dependency of the EU economy. Analysis of two publicly available databases of the Statistical Office of the European Union (Eurostat): sold production, exports and imports by PRODCOM list (NACE Rev. 2) [12] and total production by PRODCOM list (NACE Rev. 2) [13] provided understanding of the volume of total consumption of the Products in the EU on the basis of data on import, export and domestic production, allowed to calculate dependency on import of each item separately and in aggregate for each of the eight sectors covered by CBAM.

There is a high import dependency of the EU on aluminium and aluminium products, organic chemistry, fertilizers. There is a serious share of Russian products in import of electricity, fertilizers and ammonia, steel, cast iron and iron, organic chemistry, aluminium and aluminium products, however, in the amount of consumption of the EU export from Russia is not of much importance, so dependence of the EU on Russian export of Products may be discussed with some reservations (Table 1).

Table 1. The Russian export content in the EU's import and consumption, %

Sector	Share of Russian export in the total import of the EU	Share of Russian export in the total consumption of the EU
Electricity	46.8	0.2
Fertilizers, ammonia	41.0	6.2
Ferrous metallurgy	34.6	5.0
Organic chemistry	24.1	4.2
Aluminium	15.0	4.9
Plastic materials	7.8	1.2
Cement	1.1	0.0
Hydrogen	0.6	0.0

Source: Authors' calculations on the basis of data provided by the Russian Federal Customs Service and Eurostat / PRODCOM.

We used results of historical data analysis as the starting point to make the basic and alternative scenario of supply within the forecast period of 2022–2028.

Step 3: making the basic and alternative scenario of export of Russian products to the EU. The assumption that new non-market restraints of 2022 related to export of Russian products will not be taken into account due to the pending character of the situation and uncertainty of the final list of limitations was made as the principal assumption for making the basic scenario.

The basic scenario of export of aluminium and aluminium products, fertilizers and ammonia, cast iron, iron, steel and organic chemistry was made in reliance on a macroeconomic poll conducted by the Bank of Russia in March 2022 [14] according to which in 2022 it is expected that GDP in Russia will decrease by 8%, in 2023 it will grow by 1%, in 2024 – by 1.5%. A long-range forecast of annual GDP growth for Russia in the basic and alternative scenario, except for the best-case scenario, is 1%. The forecast of electricity export to the EU (mainly to Latvia, Lithuania, Finland) took into account the plans of the Baltic states to withdraw from the power grid formed by Belarus, Russia, Estonia, Latvia, and Lithuania (BRELL) by 2055, and the plan of Finland to stop electricity imports from Russia by 2030. It is important to note that as long as free allowances for CO_2 emissions are not allocated for the power sector in the EU the tax burden in all scenarios is defined only on the basis of export volumes. The forecast of growth of plastic materials' export to the EU is based on project parameters and dates of commissioning of new largest Russian plants manufacturing polyethylene and polypropene. In spite of the fact that currently hydrogen is not produced and manufactured in the EU in significant amounts, the Energy Strategy of the Russian Federation for the Period up to 2035 [15, p. 47] contemplates rise of hydrogen production to 0.2 mln tons by 2024 and to 2.0 mln tons – by 2035. The forecast of hydrogen export is based on the assumption that 50% of output will be supplied to the European market.

Flat 2021 Scenario. This scenario contemplates preservation of export volumes at the level of 2021. The scenario is made exceptionally for comparison in order to get an understanding of the amount of carbon duty the Russian economy would pay if within the forecast period of 2022–2028 the volume of export of Russian Products remained unchanged at the level of 2021.

The best-case scenario is based on the conservative scenario of GDP growth in Russia made by the Ministry of Economic Development of the Russian Federation in 2021 [16]. According to the forecast GDP is expected to grow by 2.5% in 2022, by 2.6% – in 2023, and by 2.7% – in 2024. The long-range forecast of Russian GDP growth is 2.7%. Additionally, the forecast of dynamics of export volumes is increased by 5% in comparison to the basic scenario.

The worst-case scenario is constructed on the basis of the results of a macroeconomic poll of the Bank of Russia conducted between 01.03.2022 to 09.03.2022 (minimum of the central tendency) according to which GDP in Russia is expected to decrease by 16% in 2022, by 5% – in 2023, and to grow by 0.9% – in 2024. Additionally, the forecast of dynamics of export volumes is reduced by 5% in comparison to the basic scenario.

The stress scenario is based on the results of the abovementioned poll of the Bank of Russia. The minimum values which show respondents' expectations concerning GDP decrease in Russia by 23% in 2022, by 7.3% – in 2023 and a 0.7% growth in 2024 are taken as the basis. The scenario presupposes an additional decrease of export volumes by 20% compared to the basic scenario.

The scenario analysis shows that total volumes of Products supplied are smaller in the basic scenario than in the Flat 2021 scenario, the stress scenario shows reduction of Russian exports in the majority of sectors by 38% in comparison to the basic scenario, the worst-case scenario – by 18%, and the best-case scenario shows growth by 23%. Obtaining of forecasting data on volumes of Russian export allows to go to the next step – calculation of the specific volume of CO_2 emissions which is subject to CBAM.

Step 4: evaluation of carbon intensity of the Products exported to the EU, calculation of the base of emissions taxable under CBAM. Several components influence the specific volume of greenhouse gas emissions liable to the carbon duty in the EU. They are the actual level of emissions of Russian exporters, target emissions (benchmarks) defined by the European Commission [17] and the share of free emission allowances which is to be decreased within the period of partial effect of CBAM and reduced to zero by the end of 2028 according to the proposed Amendments to the Draft Legislation.

The specific volume of emissions liable to the carbon duty in all the sectors covered by CBAM except for electricity and cement (free allowances for cement products will be reduced to zero completely by 2025) will grow gradually by the date of full effect of CBAM at the end of 2028. Consequently, the burden on Russian exporters will increase. The last step to calculate this requires making a forecast of the price of EU CBAM allowances for emissions of 1 ton of CO_2 equivalent.

Step 5: generation of price forecast for an emission certificate for 1 ton of CO_2 by the EU ETS. The price of the allowance for 1 ton of CO_2 equivalent is defined on the basis of offer and demand at the trading platform of the EU EST and at the date of calculations amounted to 88.99 Euro per 1 ton of CO_2 equivalent [18]. Consensus of long-range forecasts of analysts from Bloomberg New Energy Finance (BNEF) [19], taken as the basis in this research, indicates that taking into consideration the ambitious signs related to implementation of the environmental agenda given by the European Commission, further growth of the allowance is expected over the long term, up to 108 Euro per 1 ton of CO_2 equivalent emissions by 2030.

Step 6: calculation of the total burden on Russian exporters in the context of described scenarios and economic sectors. Taking into account a wide variability of fields of the results which may be obtained due to the collected data within this research we took a decision to single out three indicators which provide a vivid presentation of carbon duty influence on Russian exporters. They are the medium duty amount per year within the period of 2025–2028, the carbon duty amount in 2028 and the total amount of the carbon duty within the period of 2025–2028. See Table 2.

Table 2. Additional burden on Russian exporters, Euro bln

Scenario	Medium burden	Burden in 2028	Total burden
Basic	3.77	6.20	15.07
Flat 2021	3.79	5.91	15.17
Best-case	4.56	7.61	18.22
Worst-case	3.19	5.23	12.77
Stress	2.48	4.06	9.94

Source: Authors' calculations.

The medium amount of the carbon duty imposed on the Russian economy according to the basic scenario within the forecasting period amounts to 3.77 bln Euro and varies from 2.48 to 4.56 bln Euro depending on the scenario. In general, the amount of the duty within the period of 2025 to 2028 in the basic scenario amounts to 15.07 bln Euro and varies from 9.94 to 18.22 bln Euro, which is comparable with the market capitalization of the largest Russian companies such as PAO Severstal, PJSC NLMK, United Company RUSAL etc.

It is of special importance to single out from the sectors covered by CBAM the ones which will suffer the most from imposing the carbon duty. The results of the evaluation conducted on the basis of the basic Russian export scenario show that the maximum burden falls on the ferrous metallurgy sector: in total, the supply of iron, cast iron, steel, and products to the EU account for 34.2% of the carbon duty. Plastic materials account for 20.4% of the burden, aluminium and aluminium products – for 14.0%, organic chemistry – for 13.7%.

Table 3. A carbon duty split by economic sectors in the base case scenario

Sector	Share in the total carbon duty, %	Cumulative share, %	Medium amount of the duty in 2025–2028, bln Euro	Medium amount of the duty in 2025–2028, bln RUB
Ferrous metallurgy	34.2	34.2	1.29	126.2
Plastic materials	20.4	54.6	0.77	75.0
Aluminium	14.0	68.6	0.53	51.6
Organic chemistry	13.7	82.4	0.52	50.5

Sector	Share in the total carbon duty, %	Cumulative share, %	Medium amount of the duty in 2025–2028, bln Euro	Medium amount of the duty in 2025–2028, bln RUB
Fertilizers and ammonia	12.0	94.3	0.45	43.8
Electricity	4.1	98.5	0.16	15.0
Hydrogen	1.5	99.9	0.05	5.4
Cement	0.1	100.0	0.00	0.2
Total	100	100	3.77	367.8

Source: Authors' calculations.

Applying the carbon duty to the Products imported to the EU may potentially entail a commensurable increase in the price for such products, thus nullifying the negative effect of the carbon duty. However, the results of calculations of this research based on the pro-rata principle of import dependence indicate that price increment as a result of CBAM does not compensate for the additional burden on Russian companies. Moreover, implementation of CBAM will make Russian organic chemistry, ammonia, cement, and fertilizers noncompetitive in the European market.

Step 7: calculation of the economic effect from implementation of the export carbon duty at the level of the Eurasian Economic Union. It is beyond dispute that it is necessary to take preventative actions which would mitigate the negative effect of CBAM on Russian exporters, but the discussions concerning the path to be taken are still ongoing.

One of the discussed issues was the issue of the efficiency of introducing an immediate analogue of CBAM in Russia – a carbon export duty which would be considered by the European regulator to be paid by the Russian exporters when importing Products to the EU. Thus, the proceeds from the carbon duty would go to the budget of the Russian Federation, and could be used to create new plants in the country which are economically and environmentally more efficient. The authors think that without measures such as government support for exporters comparable in scope, such initiatives will be inefficient because the export duty should cover all exports of the products subject to CBAM. Otherwise, introducing such duty will violate WTO regulations and will provide grounds to third countries for filing actions against Russia, or will entail comparable blocking-off measures in relation to the importation of Russian products. Taking this into consideration, even introducing a carbon duty on Russian products exported beyond the EAEU would be the optimal decision to a greater extent than introducing the Russian internal export duty. Yet, it is not an acceptable solution, because the burden on the exporters is still significantly greater than the burden on the exporters in case of CBAM. If the duty is imposed on the Products exported beyond the EAEU, the exporters of organic chemistry will suffer least of all because export to the EU amounts to 77% of the total Russian export of organic chemistry beyond the EAEU, consequently, the export duty will cover 23% of export volumes. An EAEU carbon duty would cover 34% of export of electricity, 54% of ammonia, 65% of cement and aluminium, 66% of iron and steel, 69% of plastic materials, 75% of fertilizers, 78% of hydrogen and 84% of cast iron.

In case of introducing of the EAEU carbon duty according to the basic scenario, it will be 1.2–5.8 times higher for various types of exported products. On average, the burden on exporters will be 2.8 times higher in case of the EAEU export duty. Obviously, the government of the Russian Federation will have to compensate for their losses applying alternative, non-mirror measures such as tax benefits for construction of new plants or modernization of existing ones which correspond to the most rigorous world ESG standards for manufacture of products with the minimum carbon footprint or implementation of environment protection initiatives.

Step 8: influence of the burden on Russian GDP and calculation of the necessary amount of government support for the exporters. It should be noted that from the point of view of influence on the gross domestic product of the Russian Federation payment by exporters of duties under CBAM and an alternative duty will have completely different consequences.

Payment under CBAM constitutes an outflow of funds from the budget of the country, while introducing an export duty is meant to impede such outflow. The results of calculations show that in order to compensate exporters for the burden of the EAEU export duty in comparison to the CBAM burden even for 2025–2028, the government will have to provide an indirect support to the exporters equivalent in total to 2% of forecasted GDP for this period (2.67 tln RUB) or on average – 0.5% of GDP per year (667 bln RUB). Based on forecasts of a long-term growth rate of the Russian economy of 1% per year according to the basic, worst-case and stress scenario, the necessary minimal government support may decrease the GDP growth twice in the long time horizon which is an unreasonable price for support of a limited number of Russian exporters.

It looks more logical that it is better to comply with CBAM and at the same time – to support Russian manufacturers in order to decrease the carbon footprint of the exported products, improve their competitiveness in the European market and, consequently, reduce the CBAM duties for Russian exporters.

Conclusions

The carbon border duty of the EU may potentially deprive a series of Russian exporters of competitive advantages if they do not or cannot adapt to the requirements of the current European environmental agenda and fail to take measures to reduce the carbon footprint of the exported products.

In the basic scenario, the average annual amount of the CBAM duty during the partial effect of the mechanism in 2025–2028 will amount to 3.77 bln Euro (367.8 bln RUB), however, the burden on the exporters will be 2.8 times more if the government chooses to introduce the export EAEU carbon duty. Besides this, introducing such duty will require the government to provide an additional support to exporters which will entail sacrifice of a half of the Russian economy's growth over the long term.

As long, as such price may be unjustifiably high for the state, the optimal solution for Russian exporters is investment in modernization of existing productive facilities and construction of new ones which meet the best-in-the-world ESG standards aimed at decreasing the carbon footprint of the exported products and, consequently, improving competitiveness of Russian exporters in the European market. A lot of Russian companies have been working towards this objective for some time now but there is still a lot to be done.

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How News Reports and ESG Publication Financially Affect Firms

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Abstract

ESG has become a growing and integral part of company activities. Not only is it something investors now take into consideration when choosing stocks, but the question of a firm's Environmental, Social and Governance awareness and actions has integrated itself into something as critical as some banks' decisions to provide loans to a firm. While ESG used to be just a "nice-to-have," there is no denying that it is now a must-have for any company that wants to be a global market leader. Many prior studies have focused on ESG ratings, the types of ESG information disclosed in annual reports and the effect of financial news on firms.

The aim of this research is to take a deeper look at the effect of ESG on firms and find out whether different news feed and news publications concerning a company's ESG activities and circumstances affect its value? Our research shows that there is a weakly significant effect of negative ESG-related news on firms in the window (–1, +1) and no significant reaction to positive news. This means that investors do not statistically significantly react to positive ESG news about firms. We examined 65 publicly traded companies from 7 different markets worldwide over the course of 13 years (from 2009 to 2021). We collected a total of 458 separate news articles from the S&P Global Market Intelligence platform –and classified them into positive and negative depending on the news. We ran OLS regressions of the data points together with financial control variables on a company's CAR in a 5-, 3- and 2-day interval to check for the effect. No significant effect was reported.

Keywords: ESG programme, effect of news reports and ESG publications, asset liquidity, demand on the market, loyalty of customers and suppliers

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Introduction

Over the past several years, a new trend has been arising amongst firms. Previously, a firm's perceived value all came down to the ultimate fact of whether it could generate a profit or not. Over time, other factors emerged with the development of the business sphere as a whole: asset liquidity, demand on the market and expansion potential, customer and supplier loyalty, and many more.

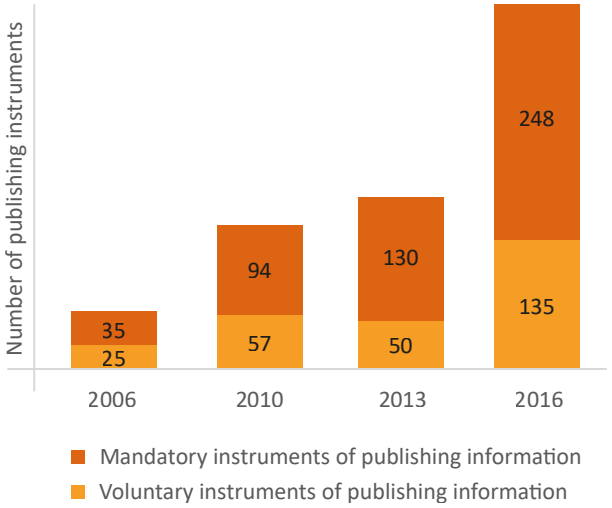
One of the latest boxes every strategically concerned firm would want to check off nowadays is a highly extensive ESG programme. There are many firms that just "go with the flow", implementing ESG strategies just because it's mainstream or expected of them by stakeholders, i.e., consumers or the government. However, many overlook the fact that ESG is truly the future and should be incorporated in every firm. Not because of some moral obligation to give back to society and the future generations, but because ESG is a firm's best bet at implementing the "going concern" principle, or simply put, sustainability. Most firms, especially if they are engaged in heavy manufacturing, exhaust their resources over time. Oil and gas companies are a good example. If no ESG strategy is implemented, fossil fuel resources will be depleted and without adequate compensation or support local communities will become unable to afford the goods and services of firms, and the constant rigorous work and stress could lead to health problems. So, even from a financial point of view, ESG is sort of an investment into a company's future welfare.

ESG is now one of the deciding factors that firms consider in their actions. This has led to an interest from the media. Company-related news used to be strictly operational and financial, such as articles about M&As, the opening of a new factory or an affiliate, new product development, etc. There is no doubt that such news affects the companies' financial components, in particular, stock prices. There is countless research studies backing up this conclusion, i.e., R. Engle and V. Ng (1991) [1]. Thus, we know for a fact that news concerning a company's operations and financials, i. e. its very existence, affects a company, as expected. But do news concerning ESG activities or events linked to ESG have the same effect? We know of separate instances, i.e., the recent Boohoo slavery scandal proves it clearly. The British clothes company Boohoo was accused of using slave labour in some of its sweatshop factories. It was indeed a roller coaster ride for investors in 2020, as demonstrated in Figure 1. Stakeholders are concerned about the entire production and promotion chain of goods, and they will not stand socially immoral behavior. This scandal even caused the company to sever some of its ties with suppliers [2]. Now that ESG is an apparent part and parcel of the firm's activities, we would like to clarify the extent of its impact. However, the above-mentioned Boohoo case may not be particularly representative. The reason behind it is because even though it is an ESG issue, it was, first of all, a very extreme case, which is why it blew up into a scandal, and second, it endangered the future of the firm as a whole, posing a threat to its existence. Therefore, one could argue that it is a serious operational matter in itself. Nornickel's oil spill in 2020 was also accompanied by an approximately 10% drop in the share price in the next couple of days. Once again, these are separate events with catastrophic consequences, so it's no surprise that such ESG events have an impact.

Figure 1. Boohoo Group PLC stock price in May 2020 – May 2021

Every company in the world is affected by ESG standards in one way or another. We have already observed that this new trend is slowly but steadily increasing its effect on firms. As shown in Figure 2, both the number of voluntary and mandatory instruments (these are different kinds of reports and statistics) is increasing over time.

Figure 2. The dynamics of voluntary and mandatory instruments of non-financial reports [3]



The main challenge faced by all ESG-related activities is that of taxonomy, i.e. categorization or classification. This means there is no single standard for ESG metrics in companies around the world. This is more of an issue when dealing with non-financial reporting. Since there is no universal standard, the reporting varies vastly. Firms tend to stick to standards created by large funds and rating agencies like MSCI, Sustainalytics, etc.; however, they vary amongst themselves. The reports are not within the scope of our research, as such research has been conducted multiple times, in particular in the previously mentioned study by E. Fedorova, D. Afanasev, R. Nersesyan and S. Ledyaeva (2020) [3].

However, the issue of taxonomy is extrapolated to news articles as well. Since there are no universal standards, it's hard to react appropriately to certain news., such as the amount of emissions. Factors such as the firm's industry, asset size, geography and revenue have to be considered, and it is not something that can be done in a split second, like it can with financial indicators. We feel that this issue is worth highlighting as it is related to one of the limitations of this research.

This research is **relevant** for several reasons. First, it is within the scope of the author's professional interest and is likely to be extremely useful in the future. ESG is a must-have for any respectable international company, and knowing the specific effects of different types of news publications and reports will allow to predict a company's future value and performance. Secondly, this research could provide practical insight to real investors and businessmen willing to acquire, invest and value a firm. With the help of this research and market best-practice insight, they would be able to tell what an appropriate news feed concerning a company's ESG should be. If news publications are completely different from these expectations, that would raise a huge red flag. And finally, the addition of sentiment and language specifics to the analysis would add to the already existing research. This is the case because, to the best of the author's knowledge, there is no existing research concerning the link between the effect of publication of comprehensive ESG factors and the financial performance and value of a firm.

Thus, the ultimate **goal** of this research is to answer the question of what kind of dependency there is between a firm's performance and value and news reports and publications on said company's ESG. To reach our goal, we need to attain the following **objectives:**

1) Familiarize ourselves with the theory and create an overview of existing research.
2) Create a pool of several existing firms from different markets.
3) Consider industry specifics and account for them as a separate variable.
4) Analyze the collected data to check for evident tendencies.
5) Search for hidden factors/tendencies with the help of models.

The **object** of this research are 65 publicly traded companies from the telecommunications, pharmaceutical, clothes/apparel, mining, retail, IT, oil/gas and many other industries operating in markets from around the world. The **subject** of this study is their Cumulative abnormal returns over 5-, 3- and 2-day periods, various news published about the companies, ROA, ROE, company size, profit margin and leverage. As we already mentioned, this topic is not a new one. However, the specifics of this research make its results a **scientific novelty**. First of all, to the best of our knowledge, all the existing research considers either only the publication of ESG reports, specific types of firms (small- and medium-sized) or a specific geographic region (North America / Europe, etc.). We will consider firms of all sizes in different industries, with different ESG programs and in all existing markets. Also, we have only seen research that does not incorporate dividends when measuring the return on stocks, while we include all dividends. All these factors will allow our results to be more universal and applicable to any firm in the world.

Literature Review and Hypotheses Evaluation

Other authors have already made contributions to the topic of the general relationship between ESG and firm value. Even though no research completely satisfies our needs, there have been several articles published on topics close to or at least in the field of our research. There are 2 main points to our research – the ESG component and the effect on returns component. So we feel we have to look at the complete spectrum of ESG-related papers that have to do

with the financial aspect. As a result, the total amount of literature can be grouped into 4 categories:

1) Research on the companies' motivation to report – what the incentives behind publishing ESG reports are.
2) How different types of reporting – integrated, i.e. ESG reports combined with annual reports, stand-alone, i.e. separate ESG reports or reports on CSR and a complete lack of ESG reports – affect firm performance or value.
3) Research as a social experiment, rather than based on empirical analysis, i.e. asking interviewees questions about their attitude towards ESG metrics when forming a portfolio, reviewing random companies, etc.
4) And lastly, the articles most relevant to this research that analyze the effect of external information about ESG activities and news of companies on firm value. They capture ideas like sentiment and some even come close to our research and use news publications on ESG.

Research on companies' motivation to report – what the incentives behind publishing ESG reports are

The first article is written by De Silva Lokuwaduge, Chitra Sriyani and Heenetigala Kumudini (2017) [4], and examines the top 30 metal and mining companies in Australia. Their research uses Chi-squared testing to check their hypotheses, which stated that there is no significant difference between the mining companies' ESG reporting practice and motivation to report, and that there is a significant difference between the mining companies' ESG reporting practice and the underlying motivation of ESG reporting. They come to find that there are perceived pressures from stakeholders to report ESG information, and Australian mining companies are motivated to report this information in order to overcome the pressure they receive from their powerful stakeholders. This study further reveals that the reports that could create negative reactions from the stakeholders, such as industry disputes and grievances, were either not mentioned or least mentioned in the reports; as noted by the previous research of, the expectation may be to strategically create a positive attitude among stakeholders to manage (or manipulate) them in order to gain their approval or to divert their disapproval.

Another study was conducted by Zhou Shan (2016) [5], researching 75 Chinese companies on the Chinese Stock Exchange in 2005–2012. They used uni- and multivariate statistical analyses of ESG reporting and its relation to environmental and financial performance. In addition to descriptive statistics, t-tests and analyses of variance (ANOVA), they used linear panel regression to find out whether firms that publish environmental reports achieve higher financial returns. The authors discovered that ownership status and membership in certain stock exchanges influence the frequency of ESG disclosure. In turn, ESG reporting influences both environmental and financial performance. They conclude that the main driver of ESG disclosure is accountability, and that Chinese corporations are catching up to their western peers with respect to the frequency of ESG reporting as well as with respect to its quality. So, in short, a positive result of ESG disclosure was also found here.

One more study about the factors that influence ESG reporting was conducted by M. Arayssi, M. Jizi and H.H. Tabaja (2019) [6]. They studied 184 usable firm-year observations for 2008–2017 in Gulf countries to try to find out what the most influential ESG reporting factors were. In this research, examining publicly listed companies over a 10-year period shows that higher board independence and female board participation facilitate the transmission of a firm's positive image by improving social responsibility. Independent boards of directors and women' participation serve as catalysts to strike an effective balance between firms' financial targets and social responsibilities. In contrast, boards chaired by chief executive officers are less supportive in executing a social agenda and, consequently, reporting their ESG activities. So we see that diversity in general, and board diversity in particular, positively affects ESG performance and disclosure and, in turn, firm performance.

A more formal approach is taken by P. Sharma, P. Panday and R.C. Dangwal (2020) [7]. They study Indian companies listed at Bombay Stock Exchange in 2013–2016 and apply Ordinary Least Square (OLS) models to examine the relationship between the ESG disclosure index and the independent variables, namely the financial performance, market performance, FIIs' (foreign institutional investors') stake and leverage after statistically controlling the effects of a firm's size and the industry type of the companies. Their results indicate that financial and market performance has a positive and significant association with the level of ESG disclosure, whereas FIIs stake and leverage have a negative and significant association with the level of ESG disclosure. There was nothing particularly unexpected here.

Sector-specific research was conducted by L. Conca, F. Manta, D. Morrone and P. Toma (2021) [8]. There were 57 European-listed companies (EU28) in the agri-food sector observed in 2010–2018 in this paper. The authors used several OLS regressions of ROA, Profit margin and Tobin's Q on lnSIZE, LEV, GROWTH, EBITDA, lnCASH, ESG_1, ENV_1, SOC_1, GOV_1 to check for the relationships among ESG practices and firm performance and value. They find out that ESG disclosure practices impact corporate profitability; specifically, evidence is provided for the existence of a positive relationship between profitability and disclosure practices of strictly environmental and social information and a negative effect between a company's market value and disclosure practices relating to governance.

Y. Xiang and J.L. Birt (2020) [9] also had something to say about the factors that influence ESG internet disclosure. They looked at the Top 200 Australian firms by Market Capitalization from ASX 200 in 2018. This paper constructs a disclosure index featuring a wide range of both financial and non-financial disclosures, including social

media strategy. This study then investigates the firm characteristics associated with the level of internet disclosure. The authors find that a firm's internet reporting is associated with firm size, financial performance and analysts' coverage, but not associated with the percentage of independent board members. A firm's social media strategy is associated with firm size and its environmental, social and corporate governance (ESG) ranking. However, this article was less insightful to us for the purpose of our research.

The last article from this group comes from the Indian authors S. Bhattacharya and D. Sharma (2019) [10]. This study considers a sample of 122 firms from the list of 500 companies listed on the Bombay Stock Exchange (BSE) 500. Ordered logistic regressions were used with credit ratings as predicted variables; ESG scores as predictor variables and market capitalization, net debt to equity, and total debt-to-asset as control variables. It was found that overall ESG performance and performance of individual components (environment, social and financial variables such as market capitalization, and debt to equity ratio) had significant positive indicators of creditworthiness as measured by the credit rating. The governance score had a positive and insignificant relationship with credit rating. Market capitalization was observed to have a significant direct relationship with credit worthiness. On the other hand, the number of independent directors in companies showed a significant inverse relationship with creditworthiness. ESG significantly impacted the credit rating in the desired direction only for small- and mid-level firms; for large firms which already had a higher credit rating, ESG showed no effect. It was also found that the credit rating itself significantly determined the extent of overall ESG reporting and disclosure of its components.

How different types of reporting affect firm performance or value

The second group deals with the different types of reporting and its influence on the firm. For example, in the research of L. Mervelskemper and D. Streit (2017) [11], the authors examined 217 publicly listed companies worldwide in 2010–2014. They ran OLS regressions to find out whether the type of ESG reporting influenced the companies; ESG performance or the investors' attitude towards the firms. The results show that the degree to which a firm's ESG performance is valued by investors does depend on its decision to report or not to report on ESG activities at all, irrespective of the specific report type chosen (standalone or integrated). More specifically, the issuance of any kind of ESG report is not only associated with a higher degree of value-relevance of ESG performance, but also seems to improve the investors' ability to price ESG activities in the desired (positive) direction. Also, the research provides early empirical evidence that merely publishing an integrated report can even further enhance market valuation of a firm's composite ESG and corporate governance performance to an economically and statistically significant extent at no additional cost, which is a new and critical finding.

Another article by J. Maniora (2017) [12] studies 200 to 300 companies from around the world over the 2002–2011 period. The authors run linear regression models to check whether ESG integrated reporting is beneficial to the firm and whether it brings a sense of Integrated Ethics into the company's business model. The results suggest that IR is a superior mechanism only for the integration of ESG issues into the core business model, but only when comparing IR with the ESG reporting strategies of (a) no ESG reporting and (c) ESG reporting in annual reports. In comparison with (b), stand-alone ESG reporting, the results indicate that IR is negatively associated with the ESG integration level and with the economic and ESG performance. So this research displays mixed results depending on the situation.

A more market-valuation approach is proposed in the research of A. Landau, J. Rochell, C. Klein and B. Zwergel [13]. They examine 50 companies of the STOXX Europe 50 between 2010 and 2016 to see the impact of integrated reporting on the MV of the firms. It is worth noting that the Ohlson model is applied for market valuation and an OLS regression of MV was run on BV, NI, IR and type of ESG information disclosure. As a result of their research, they contribute to existing literature by finding that IR does play a role in the market valuation of a firm's equity. In line with studies of the cost-concerned school, the findings show a negative influence on market valuation unless firms provide an IR with the assurance of a Big 4 audit firm and conduct their report according to the newest GRI guidelines. An assured IR that does not follow the newest GRI guidelines is also penalized by a lower market valuation but to a lower extent. This result is extremely surprising to us because it demonstrates a go-all-the-way approach, not saying that publishing a non-audited and non-GRI-standard report has no effect on MV, but rather that it will affect the company negatively. We would assume that these results would scare the firms that are not dedicated enough to publish audited reports to the latest GRI standard and would leave only the firms that are whole-hearted, so to say, and that have the experience and ability to satisfy the market's ESG requirements.

Social experiments aimed changing the attitude towards ESG

The third group is a cluster of studies that relies on social experiment methods like questionnaires and case study situations. This is less relevant for us, so we will not cover as many articles here, and just use one example from the research study by L. Espahbodi, R. Espahbodi, N. Juma and A. Westbrook [14]. They conducted interviews and an experiment – a between-subject 2 × 2 sequential experiment using graduate students in a Master's of Accountancy program as participants. Participants were provided with the industry, company and selected financial data manipulated to show improving or declining sales and earnings for a medical device company (disguised) and were asked to assess the stock price in the short and long run and to decide what portion of their additional funds to invest in the company. Participants were then provided with ESG

information, manipulated for the ESG priorities to be either included or not included in the company's strategy, and asked to repeat their previous stock price assessments and investment allocation. They found that integration of material ESG priorities into corporate strategy has no significant effect on investors' price assessments and investment allocation, and that financial performance does not strengthen that relationship. Further analysis reveals that perceived relevance and reliability of ESG disclosures have a mediating effect on long-term stock price assessment and investment allocation, and that financial performance has a stronger effect on investors' long-term price assessment and investment allocation when ESG priorities are integrated into corporate strategy. It means that investors, at least represented by this sample group, do not incorporate ESG factors into their main decision to invest in a firm or to price it. This result is critical for us, as we will be looking at the effect of ESG news publications on a firm's MV and performance. When comparing 2 firms, we don't exclude the possibility that ESG could be a deciding factor. That means that if 2 firms demonstrate equal or very similar performance, value, competitive advantage, etc., essentially, they are the same, from a financial perspective. Let's presume that one firm actively performs ESG activities and publishes reports, while the other doesn't – in that case we believe the investor would pick the former, However, sacrificing financial performance for social responsibility doesn't seem like a rational investment strategy in today's day and age. We will look deeper into this idea in our research.

The effect of external ESG information on firm value

And finally, the fourth group, which utilizes methods most similar to ours and studies analogous topics. In reality, there are different types of literature in this group. Some of the studies have to do with the effect of extreme events on the firm value. For example, the effect of severe events like product recalls, airline crashes, product tampering, corporate fraud, "unethical behavior", social movements and protests or massive layoffs. The methodology used in these studies is impeccable, and they show that firms are penalized by society beyond the direct cost of these adverse events. The problem with these cases, however, is that they analyze the effects of only these extreme cases, such as plane crashes, massive layoffs or complete biological disaster. This is a serious limitation since they don't happen that often and represent only a negligibly small part of ESG-related events. Thus, making conclusions about the effect of general ESG behavior and its coverage in the media on firms would result in sample biases. This is the critique of G. Capelle-Blancard and A. Petit (2019) [15], which we will now cover in more detail. We will not examine any other literature that deal with the somewhat extreme cases for reasons mentioned earlier. We will focus more on general research on the topic.

G. Capelle-Blancard and A. Petit use event studies to examine the effects of ESG-related news, classified as positive or negative, on the abnormal returns of companies. They analyze news of 100 firms from the Dow Jones Sector Titans indexes between January 2002 and December 2010. The authors collect ESG publications from the Covalence EthicalQuote database and use control variables like lexical news context, firm size by asset value and firm reputation, calculated by the portion of positive ESG news in the total news pool. They find that investors react to ESG news, but mainly, although not exclusively, to negative ones. While the change in a firm's market value within a 3-day window around the publication of negative ESG news is about 0.1% on average, the impact of positive ESG news is barely significant. So we see minimal reaction of investors to ESG-related news.

Similar research was conducted in Japan by Miho Murashima (2016) [16]. It was a short-term event study and OLS regression on the 6295 news events from 879 Japanese companies in 2001–2016. The authors collected news from a Japanese database called Nikkei Telecom based on around 50 keywords in positive and negative categories. They find that, first, that there are different reactions to CSR-related news announcements depending on the type of shareholders. Second, only individual investors react to positive news, while individual, institutional and foreign investors all react to negative news. This is one of the reasons for mixed results in the CSR and financial performance linkage studies. Once again, we see research with some reaction to negative ESG news and barely any reaction at all from positive news in external sources.

Another study was conducted by Junhee Seok, Youseok Lee and Byung-Do Kim (2019) [17]. This research was designed slightly different, however, since the authors incorporated advertisement expenses into the equation. They covered 77 Korean firms over the period of 2012–2015. They used a three-step regression analysis and the Sobel test, this study reveals the roles of word-of-mouth (WOM) and advertising expenditures in the relationship between CSR news reports and firm value. They found that CSR news reports positively affect firm value, and this relationship is mediated by WOM and moderated by advertising expenditures. Notably, the positive effect of WOM on firm value is stronger for companies that spend less on advertising. This study, however, takes a different route and does not focus on the effect of positive and negative news, but, rather, analyzes the impact of publicizing news about CSR activities in the media on firm value, where they find their significance.

The last article we will cover is that of P. Krüger (2015) [18]. The author used information from a closed database KLD (which is now part of MSCI). This resource seeks to classify publicly available ESG information into 6 clusters and label them positive or negative. The sample comprises 2116 events related to 745 different firms between 2001 and 2007. He finds that investors react to negative news about CSR in a strongly negative manner. The reaction is particularly pronounced for information regarding communities and the environment. He also finds that there is a mix of significant negative effects for some windows of CAR and non-significant results. This again reinforces the idea that

investors react to negative news about ESG events, but do not react or react negatively to some of these news.

Based on real-world experience, trends in certain industries and the revised literature, the following **hypotheses** were put forward:

1) There is a strong significant relationship between negative ESG-related news and CAR in all windows.
2) There is no positive significant relationship between positive ESG-related news and positive returns.
3) There is no relationship between the publishing of ESG-related news and stock returns in emerging markets.
4) The stated hypotheses are valid in all windows of observation in the short-term.
5) A company's industry has no effect on the relationship between ESG news publishing and stock return.

As we have shown, there are some articles on the subject, even extremely specific ones in specific countries like Japan and South Korea. They are all correct in their own right. However, none of them entirely fit our goal, which is to analyze the global market, with all of its peculiarities and attitudes towards ESG and in different sectors. Thus, the main novelty of this research is that:

1) It considers a truly international sample, as will be demonstrated in the data description. It means that the results will be applicable worldwide.
2) It considers all dividends in the calculation of return. To the best of our knowledge, dividends were excluded from previous research. We understand that this effect is not life-changing, but its inclusion does make the method more refined.

Data Collection and Methodology

Data collection, description and classification. Firm choice and ESG publication specifics

The specifics of our research require it to be an event study, so we followed the general principles throughout our work. The first question that requires an answer in this research was the pool of companies. As we already mentioned, previous research focused on only one market or one country. We want to conduct truly universal research, so for that purpose we need to include companies from around the globe. We understand that companies cannot be selected at random from each market, and one of our ideas was to select the top companies by market capitalization from every major stock exchange. However, there's also the question of which specific stock exchanges to select, and given the volatility of the market, this list of top companies is constantly changing. Thus, the best and most consistent method is to select a global index and select companies from that index.

There are 8 generally accepted global indices:

1) MSCI ACWI Index.
2) MSCI World.
3) S&P Global 100.
4) S&P Global 1200.
5) The Global Dow – Global version of the Dow Jones Industrial Average.
6) Dow Jones Global Titans 50.
7) FTSE All-World index series.
8) OTCM QX ADR 30 Index.

Out of all these 8 indices there is only one index that allows us to both have a large enough list of companies to choose from and provides the most diversity between emerging and developed markets – that is the S&P Global 1200. This index is comprised of more than 1200 companies, covers 31 countries and accounts for 70% of the global stock market capitalization [19]. But most importantly, it covers 7 diverse regional indices (Table 1).

Even though this is the most diverse index, as we can see from the table, we have a total of only 90 companies from emerging markets and over 1000 companies from developed markets. Just due to the sheer number of firms from developed countries, they always outweigh the number of firms from emerging markets. If we were to take the companies as is, our research would be subject to selection bias, since the ratio of firms from emerging and developed markets would equal approximately 1 : 11. The bias is obviously in favour of the developed markets, and we would not be able to claim that our research is universal. So the only way to overcome this bias is to balance the number of firms. We have a total of 90 firms from 2 emerging market indices. Thus, we have to gather firms from the remaining 5 developed market indices to match those 90 firms. We decided to select the top 20 firms from each of the 5 indices to approximately match the total number of firms, resulting in a total of 190 firms. A list of these firms is provided in Appendix 1.

Table 1. S&P Global 1200 constituents

Index	Region	Country
S&P 500	North America	USA
S&P/TSX 60	North America	Canada
S&P Europe 350	Europe	European countries
S&P/TOPIX 150	Asia/Pacific	Japan
S&P/ASX All Australian 50	Asia/Pacific	Australia
S&P Asia 50	Asia/Pacific	Asian countries
S&P Latin America 40	Latin America	Latin American countries

However, two more adjustments still need to be made:

- We have to exclude financial firms and banks due to the specifics of their operations and balance sheet. We shall be adding financial control variables, so firms from these sectors would alter the true result.
- To avoid sample bias, we excluded firms that had more that 60 news articles. Some firms (like Apple and Facebook, for example) had more than 200 news articles each. Including such cases would skew the results in the direction of those firms.

After all the adjustments, we arrived at a total of 65 firms from 7 regional indices from 21 different countries (9 emerging and 12 developed) (Appendix 2) and 25 industries (grouped into 11 categories depending on the similarity for the purpose of relevant regression analysis – Appendix 3). This amounts to a total of 458 news articles.

The second question we had to face was gathering the needed ESG information. We couldn't gather the information from any open resource for 3 reasons – we needed the information to be reliable, timely and related to the topic of ESG. Luckily, we were able to gain access to the S&P Global Market Intelligence Platform. This is a sub-division of S&P that gathers news, financials and other key information concerning companies around the world. The articles available can be sorted by geography, industry, company and most importantly, topic. We selected the only 3 topics that are linked to ESG – ESG, Environment and Renewables. From the 65 selected firms we were able to extract 458 separate news articles with timestamps. We then went over the articles to define the sentiment as positive or negative. There turned out to be more positive news than negative. We had 115 negative news and 343 positive ones. That concludes the collection of the news articles.

Financial information was collected from Bloomberg. To calculate the stock returns, we downloaded information about stock prices and dividends. We take dividends into account as that is a vital part of the stock value. We collected information concerning the 7 indices and 65 companies. Stock return was calculated by the standard return formula:

$$r_{i,t} = \frac{P_t - P_{t-1} + Div_t}{P_{t-1}}. \quad (1)$$

The return for the indices were calculated the same way, but without dividends since they do not yield dividends. Since we have the information about stock returns and the timestamps of every event, we are able to collect the observed returns within a time window.

An event study begins by identifying the period (event window) involved in the event. Several papers address the issue of the appropriate window length that should be used to measure the price reaction correctly. S.C. Hillmer and P.L. Yu (1979) [20] find that the event window should end within hours of the initial announcement. S.G. Chang and Son-Van Chen (1989) [21] find that event windows should last a number of days as the market keeps responding to news. D. Krivin et al. (2003) [22] point out that event window length may be related to the period of observation. We took the estimation window and analyzed the statistical properties of the 5-day [–2, +2], 3-day [–1, +1] and 2-day [0, 1] Cumulative Abnormal Returns around the event date. We kept the windows small because, as A. McWilliams et al. (1999) [23] mentioned, expansion of the event windows resulted in raising the amount of information-related noise, or in other words, increasing confounding concurrent events reduces the power of the test statistic. Also, these are the most commonly used windows in the research we covered. To mitigate the information leakage problem or to identify relevant prior events and control for their effects, however, we include time returns from days in the past, as we mentioned, –2 and –1 days.

We previously stated that we analyzed abnormal returns. They were calculated based on the observed returns, which was achieved by extracting information from Bloomberg. According to S. Brown and J.B. Warner (1985) [24], there are 3 ways to calculate an abnormal stock return: The mean adjusted return–

$$AR_{i,t} = R_{i,t} - \bar{R}_i, \quad (2)$$

where the Abnormal return (AR) is the difference between the observed return and the mean return of the estimation period (usually 250 days);

The market adjusted return –

$$AR_{i,t} = R_{i,t} - R_{m,t}, \quad (3)$$

where the AR is the difference between the observed return of the stock and the observed return of the market on the same day;

The OLS market model –

$$AR_{i,t} = R_{i,t} - \hat{\alpha}_i - \hat{\beta} \cdot R_{m,t}. \quad (4)$$

S. Brown and J.B. Warner go on to conclude that "With daily data, these two methodologies [Market adjusted returns and OLS market model] have similar power, and, as expected, the power of each is much greater with daily than with monthly data. Market Adjusted Returns and the OLS market model also outperform a simpler Mean Adjusted Returns procedure, which has low power in cases involving event-date clustering" [24]. Since we have daily data, the two best models are the OLS market model and the Market adjusted model. We started by using the OLS market model, but soon encountered the fact that some of the regressions were non-significant, so it would not be applicable for all 458 cases. In addition, the Market Adjusted model is conceptually closer to us. Looking at this from an investor's point of view, we find comparing the stock to the market would be more appropriate than comparing a stock to its previous returns. Taking all of this into consideration, we selected the Market Adjusted model and used it to calculate CAR. We selected the corresponding S&P Index (from the given 7) for every stock as a proxy for the market. By subtracting the market return from the observed return, we obtain the abnormal return for a day, and then sum up the returns for several days in the three windows we have

previously mentioned. A description and test for significance of the CARs are provided in the next chapter.

We also collected the information about the companies' ROA, ROE, Revenue, Total Assets, Profit margin and financial leverage. We used the natural logarithm of Revenue over Total assets as a proxy for the size of the firm as is done in similar research study by E. Fyodorova, R. Sayakhov, I. Demin, D. Afanasyev (2019) [25]. We set these indicators as control variables in our regressions.

Model-based analysis with key factor significance

Before we start with the statistical checks, a brief report of the summary statistics and correlation of variables is provided in Figures 3 and 4.

Figure 3. Summary statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
car22	458	.0006861	.0376465	-.153775	.2099734
car11	458	-.0009622	.0279271	-.1409184	.1215356
car01	458	-.0004621	.022793	-.1064287	.1009859
roatl	458	6.966878	6.180668	-5.06	38.15
roetl	458	19.70906	30.75732	-15.38	298.25
sizetl	458	-.5732736	.5689946	-3.117398	.9324046
profitmarg~l	458	13.91393	27.58448	-13.05	476.51
leveragetl	458	2.678581	1.507119	1.21	15.12
sentiment	458	1.251092	.4341153	1	2
markettype	458	1.427948	.4953223	1	2
industry	458	5.18559	2.258572	1	11

Figure 4. Correlation of variables

(obs=458)

	car22	car11	car01	roatl	roetl	sizetl	profit~l	levera~l	sentim~t	market~e	industry
car22	1.0000										
car11	0.7804	1.0000									
car01	0.6103	0.7414	1.0000								
roatl	-0.0416	0.0408	0.0555	1.0000							
roetl	0.0018	0.0516	0.0400	0.6989	1.0000						
sizetl	-0.0087	-0.0168	-0.0244	0.1779	0.2814	1.0000					
profitmarg~l	-0.0478	0.0167	0.0276	0.4167	0.1602	-0.4273	1.0000				
leveragetl	0.0289	0.0302	0.0250	0.1650	0.7272	0.1951	-0.0895	1.0000			
sentiment	0.0174	-0.0605	-0.0275	-0.1361	-0.1397	-0.1193	-0.0599	-0.1402	1.0000		
markettype	0.0385	-0.0276	0.0074	-0.2709	-0.2923	-0.1551	-0.0061	-0.2688	0.2828	1.0000	
industry	-0.0602	0.0309	0.0050	0.4467	0.2365	-0.1714	0.4006	0.0383	-0.2552	-0.3039	1.0000

The results of the event study are provided in Table 2. We start by checking the significance of the mean CARs in the case of positive and negative news. We use a z-test instead of a t-test, since the sample size is more than 30 in each case, even though we do not know the population's standard deviation – we assume that the sample variance equals the population variance. Since we would like to check for statistically significant positive CARs in the case of positive news and statistically significant negative CARs in the case of negative news, we use a one-tail distribution and compare at 1%, 5% and 10% confidence intervals, which correspond to critical z-values (+–)1.28, (+–)1.64 and (+–)2.33. We test the null hypothesis, which states that for the positive (negative) events the mean is equal to 0. The alternative hypothesis is that it is greater (less) than 0.

Table 2. Results of the event study

Market type	Window	Positive news			Negative news		
		Mean	z-statistic	Obs.	Mean	z-statistic	Obs.
Overall	(–2,+2)	0.00031	0.163	343	0.0018	0.43	115
	(–1,+1)	0.000016	0.010	343	–0.0039*	–1.33	115
	(0,+1)	–0.0001	–0.086	343	–0.0015	–0.62	115
Developed	(–2,+2)	–0.00017	–0.082	224	–0.0029	–0.888	38
	(–1,+1)	–0.00009	–0.058	224	–0.0015	–0.566	38
	(0,+1)	–0.0008	–0.675	224	0.00054	0.261	38
Emerging	(–2,+2)	0.0012	0.315	119	0.004	0.683	77
	(–1,+1)	0.0002	0.067	119	–0.005	–1.216	77
	(0,+1)	0.00122	0.494	119	–0.0026	–0.720	77

As we can see from the table, only one window of CARs, that is (–1, +1) is significant at 10% for the negative events. Some of the others come close to being significant, but they are not. Looking at the significance of the data in this table, we can say that there is no correlation between positive news and positive CARs and there is little correlation with negative news and a negative CAR, which is in line and confirms the research of previous authors mentioned in the literature review. The message is clear – investors react to negative information (in our research – only in certain windows), but show no reaction to positive information. Based on the results, we can say that two of our hypotheses (H2 and H3) have been proven and two others (H1 and H4) have been disproven.

To measure the extent of investors' reaction and the influence of other factors, we ran a number of regressions. In the case of event studies with several non-sequential events with time gaps, OLS is an appropriate model. As seen in previous research covered in the review, OLS regression is what is used as the golden standard. Also proven to be representative in itself, S. Brown and J.B. Warner (1985) writes: "Procedures other than OLS for estimating the market model in the presence of non-synchronous trading convey no clear-cut benefit in detecting abnormal performance" [24]. We use the following model for our OLS regression:

$$\begin{aligned} CAR(-n,n)_{t,i} &= \alpha + \beta_1 \cdot ROA_{t-1,i} + \\ &+ \beta_2 \cdot ROE_{t-1,i} + \beta_3 \cdot Asset\_size_{t-1,i} + \\ &+ \beta_4 \cdot Profit\_margin_{t-1} + \\ &+ \beta_5 \cdot Leverage_{t-1} + \beta_6 \cdot dummy_{pos_{neg}} + \\ &+ \beta_7 \cdot dummy(dev, emerg) + \\ &+ \beta_8 \cdot dummy(industry). \end{aligned} \quad (5)$$

For our control variables, we selected those that are most commonly used in research literature and can have an effect on CARs in order to address probable heterogeneity. All of them are lagged by one year to avoid potential endogeneity problems due to simultaneity, also consistent with previous research.

Results of the Regression and Analysis

Running 3 robust regressions for different windows, we achieved the following result:

For CAR(–2, +2) see Figure 5.

Figure 5. OLS CAR(–2, +2) regression

Linear regression

Number of obs	= 458
F(16, 441)	= 0.93
Prob > F	= 0.5314
R-squared	= 0.0316
Root MSE	= .03771

car22	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
roatl	-.0001015	.0007296	-0.14	0.889	-.0015354	.0013325
roetl	.0000716	.0002205	0.32	0.745	-.0003617	.000505
sizetl	-.0052731	.0040629	-1.30	0.195	-.0132582	.002712
profitmargintl	-.000112	.0000809	-1.39	0.167	-.0002709	.0000469
leveragetl	.0001434	.003922	0.04	0.971	-.0075648	.0078515
2.sentiment	.0007057	.0046981	0.15	0.881	-.0085277	.009939
2.markettype	.0074451	.0070167	1.06	0.289	-.0063451	.0212354
industry						
2	-.0438543	.0399233	-1.10	0.273	-.1223179	.0346093
3	-.0133825	.0220139	-0.61	0.544	-.0566476	.0298827
4	-.0085533	.0228915	-0.37	0.709	-.0535434	.0364367
5	-.0074637	.0233329	-0.32	0.749	-.0533212	.0383939
6	-.0301813	.0227042	-1.33	0.184	-.0748032	.0144406
7	-.0108222	.023625	-0.46	0.647	-.0572539	.0356095
8	-.0110073	.0244074	-0.45	0.652	-.0589765	.0369618
10	-.0147621	.0230978	-0.64	0.523	-.0601577	.0306334
11	-.0078679	.0285351	-0.28	0.783	-.0639496	.0482138
_cons	.0065228	.0244364	0.27	0.790	-.0415034	.054549

We obtained a non-significant model with very little predictive power. None of the variables are significant in a 5-day window.

For CAR(–1,+1) see Figure 6.

Figure 6. OLS CAR(–1, +1) regression

Linear regression

Number of obs	= 458
F(16, 441)	= 1.24
Prob > F	= 0.2363
R-squared	= 0.0237
Root MSE	= .02809

carll	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
roatl	.0001589	.0005331	0.30	0.766	-.0008888	.0012066
roetl	.0000574	.0001529	0.38	0.708	-.0002431	.0003578
sizetl	-.0034267	.002891	-1.19	0.237	-.0091086	.0022552
profitmargintl	-.0000832	.0000467	-1.78	0.075	-.000175	8.57e-06
leveragetl	-.000304	.0027136	-0.11	0.911	-.0056372	.0050291
2.sentiment	-.0037177	.0035155	-1.06	0.291	-.010627	.0031916
2.markettype	.0003562	.0053289	0.07	0.947	-.010117	.0108294
industry						
2	-.024126	.028324	-0.85	0.395	-.0797928	.0315408
3	-.0071776	.0122982	-0.58	0.560	-.0313479	.0169928
4	-.0047021	.013176	-0.36	0.721	-.0305976	.0211935
5	-.0066132	.0137667	-0.48	0.631	-.0336697	.0204433
6	-.0162789	.013165	-1.24	0.217	-.0421528	.0095951
7	-.0099587	.0142152	-0.70	0.484	-.0378967	.0179794
8	-.0022299	.0139233	-0.16	0.873	-.0295941	.0251343
10	-.0075948	.0134885	-0.56	0.574	-.0341045	.018915
11	.0082084	.0166111	0.49	0.621	-.0244384	.0408551
_cons	.0049341	.0146405	0.34	0.736	-.0238397	.0337079

A similar result, but the sentiment parameter is much more significant in this case, although it still does not reach a tangible mark. However, we do get a significant profit margin variable.

For CAR(0, +1) see Figure 7.

Figure 7. OLS CAR(0, +1) regression

Linear regression

					Number of obs =	458
					F(16, 441) =	1.57
					Prob > F =	0.0735
					R-squared =	0.0409
					Root MSE =	.02272

car01	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
roatl	.0007427	.0004516	1.64	0.101	-.0001449	.0016304
roetl	-.0000831	.0001328	-0.63	0.532	-.0003442	.000178
sizetl	-.0036795	.0021574	-1.71	0.089	-.0079195	.0005606
profitmargintl	-.0000886	.0000361	-2.45	0.015	-.0001596	-.0000176
leveragetl	.0014128	.0022898	0.62	0.538	-.0030875	.005913
2.sentiment	-.0024427	.0027261	-0.90	0.371	-.0078005	.002915
2.markettype	.0016875	.0040467	0.42	0.677	-.0062657	.0096408
industry						
2	-.0174252	.0194746	-0.89	0.371	-.0556998	.0208493
3	-.0079852	.0102677	-0.78	0.437	-.0281649	.0121945
4	-.0130423	.0108232	-1.21	0.229	-.0343138	.0082293
5	-.0091456	.0112044	-0.82	0.415	-.0311661	.012875
6	-.0213514	.011066	-1.93	0.054	-.0431001	.0003972
7	-.015843	.0113123	-1.40	0.162	-.0380757	.0063898
8	-.0026699	.0113222	-0.24	0.814	-.024922	.0195822
10	-.0113337	.0107634	-1.05	0.293	-.0324876	.0098201
11	.005098	.0143892	0.35	0.723	-.023182	.0333779
_cons	.0011494	.0120394	0.10	0.924	-.0225123	.0248111

The result for (0, +1) window is slightly different – the model itself and the variable "size" become significant at 10%, but the sentiment is still non-significant. Unfortunately, due to the insignificance of the OLS models and sentiment variables, we are unable to tell what the specific effect of the good or bad news is. This is somewhat inconsistent with previous research since we did observe some significant variables in some of the research we covered, whilst seeing insignificant in others.

One of our ideas was to remove the industry variable, since it has 11 states and could potentially be ruining the regression. Nevertheless, that assumption proved to be wrong, as can be seen in Figure 8. Removing it only makes it less significant and reduces predictive power. However, this does not completely prove or disprove our 5th hypothesis (H5). We hypothesized that the industry would be irrelevant to the CARs, but we do see that for industry 6, which is energy and oil, the variable is positive and close to being significant at 5%. It is an interesting result – this means companies that notoriously have a historically sizeable influence on ESG react more than others, and react positively. This is logical and a novelty to existing literature. Other combined effects were applied to make the model more refined and significant, but they did not reach a tangible result worth including in this research.

Figure 8. OLS CAR(0, +1) regression without the industry variable

Linear regression

Number of obs	458
F(7, 450)	0.64
Prob > F	0.7215
R-squared	0.0070
Root MSE	.02289

car01	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
roatl	.0004163	.0004273	0.97	0.330	-.0004235	.0012562
roetl	-.0000443	.000128	-0.35	0.729	-.0002959	.0002073
sizetl	-.0019613	.0018754	-1.05	0.296	-.0056469	.0017243
profitmargintl	-.000022	.0000211	-1.04	0.297	-.0000635	.0000194
leveragetl	.0009545	.0022198	0.43	0.667	-.003408	.005317
2.sentiment	-.0015665	.0027343	-0.57	0.567	-.00694	.0038071
2.markettype	.0017541	.0024787	0.71	0.480	-.0031171	.0066254
_cons	-.0062215	.0065399	-0.95	0.342	-.0190741	.006631

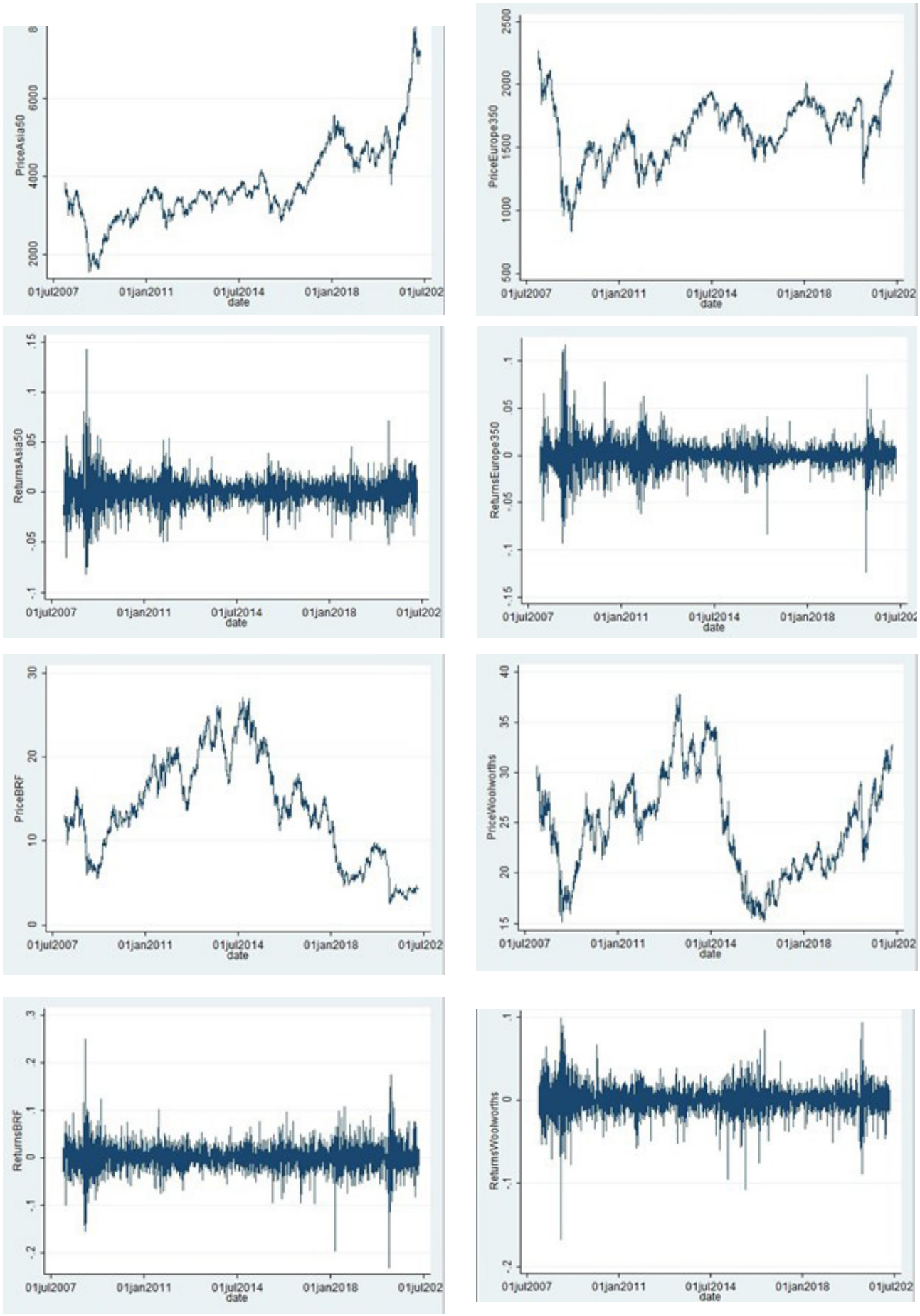
Conclusion

We collected ESG-based data from 65 different firms in 7 different markets for 2007–2021. This resulted in 458 separate strings of news articles in the given time period. Using the CAR based on the market-adjusted model as a metric for the effect on the firm, we found that for a 3-day period, negative news has a weakly significant effect, while positive news has no effect at all. This is in line with previous research in principle. However, we demonstrate that this effect takes place only for the window (–1, +1), which is a new discovery. Given the international all-industry sample we used, we can claim with confidence that these results are universal and apply to companies from any market in any industry. Also we found a significant effect of the energy and oil industry variable on the CAR(0, 1).

However, we understand the limitations of our research. First of all, we did not take into account the severity effect. All news, including ESG, have different severity levels. Generating 2% more emissions than in the preceding year is obviously a much less severe infringement for a company than an accident that killed tens or hundreds of people and / or damaged the wildlife in a 2-km radius. So in principle, severity should be taken into account. The problem with assigning scores is that, to the best of our knowledge, there is no general scoring method that would be accepted by all / most academics and/or not be a subjective and biased metric. Secondly, having a wider range of markets, for example, the African and Oceanic SEs would make the results more robust. However, due to the lack of information, including that on ESG activity about them, it does not seem feasible at the moment. And thirdly, we hypothesize that the OLS model might not be the best model to describe the data due to the varying volatility of the stock returns through time. For that reason, we would want to turn to ARCH models to see whether they would fit the data better. We know that ARCH models fit regression models in which the volatility of a series varies through time. In the case of stock returns, periods of high and low volatility are usually grouped together. ARCH models estimate future volatility as a function of prior volatility. To accomplish this, arch fits models of autoregressive conditional heteroscedasticity (ARCH) by using conditional maximum likelihood. We also understand that there is an autoregressive pattern here, and that past variance and past volatility will contribute to future volatility.

We see that there is an apparent link of asset prices with an increase in volatility of returns (Figure 9).

Figure 9. Visual comparison of stock and index prices to their respective volatility



We selected one index and one stock from both markets (developed and emerging) to demonstrate the correlation in the fall in prices and increased volatility in returns. Apparently, every sharp fall is accompanied by a cluster of higher than average volatility, which stays at that level for a time. And once it falls back, it stays at that clustered level. Thus, this visually displays the autoregressive characteristic of the data and the visual evidence seems to indicate the expected form of asymmetry.

There is the question, however, of which specific ARCH model to choose. It is proven in R. Engle and V.K. Ng (1991) [1] that the ARCH and EGARCH models. This would perfectly describe the relationship between the given information. However, the lack of ESG information is holding us back for now. Unfortunately, ESG is a tendency that has just recently started developing and gaining popularity. This means that increasingly more news articles about firms are coming out every year. But for the ARCH model to work, we need ESG event points every day with no intervals. As ESG develops further, this will become a possibility in the future, but for now it is impossible. My hypothesis is that this is the reason why no other authors have employed or even mentioned ARCH models in their ESG research and use OLS as a standard regression. So, this point in particular is what we bring as a research goal for the years to come.

We find the results achieved in this research to be logical and fit for the reality we live in today. Evidently, investors do pay attention to the ESG-component of firms as of now, but it is not a deal-breaker. It is more like a "nice-to-have" than a "must". When investors witness negative news, they sell in the short-term to avoid potential loss. However, they do not see the added value in positive ESG news, which is why there is no effect. From what we see in reality, the world is not at a point where ESG would play a decisive role in investment, which is why we find the results of this study unbiased and sound.

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Appendix

Appendix 1. List of initial S&P companies

Company	Ticker	Country	Industry
Tencent Holdings	SEHK: 700	China	Communication
Samsung Electronics	KRX: 005930	South Korea	Information Technology
Taiwan Semiconductor Manufacturing	TWSE: 2330	Taiwan	Information Technology
AIA Group	SEHK: 1299	Hong Kong	Financial
China Construction Bank	SEHK: 939	China	Financial
Ping An Insurance	SEHK: 2318	China	Financial
Industrial and Commercial Bank of China	SEHK: 1398	China	Financial
China Mobile	SEHK: 941	China	Communication
SK Hynix	KRX: 000660	South Korea	Information Technology
Meituan-Dianping	SEHK: 3690	China	Consumer Discretionary
Hong Kong Exchanges and Clearing	SEHK: 388	Hong Kong	Financial
DBS Group	SGX: D05	Singapore	Financial
Oversea-Chinese Banking	SGX: O39	Singapore	Financial
Bank of China	SEHK: 3988	China	Financial
Hon Hai Precision Industry	TWSE: 2317	Taiwan	Information Technology
United Overseas Bank	SGX: U11	Singapore	Financial
CNOOC Limited	SEHK: 883	China	Energy
CK Hutchison Holdings	SEHK: 1	Hong Kong	Industrials
Link Real Estate Investment Trust	SEHK: 823	Hong Kong	Real Estate
Sun Hung Kai Properties	SEHK: 16	Hong Kong	Real Estate
Hong Kong and China Gas	SEHK: 3	Hong Kong	Utilities
MediaTek	TWSE: 2454	Taiwan	Information Technology
Singapore Telecommunications	SGX: Z74	Singapore	Communication
Naver	KRX: 035420	South Korea	Communication
CK Asset Holdings	SEHK: 1113	Hong Kong	Real Estate
CLP Holdings	SEHK: 2	Hong Kong	Utilities
China Life Insurance Company	SEHK: 2628	China	Financial
China Merchants Bank	SEHK: 3968	China	Financial
Shinhan Financial Group	KRX: 055550	South Korea	Financial
Galaxy Entertainment Group	SEHK: 27	Hong Kong	Consumer Discretionary
Hang Seng Bank	SEHK: 11	Hong Kong	Financial
China Petroleum & Chemical	SEHK: 386	China	Energy
POSCO	KRX: 005490	South Korea	Materials
Xiaomi	SEHK: 1810	China	Information Technology

Company	Ticker	Country	Industry
Hyundai Motor Company	KRX: 005380	South Korea	Consumer Discretionary
Celltrion	KRX: 068270	South Korea	Health Care
KB Financial Group Inc	KRX: 105560	South Korea	Financial
CTBC Financial Holding	TWSE: 2891	Taiwan	Financial
Hyundai Mobis	KRX: 012330	South Korea	Consumer Discretionary
Formosa Plastics Corporation	TWSE: 1301	Taiwan	Materials
Chunghwa Telecommunications	TWSE: 2412	Taiwan	Communication
LG Chem	KRX: 051910	South Korea	Materials
Nan Ya Plastics Corporation	TWSE: 1303	Taiwan	Materials
Formosa Chemicals & Fibre Corporation	TWSE: 1326	Taiwan	Materials
Largan Precision	TWSE: 3008	Taiwan	Information Technology
Cathay Financial Holding	TWSE: 2882	Taiwan	Financial
China Overseas Land and Investment	SEHK: 688	China	Real Estate
Sands China	SEHK: 1928	Hong Kong	Consumer Discretionary
PetroChina	SEHK: 857	China	Energy
KT&G	KRX: 033780	South Korea	Consumer Staples
ALFA	BMV: ALFA A	Mexico	Conglomerate
América Móvil	BMV: AMX L	Mexico	Telecommunications
Banco Bradesco	NYSE: BBD	Brazil	Banking
Banco Santander Chile	NYSE: BSAC	Chile	Banking
Banco de Chile	BCS: CHILE	Chile	Banking
Banco do Brasil	B3: BBAS3	Brazil	Banking
Bancolombia	NYSE: CIB	Colombia	Banking
B3	B3: B3SA3	Brazil	Stock Exchange
BRF S.A.	NYSE: BRFS	Brazil	Food processing
CCR S.A.	B3: CCRO3	Brazil	Transportation
Cemex	BMV: CEMEX CPO	Mexico	Cement
Cencosud	BCS: CENCOSUD	Chile	Retail
Cielo S.A.	B3: CIEL3	Brazil	Financial services
Compañía de Minas Buenaventura	NYSE: BVN	Peru	Mining
Companhia Energetica de Minas Gerais (CEMIG)	NYSE: CIG	Brazil	Energy
Companhia Siderúrgica Nacional	NYSE: SID	Brazil	Steel
Companhia de Bebidas das Americas (AmBev)	NYSE: ABEV	Brazil	Beverages
CPFL Energia	NYSE: CPL	Brazil	Energy
Credicorp	NYSE: BAP	Peru	Banking
Ecopetrol	NYSE: EC	Colombia	Oil

Company	Ticker	Country	Industry
Grupo Elektra	BMV: ELEKTRA *	Mexico	Retail
Empresa Brasileira de Aeronáutica (Embraer)	NYSE: ERJ	Brazil	Aerospace/Defense
Empresas CMPC	BCS: CMPC	Chile	Paper/Pulp
Empresas Copec	BCS: COPEC	Chile	Energy
Enel Américas	NYSE: ENIA	Chile	Energy
Enel Generación Chile	NYSE: EOCC	Chile	Energy
Fomento Económico Mexicano (FEMSA)	BMV: FEMSA UBD	Mexico	Beverages
Gerdau	NYSE: GGB	Brazil	Steel
Grupo Financiero Banorte	BMV: GFNORTE O	Mexico	Banking
Grupo Televisa	BMV: TLEVISA CPO	Mexico	Media
Itaú Unibanco	NYSE: ITUB	Brazil	Banking
Itaúsa Investimentos Itau	B3: ITSA4	Brazil	Banking
LATAM Airlines Group	NYSE: LFL	Chile / Brazil	Airline
Petrobras	NYSE: PBR.A	Brazil	Oil
S.A.C.I. Falabella	BCS: FALABELLA	Chile	Retail
Sociedad Química y Minera de Chile	NYSE: SQM	Chile	Agricultural Chemicals
Southern Copper Corp.	NYSE: SCCO	Peru	Mining
Ultrapar Participacoes S.A.	B3: UGPA3	Brazil	Energy
Vale	NYSE: VALE.P	Brazil	Mining
Wal-Mart de México	BMV: WALMEX V	Mexico	Retail
Amcor	AMC	Australia	Materials
ANZ Bank	ANZ	Australia	Financials
BHP	BHP	Australia/UK	Materials
Brambles	BXB	Australia	Industrials
Commonwealth Bank	CBA	Australia	Financials
CSL	CSL	Australia	Health Care
Goodman Group	GMG	Australia	Real Estate
Insurance Australia Group	IAG	Australia	Financials
Macquarie Group	MQG	Australia	Financials
National Australia Bank	NAB	Australia	Financials
Rio Tinto	RIO	Australia/UK	Materials
Scentre Group	SCG	Australia	Financials
South32	S32	Australia	Materials
Suncorp	SUN	Australia	Financials
Telstra	TLS	Australia	Telecommunication Services
Transurban	TCL	Australia	Industrials

Company	Ticker	Country	Industry
Wesfarmers	WES	Australia	Consumer Staples
Westpac	WBC	Australia	Financials
Woodside Petroleum	WPL	Australia	Energy
Woolworths	WOW	Australia	Consumer Staples
TOYOTA MOTOR CORP		Japan	Consumer Durables
SOFTBANK GROUP CORP		Japan	Communications
SONY GROUP CORPORATION		Japan	Consumer Durables
KEYENCE CORP		Japan	Electronic Technology
NIPPON TEL & TEL CORP		Japan	Communications
FAST RETAILING CO LTD		Japan	Retail Trade
RECRUIT HOLDINGS CO LTD		Japan	Technology services
NIDEC CORPORATION		Japan	Producer manufacturing
KDDI CORPORATION		Japan	Communications
SHIN-ETSU CHEMICAL CO		Japan	Process Industries
NINTENDO CO LTD		Japan	Consumer Durables
TOKYO ELECTRON		Japan	Electronic Technology
MITSUBISHI UFJ FINANCIAL GROUP INC		Japan	Finance
CHUGAI PHARMACEUTICAL CO		Japan	Health Technology
SOFTBANK CORP.		Japan	Communications
DAIKIN INDUSTRIES		Japan	Producer manufacturing
TAKEDA PHARMACEUTICAL CO LTD		Japan	Health technology
MURATA MANUFACTURING CO		Japan	Electronic technology
HONDA MOTOR CO		Japan	Consumer Durables
DENSO CORP		Japan	Producer Manufacturing
Nestle SA Reg		Switzerland	Consumer Staples
ASML Holding NV			Information Technlogy
Roche Hldgs AG Ptg Genus		Switzerland	Healthcare
Novartis AG Reg		Switzerland	Healthcare
LVMH-Moet Vuitton		France	Consumer Durables
Unilever		UK	Consumer Staples
SAP SE		Germany	Information technology
Siemens AG		Germany	Industrials
AstraZeneca Plc		UK	Healthcare
HSBC Holdings Plc		UK	Financials
Royal Dutch Shell		Netherlands	Oil and gas
L'Oreal		France	Consumer Durables

Company	Ticker	Country	Industry
Anheuser-Busch Inbev		Belgium	Consumer Durables
Medtronic		Ireland	Health Technology
Total S.A.		France	Oil and gas
Prosus		Netherlands	Communication
Novo Nordisk		Denmark	Healthcare
Accenture		Ireland	Information technology
BP		UK	Oil and gas
Sanofi		France	Healthcare
Shopify Inc	SHOP-T	Canada	Information Technology
Royal Bank of Canada	RY-T	Canada	Financials
Toronto-Dominion Bank	TD-T	Canada	Financials
Canadian National Railway Co.	CNR-T	Canada	Railroads
Enbridge Inc	ENB-T	Canada	Oil & gas
Bank of Nova Scotia	BNS-T	Canada	Banking
Brookfield Asset Management Inc Cl.A Lv	BAM-A-T	Canada	Financials
Bank of Montreal	BMO-T	Canada	Financials
Canadian Pacific Railway Limited	CP-T	Canada	Railroads
Tc Energy Corp	TRP-T	Canada	Oil & gas
Thomson Reuters Corp	TRI-T	Canada	Consulting
Canadian Imperial Bank of Commerce	CM-T	Canada	Financials
BCE Inc	BCE-T	Canada	Communication
Manulife Fin	MFC-T	Canada	Financials
Barrick Gold Corp	ABX-T	Canada	Mining
CDN Natural Res	CNQ-T	Canada	Oil & gas
Alimentation Couche-Tard Inc Cl B Sv	ATD-B-T	Canada	Consumer Staples
Constellation Software Inc	CSU-T	Canada	Information Technology
Nutrien Ltd	NTR-T	Canada	Basic Materials
Suncor Energy Inc	SU-T	Canada	Oil & gas
Apple Inc.	AAPL	USA	Information Technology
Microsoft Corporation	MSFT	USA	Information Technology
Amazon.com Inc.	AMZN	USA	Consumer discretionary
Facebook Inc. Class A	FB	USA	Communication
Alphabet Inc. Class A	GOOGL	USA	Communication
Alphabet Inc. Class C	GOOG	USA	Communication
Tesla Inc	TSLA	USA	Consumer discretionary
Berkshire Hathaway Inc. Class B	BRK.B	USA	Financials
JPMorgan Chase & Co.	JPM	USA	Financials

Company	Ticker	Country	Industry
Johnson & Johnson	JNJ	USA	Healthcare
NVIDIA Corporation	NVDA	USA	Information Technology
Visa Inc. Class A	V	USA	Information Technology
UnitedHealth Group Incorporated	UNH	USA	Healthcare
Home Depot Inc.	HD	USA	Consumer discretionary
Mastercard Incorporated Class A	MA	USA	Information Technology
Procter & Gamble Company	PG	USA	Consumer staples
Walt Disney Company	DIS	USA	Communication
PayPal Holdings Inc	PYPL	USA	Information Technology
Bank of America Corp	BAC	USA	Financials
Intel Corporation	INTC	USA	Information Technology

Colour code – highlighted yelow – excluded.

Appendix 2. Final list of S&P companies used in research

Company	Country	Industry	Index
Accenture	Ireland	Information Technology	Europe350
Anheuser-Busch Inbev	Belgium	Consumer Durables	Europe350
ASML Holding NV	Netherlands	Information Technlogy	Europe350
AstraZeneca Plc	UK	Healthcare	Europe350
BRF S.A.	Brazil	Food processing	LATAM40
Canadian National Railway Co.	Canada	Railroads	TSX60
CEMEX, S.A.B. de C.V.	Mexico	Cement	LATAM40
China Mobile	China	Communication	Asia50
China Overseas Land & Investment Limited	China	Real Estate	Asia50
CK Asset Holdings	Hong Kong	Real Estate	Asia50
CK Hutchison Holdings	Hong Kong	Industrials	Asia50
CLP Holdings	Hong Kong	Utilities	Asia50
CNOOC Limited	China	Energy	Asia50
Companhia Energética de Minas Gerais	Brazil	Energy	LATAM40
Companhia Siderúrgica Nacional	Brazil	Steel	LATAM40
Ecopetrol S.A.	Colombia	Oil	LATAM40
Enel Américas S.A.	Chile	Energy	LATAM40
Enel Generación Chile S.A.	Chile	Energy	LATAM40
Falabella S.A.	Chile	Retail	LATAM40
FAST RETAILING CO LTD	Japan	Retail Trade	TOPIX150
Formosa Plastics Corporation	Taiwan	Materials	Asia50
Gerdau S.A.	Brazil	Steel	LATAM40
Goodman Group	Australia	Real Estate	ASX50
Home Depot Inc.	USA	Consumer discretionary	S&P500
Hon Hai Precision Industry	Taiwan	Information Technology	Asia50
HONDA MOTOR CO	Japan	Consumer Durables	TOPIX150
Hyundai Motor Company	South Korea	Consumer Discretionary	Asia50
Intel Corporation	USA	Information Technology	S&P500
L'Oreal	France	Consumer Durables	Europe350
LATAM Airlines Group S.A.	Chile	Airline	LATAM40
LG Chem, Ltd.	South Korea	Materials	Asia50
Link Real Estate Investment Trust	Hong Kong	Real Estate	Asia50
LVMH-Moet Vuitton	France	Consumer Durables	Europe350
Mastercard Incorporated Class A	USA	Information Technology	S&P500
Medtronic	Ireland	Health Technology	Europe350
NIPPON TEL & TEL CORP	Japan	Communications	TOPIX150
Novartis AG Reg	Switzerland	Healthcare	Europe350

Company	Country	Industry	Index
Novo Nordisk	Denmark	Healthcare	Europe350
Nutrien Ltd	Canada	Basic Materials	TSX60
PetroChina Company Limited	China	Energy	Asia50
Petróleo Brasileiro S.A. - Petrobras	Brazil	Oil	LATAM40
POSCO	South Korea	Materials	Asia50
Procter & Gamble Company	USA	Consumer staples	S&P500
Roche Hldgs AG Ptg Genus	Switzerland	Healthcare	Europe350
Samsung Elelctronics	South Korea	Information Technology	Asia50
Sands China Ltd.	Hong Kong	Consumer Discretionary	Asia50
SAP SE	Germany	Information technology	Europe350
Siemens AG	Germany	Industrials	Europe350
Sociedad Química y Minera de Chile S.A.	Chile	Agricultural Chemicals	LATAM40
Sony Group Corporation	Japan	Consumer Durables	TOPIX150
South32 Limited	Australia	Materials	ASX50
Southern Copper Corporation	Peru	Mining	LATAM40
Sun Hung Kai Properties	Hong Kong	Real Estate	Asia50
Taiwan Semiconductor Manufacturing	Taiwan	Information Technology	Asia50
TAKEDA PHARMACEUTICAL CO LTD	Japan	Health technology	TOPIX150
Telstra Corporation Limited	Australia	Telecommunication Services	ASX50
Tencent Holdings	China	Communication	Asia50
Toyota Motor Corporation	Japan	Consumer Durables	TOPIX150
Unilever	UK	Consumer Staples	Europe350
Vale S.A.	Brazil	Mining	LATAM40
Visa Inc. Class A	USA	Information Technology	S&P500
Walt Disney Company	USA	Communication	S&P500
Wesfarmers Limited	Australia	Consumer Staples	ASX50
Woodside Petroleum Ltd	Australia	Energy	ASX50
Woolworths Group Limited	Australia	Consumer Staples	ASX50

Appendix 3. Industry grouping into categories

Industry	Group / category
Agricultural Chemicals	1
Airline	2
Basic Materials	3
Cement	3
Communication	4
Communications	4
Consumer discretionary	5
Consumer Durables	5
Consumer staples	5
Energy	6
Food processing	5
Health Technology	7
Healthcare	7
Industrials	8
Information Technlogy	10
Information technology	10
Materials	3
Mining	3
Oil	6
Railroads	2
Real Estate	11
Retail	5
Retail Trade	5
Steel	3
Telecommunication Services	4
Utilities	5

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The Efficiency of Environmental Project Financing with Green Bonds in the Energy Sector: Evidence from EU Countries

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Abstract

This paper investigates whether the issue of green bonds by energy companies allows lowering the cost of funding for their environmental projects. We use empirical data on green bond placement in the energy sector and comparable conventional bond yield curves to prove the existence of the green bond yield discount. The sample includes 37 plain vanilla green bond issues and comparable yield curves of EU energy companies for 2017–2020 with total volume EUR 25 bn. We demonstrate that green bonds have a 4.7 bps lower average yield compared to conventional bonds. This green bond discount is statistically significant at a 5% level and does not depend on issue size or debut status of the issue. We draw three main conclusions: (1) energy companies may lower cost of funding by issuing green bonds, making environmental projects more economically attractive, (2) the green bond discount is present for both inaugural and subsequent green bond issues, which makes it reasonable to finance all environmental projects with green bonds, (3) the green bond discount does not depend on the issue size, which makes green bonds an appropriate choice for financing capital-intensive projects.

Keywords: green bonds, energy companies, responsible investment, ESG policy, environmental impact

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Introduction

Energy is a strategically important segment of the global economy that impacts countries' sustainable development and national security. Global energy consumption reached 14.2 billions toe (tonnes of oil equivalent) in 2021 and has a tendency to increase in the foreseeable future [1]. The energy sector is the major contributor to climate change and produces 35% of global greenhouse gas (GHG) emissions worldwide [2]. The total energy-related GHG emissions have grown to 40 Gt of CO_2 equivalent in 2021 [3]. Therefore, reducing emissions is the key priority for energy companies, and they actively implement environmental projects in order to achieve their decarbonization aims.

The key financial issues energy companies face when implementing environmental projects are: (1) high capital intensity, (2) long payback period, (3) low return on investment (ROI) [4]. It forces energy companies to seek new financial instruments that allow attracting cheaper funding in the long-term. Green bonds could be the solution for energy companies since they usually have long maturity periods and significant amounts like plain vanilla bonds, but they may additionally offer a discounted interest rate due to a sufficient interest from investment community.

The global green bond market has grown to an adequate volume during the last several years. Since 2015, the amount of outstanding green bonds has increased more than 10-fold from $40bn to $500bn, attracting notable investor demand in global markets.

One of the reasons is the widespread adoption of the "responsible investment" concept by investors, which implies that the environmental impact is closely correlated with a company's long-term performance. Eco-friendly investments hedge investors against the risks of environmental hazards and potential penalties that governments tend to impose on polluting companies. This tendency has led to the appearance of a new investor type with a separate green mandate which is mostly focused on green bonds.

Another driver of the green bond segment growth is governmental support. The most common ways of governmental support are (1) mandatory disclosure of green investments by institutional investors, (2) tax exemption and coupon subsidies for green bonds, (3) subsides for green bond verification costs and (4) creation of dedicated green funds. An example of efficient regulation in the European market is Article 173 of the French Energy Transition Law that obliges publicly listed companies and institutional investors to disclose carbon emissions of their projects and investment portfolios. It stimulates active investment into green bonds, so that they appear in the investors' above-mentioned carbon reporting.

Energy companies comprise a significant portion of the green bond market issuance since they play a major role in the transition to the green economy. Almost 1/3 of the total annual green bonds issued in 2019 has been used for energy projects including solar, wind, geothermal, bioenergy and small hydropower plants. Many European energy and utilities companies, including A2A, Alliander, E.ON, Enel, Hera, Iberdrola, Innogy, Iren, Tennet Holding, Terna, etc., are now active green bond issuers.

The primary aim of this study is to determine the efficiency of financing environmental projects in the energy sector with green bonds compared to a similar senior unsecured public debt instrument – plain vanilla bonds. The nature of environmental projects in the energy sector with a long payback period and low rates of return implies that the primary efficiency indicator is the cost of funding.

The results may be useful in the pricing of green bonds' primary placements for both energy companies (issuers) and investors.

The remaining article is outlined as follows. Section second presents a literature review that has helped in building hypotheses. Section three provides details related to the sampling method and variable adoption. Section four presents the results and their statistical explanation. Section five contains a discussion of the results and their comparison to other authors' results. Section six concludes the existing study and provides further recommendations.

Literature overview and hypotheses statement

There are only a few papers on green bond pricing, and they do not have a common consensus regarding the "green premium" – the additional price premium (discount in yield) that investors are willing to pay for the green label compared to conventional bonds.

R. Preclaw and A. Bakshi (2015) [5] have conducted research based on secondary global bond market data for 2014–2015 with OLS-regression. The authors identified a 17-bps lower yield of the green bonds compared to ordinary bonds. G. Gianfrate and M. Peri (2019) [6] have analyzed European companies' bond yields in the secondary market for 2013–2017 with propensity score matching. They found a significant 20-bps discount of corporate green bond yields compared to conventional bonds. O.D. Zerbib (2019) [7] studies EUR and USD bond yields for 2013–2017 with matching and two-step regression methods. Author concludes that green bonds have 2-bps lower yields compared to conventional bonds. Q. Sheng et al. (2021) [8] in their research also calculated a significant 8-bps green bond discount in yield compared to conventional bonds and highlighted the importance of third-party verification. Authors have drawn these results by analyzing data on Chinese companies' primary bond placements with propensity score matching.

On the other hand, Climate Bonds Initiative [9] identified neither a premium, nor a discount in yield based on US and Eurobond primary market data for the respective period. Authors used the secondary market yield curve bootstrapping and subsequently compared it to the primary placement green bond yields in order to identify a premium or a discount. In addition, there are some papers that identify a premium in green bonds' yield. Among them

is the research study by A. Karpf and A. Mandel (2018) [10] who have identified an 8-bps greater green bond yield based on 2010–2016 US muni bonds data.

The analysis of results drawn by different authors on this topic and their applicability for the purposes of this study is shown in Table 1.

Table 1. Results of existing research on greenium and their applicability

Research, source	Data	Results	Applicability
M.J. Emets (2020) [11]	Sample of 318 green and 1 695 conventional bonds	47 bps greenium	Energy sector is not isolated; Low descriptive power of OLS model (0.5–0.6); Dynamics of systematic factors (like base rates) is not considered
G. Gianfrate and M. Peri (2019) [6]	Sample of EU bonds secondary market for 2013–2017	20 bps greenium	Secondary market data is poorly applicable to issuers
R. Preclaw and A. Bakshi (2015) [5]	Sample of Eurobonds secondary markets for 2014–2015	17 bps greenium	Secondary market data is poorly applicable to issuers; Sample period is too narrow for drawing reliable conclusions
A. Mikhailova and I. Ivashkovskaya (2020) [12]	Sample of 2,450 primary placements in 2008–2020	23% spread compression for green bonds	Energy sector is not isolated
Q. Sheng et al. (2021) [8]	Sample of primary placements in Chinese market	8 bps greenium	Energy sector is not distinguished
O.D. Zerbib (2019) [7]	Sample of USD and EUR nominated bonds for 2013–2017	2 bps greenium	Energy sector is not distinguished; Sample is primarily focused on sovereign and muni-bonds
A. Karpf and A. Mandel (2018) [10]	Sample of US muni-bonds secondary market for 2010–2016	–8 bps greenium (Green bond rates are higher)	Energy sector is not isolated; Secondary market data is poorly applicable to issuers; Sample is focused on muni-bonds

Source: Composed by author.

As shown in Table 1, the results of existing research on greenium may be not suitable for assessing green bond efficiency for the energy sector companies since: 1) samples are based on different bond market segments (sovereign bonds, muni-bonds), 2) research is based on secondary market data, which is not applicable to primary issuance by energy companies, 3) the energy sector is not isolated in the results, 4) research methods have low precision or omitted variables (i.e., base rate dynamics).

This paper contributes to the literature corpus by using more granular bond issue filtering, a wider timeframe, focusing on the European energy segment and introducing a theoretical model that explains the green bond premium.

Additionally, there are three segments of literature that explore the impact of environmental and social projects on the pricing of other instruments (equity and ordinary debt).

The first segment studies the impact of CSR (Corporate Social Responsibility) on a company's equity value. There are numerous works on this topic, examples are M. Statman and D. Glushkov, 2009 [13], N. Semenova and L.G. Hassel, 2016 [14]. The consensus here is that CSR positively affects equity performance. However, the concept of CSR covers a wider scope than environmental impact: it also includes social responsibility. Therefore, the above-mentioned results are not directly applicable to the green bond market.

The second segment comprises papers exploring the link between a company's environmental impact and equity value. Notable works include R. Heinkel et al. (2001) [15], M.P. Sharfman and C.S. Fernando (2008) [16], S. Chava,

2014 [17]. Just as in the previous section, authors reached a consensus that the positive environmental impact of a company's business positively affects equity value. The findings, however, are applicable only to equity capital with a pricing mechanism that is sufficiently different from bonds.

The third segment focuses on companies' cost of debt and CSR. There is no consensus among authors on this topic. One group of authors (B.C. Magnanelli and M.F. Izzo (2017) [18], K.-M. Menz (2010) [19]) concludes that CSR improvement leads to a higher cost of debt, implying inefficient spending of funds on CSR. Another group of authors (C. Stellner et al. (2015) [20], I. Oikonomou et al. (2014) [21], H. Ghouma et al. (2018) [22]) estimates that CSR improvement leads to a lower cost of debt. The results are also not directly applicable to green bonds since they do not cover green bonds issued by brown companies (transition bonds).

The pricing of inaugural and subsequent green bond issues may be different, reducing their efficiency for the issuer. On the one hand, issuers usually pay a premium in the interest rate for the debut issues to attract an extensive investor community [23]. On the other hand, green bonds signal investors about the green transformation of a company, and subsequent green bonds may lose their efficiency and reduce the green bond discount since it would not present new information to investors. We expect the green bond discount to be present for both inaugural and subsequent green bond issues, so that energy companies have a reason to use green bonds to finance all environmental projects.

Green bonds are usually smaller compared to conventional bonds, since their use of proceeds is limited to specific projects. Some researchers state that the issue size sufficiently impacts bond yield at the primary placement [24; 25]. That might cause the green bond discount to decrease for the large green bond issues used to finance capital intensive environmental projects. On the other side, we expect the green bond discount to be stable across all issue sizes so as to ensure their efficiency for energy companies.

In order to identify whether issuing a green bond allows energy companies to lower the cost of funding for their green projects, the following hypotheses were set forth:

Hypothesis I: Green bonds have lower yields compared to conventional bonds – the green bond discount is present.

Hypothesis II: The green bond discount is present not only for the inaugural green bond issue, but for the subsequent issues as well.

Hypothesis III: The green bond discount does not depend on issue size.

Data and empirical methodology

We define the green bond discount (GBD) as the difference in yield between a green bond and a conventional bond.

The following methodology was applied in identifying the green bond discount in yield:

1) Plain vanilla green bond placements were selected.
2) Conventional bond curves were structured for each green bond issue using the Nelson-Siegel approach.
3) The green bond discount was calculated for each observation.
4) Factors impacting the green discount were tested with regression analysis.

Plain vanilla green bond selection

A significant portion of green bond issuance is not plain vanilla, meaning they cannot be directly compared to conventional bonds. The following selection criteria were applied:

- Global bonds issued by European Energy companies denominated in Euro.
- Senior unsecured debt.
- Fixed-coupon issues.
- No embedded options.
- Non-structured notes / Asset-based securities / Perpetual bonds / CPI-linkers.
- Use of proceeds: environmental purposes (according to ICMA rules) verified by an external entity.

Conventional bond curve formation

First, for each of green bond placements, conventional comparable bonds were selected among plain vanilla issues with the following priority:

- Issuer's non-green bonds.
- Non-green bonds from similar European energy sector issuers in Euro having the same credit rating assigned by at least two of three leading rating agencies (Moody's, S&P, Fitch).

The curves were bootstrapped only for those green bond issues where the number of comparable conventional bonds exceeded 5.

Curve formation process follows Nelson – Siegel [26] methodology. The equation (11) is fitted for each comparable green bond issue, so as to minimize the residual sum of squares. Four parameters (β_0, β_1, β_2, β_3) are estimated for the i-th green bond issue on the sub-sample of conventional bonds (j) with yield to maturity r_{ij}, and duration m_{ij}

$$\begin{cases} r_{ij} = \beta_0 + (\beta_1 + \beta_2) \cdot \left(\dfrac{1 - \exp\left(-\dfrac{m_{ij}}{\beta_3}\right)}{\dfrac{m_{ij}}{\beta_3}} \right) - \beta_2 \cdot \exp\left(-\dfrac{m_{ij}}{\beta_3}\right) + \varepsilon_{ig} \\ \sum_{g=1}^{n} \hat{a}_{ig} \rightarrow minimize. \end{cases} \quad (1)$$

As a result, for each green bond issue (i) we formed a conventional bond curve with the following functional view:

$$r_i(m) = \beta_0 + (\beta_1 + \beta_2) \cdot \left(\frac{1 - \exp\left(-\frac{m}{\beta_3}\right)}{\frac{m}{\beta_3}} \right) - \beta_2 \cdot \exp\left(-\frac{m}{\beta_3}\right). \quad (2)$$

In the equation above (12), m is bond duration, $r_i(m)$ is the modelled conventional bond yield for the i-th green bond and $\beta_{0,1,2,3}$ are fitted curve parameters for the i-th green bond.

Deriving the green bond discount (greenium)

Once the conventional bond yield curves are fitted, the green bond discount is determined as follows:

$$GBD_i = r_i - r_i(m_i). \quad (3)$$

Where GBD is the green bond discount, r_i is a green bond yield at issuance and m_i is a green bond duration at issuance.

Regression of the green bond discount

We have used the following empirical models (14–16) to test the significance of the standalone green bond discount and the impact of issue size and debut status on the green bond discount

$$GBD_i = \beta_0 + \varepsilon_i \quad (4)$$

$$GBD_i = \beta_0 + \beta_1 \bullet DEBUT_i + \varepsilon_i \quad (5)$$

$$GBD_i = \beta_0 + \beta_1 \bullet DEBUT_i + \beta_2 \bullet VOLUME_i + \varepsilon_i, \quad (6)$$

Where $DEBUT_i$ – dummy variable that indicates whether the i-th green bond issue is inaugural (1) or not (0);

$VOLUME_i$ – the issue size of the i-th green bond, in millions of EUR.

Data sources

The research is based on the data of primary bond placements of EU energy companies nominated in EUR. European Union is the largest contributor to global decarbonization. The share of renewable energy sources in Europe's total energy mix has doubled from 20% in 2000 to 40% in 2021, which is the record among all regions [1]. One of EU's members – Norway – produces 99% of energy from renewable sources. It shows that EU energy companies are the most active in implementing environmental projects.

On the other side, European issuers have the largest share in the global green bond market. Since 2014 to 1H2022 European issuers have placed over $865 billion worth of green bonds, which comprise 45% of the global bond market [27]. Most of them are nominated in EUR.

The links among different variables in bond pricing are not constant or linear across the markets and currencies due to different regulation, investor structure, and taxation, therefore, we focus on the most representative segment of the global market – EU energy companies' bonds denominated in EUR.

The data on green bond issues has been taken from the Cbonds database. All EU energy sector bonds denominated in EUR have been pulled. The initial sample size comprised 102 observations. However, when all the filters described in the "Plain vanilla green bonds selection" section were applied, only 37 observations remained.

The data on green bond primary placement results (tenor, issue size, coupon, price, yield etc.) has been pulled from Cbonds, Bloomberg databases and issuance documents: Prospectus and Final terms. The data on secondary market quotes for comparable conventional bonds has been taken from Cbonds and Bloomberg databases.

Descriptive statistics of the green bond discount (GBD) in yield for primary bond placements of energy companies is presented in Table 2.

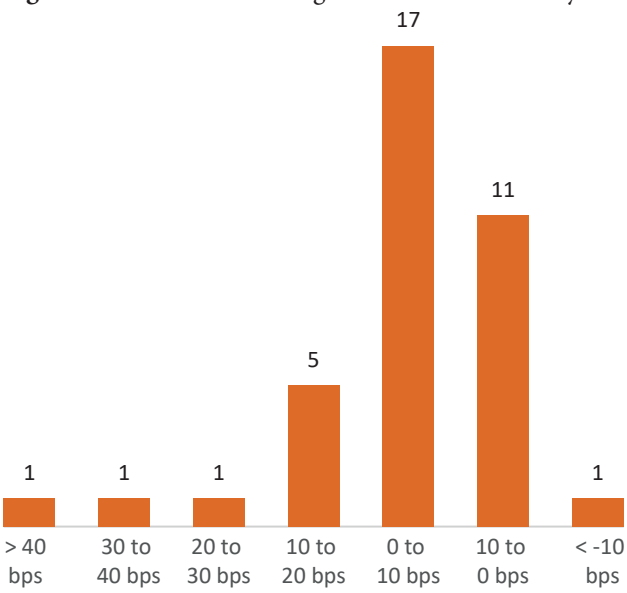
Table 2. Descriptive statistics of the green bond discount

Statistics	Value
Sample size	37 green bond issues
Average GBD	4.68 bps
Median GBD	2.83 bps

Source: Authors' calculation.

The distribution of the green discount in yield for primary bond placements of energy companies is depicted in Figure 1.

Figure 1. Distribution of the green bond discount in yield



Source: Authors' calculation.

Results

The results of the green bond discount regression analysis are presented in Table 3.

Table 3. Regression analysis of the green bond discount

	Dependent variable: Green bond discount		
	(1)	(2)	(3)
DEBUT		5.457	7.723
		(4.564)	(4.757)
VOLUME_MNEUR			0.013
			(0.009)
Constant	–4.678**	–6.596**	–16.357**
	(2.192)	(2.705)	(7.238)
Observations	37	37	37
R^2	–	0.039	0.095
Adjusted R^2	–	0.012	0.042
Residual Std. Error	13.331 (df = 36)	13.252 (df = 35)	13.048 (df = 34)
F Statistic		1.430 (df = 1; 35)	1.789 (df = 2; 34)
Note: *p**p***p<0.01.			

As shown in Table 3, the negative constant green bond discount is sufficient with 90% confidence in all three models, confirming Hypothesis I, which states that green bonds have lower yields compared to conventional bonds.

Models 2 and 3 show that the Debut factor cannot be considered statistically sufficient for determining the green bond discount size. It confirms Hypothesis II, which states that the green bond discount is present for both inaugural and subsequent green bond placements.

Model 3 shows that the VOLUME factor (issue size) has insufficient influence on the green bond discount size, which also confirms Hypothesis III.

F-statistic levels in models 2 and 3 indicate that the above-mentioned variables do not affect the green bond discount even cumulatively, which also confirms the sustainability of the green bond discount.

Discussion

The presence of a small green discount in yield indicates that investors are ready to forego only a small portion of return in exchange for the green label. One of potential reasons is that the share of responsible investors in the market is not sufficient to drive the yields sufficiently lower than conventional bonds.

At the moment, the pricing of green bonds is a little tighter than that of conventional bonds. It means that issuing a green bond may lower the cost of funding for green projects, making them even more attractive for energy companies.

Additionally, green bond issuance brings other sufficient benefits for the energy companies:

- It signals investors, denoting the transformation towards a low-carbon business model.
- It demonstrates the efficiency of the current ESG-policy to the shareholders as the company attracts market investments for its ESG-projects.
- It widens the investor base since the company attracts funds from market investors, including those with a specific green mandate, leaving other investors' limits unused.

The results of this research are mostly consistent with O.D. Zerbib [7], Q. Sheng et al. [8], and N. Mikhailova and I. Ivashkovskaya [12], which indicate a 2–8 bps greenium on an extensive sample of placements in Chinese and global primary bond markets. Authors that have based their research on secondary market data [6], [5] have obtained even higher greeniums of 17–20 bps. It can be explained by the fact that green bonds have stronger price dynamics in the secondary market following issuance.

The results would be useful in forming the environmental financing strategy for both European and Russian energy companies, since Russia has a green bond infrastructure (green project taxonomy, green listing sector at the Moscow Stock Exchange) that is fully compatible with the European market. The results are also of interest to investors because they are instrumental in identifying the fair pricing of green bonds at primary placements.

The key obstacle for this paper is the relatively small sample size – 37 green bond issues, which is caused by small size of energy companies' green bond market.

Conclusions

This paper analyses the problem of green bonds' efficiency for the financing of environmental projects by energy sector companies. For this purpose, a two-step approach was applied on the sample of European energy companies' green bonds nominated in EUR (as the largest segment of the green bond market). In the first step, we formed comparable conventional bond yield curves for each green bond issue and calculated the green bond discount. In the second step, we applied regression analysis to test for the significance of the standalone green bond discount and the impact of the debut status and issue size on it.

The main result of this research is that it confirms the efficiency of financing environmental projects by energy sector companies with green bonds in the following three aspects:

1) The research identifies an average green bond discount of 4.7 bps and confirms its statistical significance. Therefore, energy companies may lower the cost of funding by issuing green bonds, making environmental projects more economically attractive.
2) The research confirms that the debut status of the issue does not have a sufficient impact on the green bond discount. In other words, the green bond discount is present for both inaugural and subsequent green bond issues, which makes it reasonable to finance all environmental projects with green bonds.
3) This research confirms that issue size does not have a sufficient impact on the green bond discount, thus, that green bonds are appropriate for financing capital-intensive projects.

Further research in this area may be aimed at exploring the relationship between the green bond discount and the ESG-rating or at the extrapolation of the results of this research to other bond markets (for example, Chinese market or the US market).

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Prospects of Ecosystems Development in the Russian Consumer Market

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Abstract

The present paper studies the extent of infiltration of companies considered to be ecosystems into consumer spending pattern of the Russian population. For this purpose we offered a method of ecosystem market share evaluation on the basis of publicly available data of companies and official statistics. We proposed a criterion for dividing ecosystems into advanced and emerging ones. To that end we calculated the index assessing the share infiltration of ecosystems into the consumer market in 2018–2021. Dynamics of implementation of ecosystems in the consumer sector of the Russian Federation is positive but rather low which is indicative of prospects of development.

Keywords: ecosystem, consumer spending, platform economy

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Introduction

Ecosystems are multisector holdings which make a focal product for an end consumer on the basis of individual products and services of the company [1–3]. This characteristic feature constitutes grounds for classifying the company as an ecosystem.

We offer the following ecosystem definition: it is a community of companies with the same shareholder which aspires to dominate in a certain segment of markets in a particular national economy and creates an integral product for the end customer.

The following formal features result from this definition:

1) attribution of only companies or a group of companies but not sociocultural items (such as Silicon Valley) and not production chains (for example, chipset manufacturing partnerships) to the notion of "ecosystem". The first ones cannot be attributed to it because they are subject of social sciences and cannot be subject of formalized financial analysis; the latter ones – due to non-exclusivity of existing partnerships and a consistent nonparallel increment of added value;
2) within an ecosystem companies create a focal product *simultaneously* [4]. A characteristic feature of such product is the ecosystem customer's right to privileges when using certain products and services of the ecosystem. Such products comprise: uniform customer identification systems, loyalty systems, a set of services and goods available only if the customer pertains to the first two systems;
3) optional characteristic features include an umbrella brand, for example, a prefix representing the name of the parent holding and a single development strategy. The ecosystem may intentionally preserve an "alien" brand obtained as a result of company acquisition and at the same time comply with requirements of paragraph 2 (abroad – Whole Foods purchased by Amazon, in the Russian Federation – Kinopoisk bought by Yandex). However, strategy of the group of companies may be a commercial secret or be unavailable in public sources;
4) striving of ecosystems to enlarge the number of verticals in consumer markets up to the spending limits of households, i.e. to provide the most complete presence in the type network of the consumer market. As a result of this procedure revenue grows continuously (as an effect of entering new markets and squeezing competitors out of markets of presence) outperforming growth rates of the consumer market of the national economy in general up to the state of natural monopoly when there is no government regulation.

The focal product is a combination of the service and goods components which culminate in consumption on the basis of the subscription model. Otherwise speaking existence of a subscription service which combines verticals within a common joint-stock structure may be considered to be a feature of an ecosystem.

It is important to note that notions "ecosystem" and "transaction platform" are not identical or synonymous [5; 6]. The false closeness is a result of the practice of integration of, for example, ecommerce platforms and transport-and-logistic services in ecosystems [7].

As long as it is a practical research it is necessary to show a combination of ecosystem characteristic features using companies – objects of study as an example. Yandex has its own identifier Yandex.Passport which identifies a user in any service entered through a uniform identifier, YandexPlus loyalty programme which is distinguished by availability at a fee (so-called subscription), a single Yandex brand represented by a prefix in the service name. Exactly the same ecosystem elements are present in business models of VK Group (VK Connect, VK Combo etc.), Sber (Sber ID, SberpPrime etc.), Ozon, MTS and other ecosystems considered in this paper.

The first three characteristic features above are of declarative nature and are necessary to distinguish ecosystems formally from a range of commercial companies. The fourth feature is more of heuristic nature, i.e., in the first instance, it is an assumption which requires an empirical verification. Consequently, the *objective* of this paper is to establish the extent to which the last of the above features lines up with reality. The research *task* is to calculate the market share (including its dynamics) of domestic ecosystems in the markets of presence in the Russian economics in comparison to dynamics of consumer spendings for the studied period.

The research *objects* are ecosystems of the Russian Federation: Yandex, Sber, VK Group, Tinkoff, MTS, Wildberries, Ozon. The research subject is areas of ecosystems' business units and change of their revenues and (or) turnover. The result of the paper is an analytical calculation of the aggregate market share of ecosystems and evaluation of its dynamics. Below we use the term of *ecosystem index* to designate the aggregate share of household spendings included in the financial result of Russian ecosystems' retail business (except for retail proceeds attributable to foreign markets).

Literature Review

In scientific literature the first scientific publication which introduced the term "ecosystem" in scientific discourse of economic sciences was the one by J. Moore [8] Predators and Prey: A New Ecology of Competition (1993). The Russian translation of the ecosystem definition is as follows: an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world.

However, the increased popularity of the definition beyond scientific discourse is attributed to the initial public offering of Chinese tech company Alibaba in 2014 and publications of consulting agencies about it which considered the company's business model as an ecosystem of various services. At the same time it should be noted that there

are earlier publications which use the term "technological platform" opposing it against the notion of "cluster" [9]. The former term is considered as something remarkably similar to the notion of "ecosystem" mentioned in the paper while the latter rather belongs to sociocultural items described above. The technological platform from the authors' point of view is nothing more than a community of actors from among commercial enterprises, universities and government managed by a single orchestrator in order to create a focal product simultaneously.

There is a layer of studies dedicated to exploring of the definition of a digital ecosystem. Research by O. Valdez-de-Leon [10] may be distinguished from them. It studies the issues of digital ecosystems' creation and functioning, distinguishes the main components of practical foundation. The author defines a digital ecosystem as "loose networks of interacting organizations that are digitally connected and enabled by modularity, and that affect and are affected by each other's offerings". Besides, the research states that non-participation in the digital systems paradigm may result in reduction in growth rate of operating and financial results.

Other researchers V. Godin and A. Terekhova [11] study the digital ecosystem as a new business model. They make the conclusion that digitalization in general has a significant impact on business processes, and ecosystems developed mainly in three fields: as a platform for trade and rendering services, as an alliance of links of the value chain (added value community) and a self-developing organization.

The only paper related to calculation of the share of household spendings in digital ecosystems was written by the research team of PYMNTS [12]. The research studies Amazon's share in total and retail household spendings in the USA on the basis of data provided by the US Bureau of Labor Statistics and the US Census Bureau. The results show that in the observed period of 2014–2020 the share of Amazon increased manyfold. However, they do not specify the reasons for growth of this indicator.

There are a lot of studies dedicated to regulation of digital ecosystems, customers' personal data protection and mergers and acquisitions between large technological companies and small start-ups. For example, B. Kira, V. Sinha and S. Srinivasan [13] raise the issue of importance of competition and data protection policy and its regulation. The authors emphasize that it is important maintain a competitive business environment and protect consumers from large technological companies such as Google, Apple, Amazon and Microsoft which buy small start-ups actively and use clients' data to gain market power.

A. Gautier A and J. Lamesch [14] in their research study 175 purchases of Google, Amazon, Facebook (Meta Platforms), Apple and Microsoft (GAFAM) in 2015–2017. In the majority of cases the product of the taken-over company after the purchase no longer existed under its initial brand. The authors distinguish three main reasons: "the product was not so successful as it had been expected to be, the motive for the purchase was not the product but assets or R&D efforts or elimination of a competitive threat". Finally the authors show that small companies just cease to exist in an embryonic stage as a result of unsuccessful competition with tech giants. Besides as a result of such deals not just potential competitors exit from the market but the share of ecosystems in the market also increases.

In the paper by T. Stuart [15] the issue of importance of big data and regulation of its collection is studied. He shows that absence of such regulation just causes harm to consumers and society in general. Tech giants will keep abusing lack of precision in the legislation in order to enhance their monopoly position.

G. Parker, G. Petropoulos and M. van Alstyne [16] are also concerned with predominance of GAFAM in the market. The research indicates an opportunity of a four-step solution for improvement of competitive conditions degraded by purchases of ecosystems. The solution comprises: "1) a new introductory regulatory and legal framework; 2) renewal of the terms under which a notification of mergers should be obligatory and the burden of proving should be shuffled off; 3) different regulatory priorities in examining of horizontal purchases against vertical ones; and 4) upgrading of competition assurance tools in order to enhance transparency of market data and trends".

Methodology and Calculation of the Index Base

The ecosystem index is indicative of the extent of ecosystem companies' penetration into everyday household spendings. Otherwise speaking, the index shows the share of spendings which Russian consumers "give away" to ecosystems. Inasmuch as due to specific reasons there is a certain set of markets where ecosystems do not render services, for example, housing and communal services, alcohol, tobacco etc. the population's expenditures should be divided into two groups: general spendings and spendings in the markets of ecosystems' presence. Consequently, in further calculations we will show various calculations of the index premised on the calculation base (all markets or just the markets where ecosystems are present).

Now we are going to analyze the formula and data sources necessary for calculations. The index is calculated as a simple proportion:

$$\text{Ecosystem index} = \frac{\text{Total revenue (or) turnover of ecosytems from sale of goods and services}}{\text{Volume of the markets where ecosystems are present}} \cdot 100\%. \quad (1)$$

When calculating the numerator one should bear in mind that in some markets where ecosystems provide intermediary services *turnover* is used instead of revenue. For example, the "ride-tech" market (taxi, logistics, carsharing etc.) or the e-commerce market. Regardless of the fact that in this case ecosystem revenue is generated as a take rate of the rendered service cost or sold goods cost the consumer gives money to the ecosystem (justification of the approach is considered in more detail in the next section). The amount of this effective fee differs from market to market and it is stated on the basis of official statements of a company and (or) its representatives or is calculated in an analytical way as a revenue-turnover ratio.

The main sources for calculation of the numerator are quarterly and annual financial statements of a company on the basis of IFRS standards. If a company is non-public as, for example Wildberries, data from SPARK and open sources is used. Official statements of company representatives are prioritized.

One may use data from mass media or research reports in order to calculate the denominator, however they are not published on a regular basis and do not always provide information for each quarter. Therefore in this research we use information from the web site of the Federal State Statistics Service (Rosstat). The direct consequence of this approach is dependence of index calculation update on frequency of data publishing by ecosystems as well as by Rosstat which is approximately 90-120 days from the date of the end of a quarter.

The basis for calculation of population's gross expenditures with the necessary grouping is provided by Rosstat (for benchmark data see Appendix 1) (Table 1).

Table 1. Taxonomy of expenses by Rosstat

Section	Data
Consumer spending pattern of households according to groups of food and non-food products and services, on a quarterly basis	Shares of expenses by categories
Amount and structure of money income of the population of the Russian Federation according to sources; on an annual basis broken down by quarters; in the section Income, Expenditures and Savings of the Population	Quarterly absolute values of population's income
Structure of use of money income of the population of the Russian Federation; on an annual basis broken down by quarters; in the section Income, Expenditures and Savings of the Population	Quarterly relative data by categories Purchase of Good and Payment for Services and Compulsory Payments, Contributions and Other Expenses
Structure of money income and expenditures of the population of the Russian Federation; on an annual basis; see it on the second page of the Balance of Money Income, Expenditures and Savings of the Population for a Year; in the section Income, Expenditures and Savings of the Population	Share of expenditures for Taxes and Levies and Contributions to Public and Cooperative Organizations

Source: the authors' development.

So, in order to calculate the denominator it is necessary to add together all absolute expenditures by the categories stated in section I. However, Rosstat publishes only relative data. In order to calculate absolute values of expenditures by categories, first, we will find the absolute general gross expenditures of the population. They are calculated by the following formula:

$$\text{Absolute general expenditures} = \text{II} \cdot (\text{III} - \text{IV}), \quad (2)$$

where II – quarterly absolute values of income of the population;

III – sum of relative values of categories of income use: Purchase of Goods and Payment for Services and Compulsory Payments, Contributions and Other Expenditures;

IV – sum of relative values of expenditure categories: Taxes and Levies and Contributions to Public and Cooperative Organizations.

The value of section IV should be subtracted from the value of section III because ecosystems do not render services of taxes' and levies' payment to public organizations. The government does it.

Multiplying of the share of categories from section I by absolute general expenditures and adding them together afterwards provides the value of absolute expenditures in all markets as well as in the markets of ecosystems' presence (see Appendix 2).

Method of Calculation of Ecosystems' Financial Results

At the next stage it is necessary to calculate the numerator or the total revenue (turnover) generated by ecosystems for rendering services and (or) sale of good in the markets of presence. Ecosystems for this research are selected on the basis of the following *characteristic features*:

1) A unified user identificator.
2) Development of three and more consumption

verticals (for example, a marketplace, food delivery, financial services).

3) A single platform, combined sales promotions for goods and services, development of a common loyalty programme.
4) Taking into consideration take rates of the customer base, amount of revenue and rates of its growth as well as dynamics of new services' introduction.

In this research ecosystems are divided into two groups: advanced and emerging ones similar to the approach to categorizing countries by the revenue level. The former ones comprise companies with the monthly number of active customers of at least 50 mln which operate minimum in a half of consumer sectors (11 out of 22) and a quarterly revenue/turnover of at least RUB 200 billion as at the end of the research period (4th quarter of 2021). Meeting the three criteria is grounds for assigning a company to advanced ecosystems. Otherwise, the company is considered to be an emerging ecosystem (see Appendix 3).

On the basis of the limitations above we selected just seven Russian companies classified as ecosystems. We assigned Yandex, Sber and VK Group (former Mail.ru Group) to advanced ecosystems while MTS, Ozon, Tinkoff, Wildberries – to emerging ones.

Further we describe the manner of use of companies' financial data. Before we do so we have to specify the following: in this research the "revenue" and "turnover" indicators are identical. Of course, from the point of view of financial analysis this supposition is not correct, however, it acquires meaning when we analyze the market share of platforms which are a part of ecosystems. Turnover of transport services of ecosystems for calling a taxi may be an example. In this case the ecosystem revenue is the share of the effective take rate of the service turnover which amounts to approximately 7–11% of the turnover. However, this part of transactional flows remains unnoticed by the service consumer, therefore from the point of view of households the spending is attributed to expenditures for goods and services of the ecosystem.

Let us start with Yandex. Yandex generates revenue from households using three services:

- Yandex.Go;
- Yandex.Market;
- media services.

The service Yandex.Go comprises taxi, carsharing and logistic services (ride-tech), food and food products delivery (food-tech). Before the 2nd quarter of 2021 Yandex had not published GMV (gross merchandise value – turnover) for this service. Therefore in order to calculate this indicator we used the effective take rate of 10% mentioned by the head of Yandex.Taxi Daniil Shuleiko[1]. GMV was calculated as the effective take rate to revenue ratio. From the 2nd quarter of 2021 it was no longer necessary because Yandex reports comprised GMV data of Yandex.Go. Yandex.Market is an e-commerce service. Its turnover is also stated in the reports as well as the turnover of Media Services (comprising the revenue of Y.Music, KinoPoisk, Y.Plus and some other consumer services). In spite of the fact that Yandex is an international company and consolidates income from all markets, apart from Russia, in its reports the revenue earned abroad is excluded from the total amount. According to the company such revenue accounts for 6.5% of the consolidated indicator. They draw attention to exclusion of advertising business revenue from retail revenue because advertising is not directly related to the corporate retail ecosystem.

Sber has an abundant and wide taxonomy of retail services:

- E-Commerce;
- Entertainment;
- O2O (together with VK Group);
- income fee from individual persons;
- interest income from retail loans.

E-Commerce and Entertainment are a part of non-financial business of Sber which has been added to reports rather recently. As at the end of 2021 E-Commerce segment encompassed the following services: Sberlogistics, SberMarket, Samokat, SberMegaMarket, Sber EApteka, the Entertainment segment comprises OKKO, SberZvuk, Soyuzmultfilm and SberPrime subscription. For E-Commerce they calculate turnover, for Entertainment – revenue. O2O is a joint venture of Sber and VK Group which owns 45% of the company. O2O has the following services: Delivery Club, Local Kitchen, Citymobil, Citydrive and Samokat. The bank reports do not contain the necessary information on O2O therefore we use the presentation for investors of VK Group which indicates GMV of O2O. The fee and interest income are parts of the bank's core business and are stated in the reports.

The last advanced ecosystem is VK Group. VK as well as Sber has five income sources from individual persons.

- MMO games;
- IVAS (paid services and facilities);
- other income;
- Joint Venture AliExpress Russia;
- O2O (together with Sber).

Revenue from MMO Games is indicated in the presentation for investors. It is also necessary to multiply revenue of the segment by the share of Russia. IVAS and other income are stated in the corporate financial reports. The data on turnover of AliExpress Russia is indicated in the presentation for investors. O2O as in the case of Sber is used to calculate the share of VK with the coefficient of 0.45.

Tinkoff has two sources: bank's revenue and Tinkoff Mobile. All data is stated in financial reports of the company and materials for investors.

[1] URL: https://vc.ru/transport/123766-yandeks-taksi-vpervye-rasskazal-o-komissiyah-napryamuyu-servis-poluchaet-menee-10-ot-stoimosti-zakaza

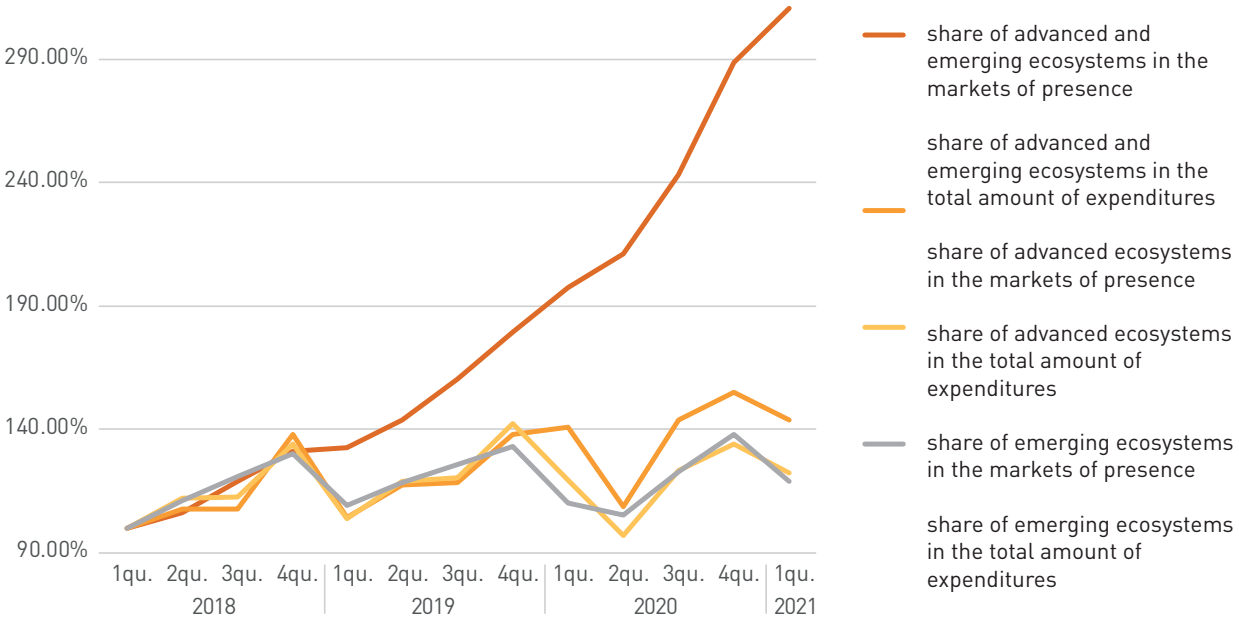
The source of information on Ozon is IFRS and materials for investors. Only company's turnover from the core business is taken into consideration – the ecosystem has relatively recently started a rapid development of its own financial services on the basis of the previously purchased bank and doesn't have a separate segment describing financial results of this business line yet. The same is true for Wildberries.

MTS is a multibusiness company comprising a bank of the same name. Therefore, ecosystem revenue encompasses bank's income from operations with individual persons and revenue from subscribers in the Russian Federation including related services. All necessary information concerning the ecosystem is also indicated in IFRS statements (see Appendix 4).

Results

The method described above allows to visualize the obtained results (Figure 1).

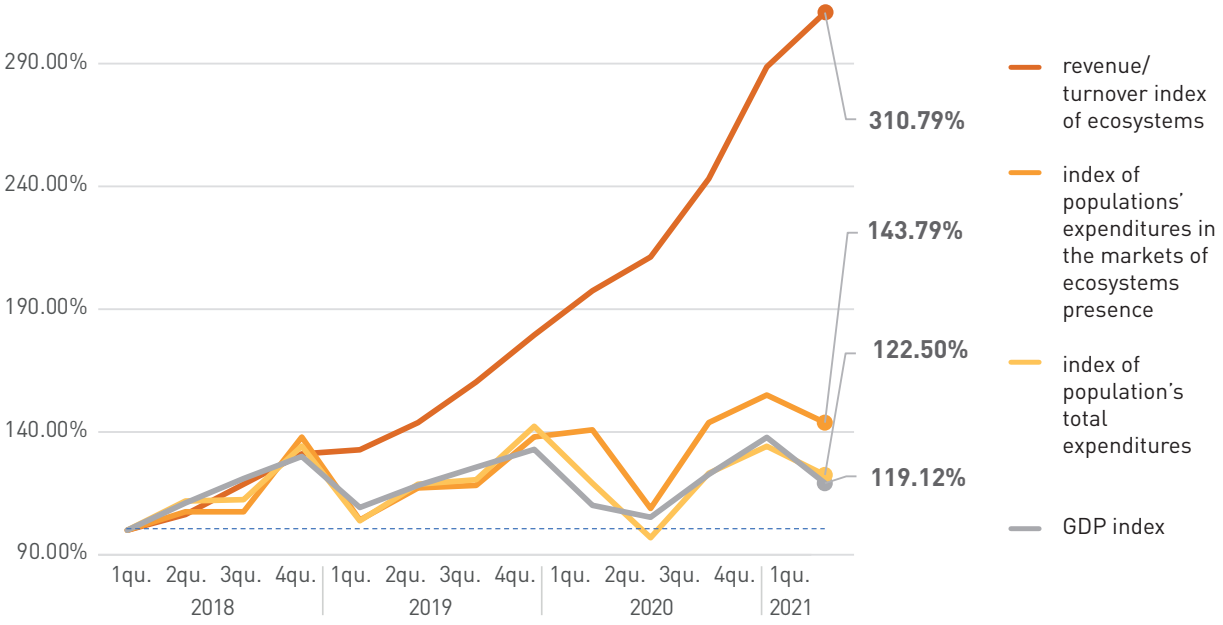
Figure 1. Change of the share of certain groups of ecosystems in consumer markets



Source: the authors' development.

See a table with initial data of the diagram in Appendix 3. It is noteworthy that indicators changed in comparison to the first period (1st quarter of 2018 = 100%), they are represented by the following indices (Figure 2).

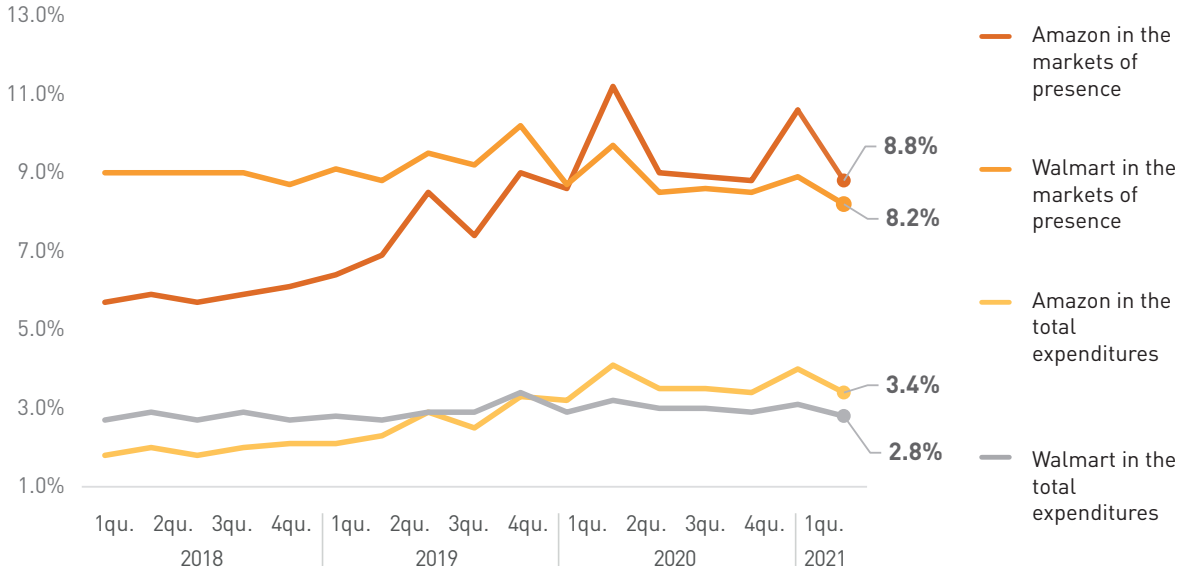
Figure 2. Change of the main macroeconomic indicators related to calculation of the share of ecosystems relative to the base period (1st quarter of 2018 = 100%)



Source: the authors' development[2].

[2] Calculation before the 1st quarter of 2021 due to unavailability of some official statistics' items as at the date of calculation.

Figure 3. Shares of Amazon and Walmart in retail expenditures of the US economy



Source: PYMNTS (2022) [17], the authors development.

Thus, we can establish that the share of ecosystems in consumer markets in a relative measurement grew most rapidly during epidemiologic limitations (1st–2nd quarter of 2020). The most probable explanation is popularization of electronic payments and remote purchase of goods and services on platforms which belong to ecosystems.

It should also be noted that after epidemiologic limitations had been imposed change of the index was no longer of a pronounced cyclical pattern (decrease of an indicator follows a quarter of its growth etc.).

Growth rates of advanced ecosystems' presence are a sequence higher than indicators of advanced ecosystems. It is due to a larger customer base as well as to surpassing opportunities of entering new markets. Otherwise speaking advanced ecosystems may "grow" intensively and extensively (for example, by means of M&A) while emerging ecosystems prefer investments into existing business lines.

It should be specified that, as stated above, the basis for calculation is not just revenue of ecosystem companies but turnover as well. I.e. the actual share of ecosystems in the markets of consumer expenditures may be somewhat lower. However, even estimate indicators mean that the market is emerging and a long way short of saturation, and they are sufficient grounds for abandoning the assertions related to possible monopolization of the common market of consumer spendings in the Russian Federation.

Comparison to Foreign Markets

We haven't found papers dedicated to similar calculations for consumer markets of foreign countries by now[3] in indices of Scopus and WoS. However, Google Scholar indexed the research by PYMNTS described above which presents a calculation of market shares of largest US retailers Walmart and Amazon [17] as at July 2022. According to calculations of the research authors by the 1st quarter of 2022 both companies accumulated around 6.2% of total US population's spendings (–6 p.p. of the estimate indicator for the Russian economy) and 17% in the markets of presence (+3 p.p. above the similar calculation for the Russian economy).

Nevertheless methodology of the research cannot be verified because neither the initial data, nor the way of calculation have been released to the public. For this reason we do not compare below dynamic indices of similar indicators of the US and Russian economy. However, if we assume that the data represents the actual order of magnitude development of platform companies in the USA is characterized, on the one hand, by a smaller number of "ecosystemic" verticals as compared to Russian companies (for example, there are no medical, banking, telecommunications and transport verticals which comprise a significant part of population's expenditures in both countries); on the other hand, by larger positions in the markets of presence, first of all, food and non-food retail markets as well as media and entertainment markets.

Regulatory Aspect

Currently the notion of "ecosystem" is not enshrined in the regulatory framework of the Russian law. At the same time the Central Bank of the Russian Federation is proactive. Since 2020 it consistently advances its own initiatives, offers public discussions and reports aimed at search for

[3] The assertion is valid in September-October 2022.

compromise ecosystem regulation mechanisms[4]. The result of this process was change of requirements to the so-called dead assets on the banks' balance sheet which comprise participation in equity of legal entities with a negative net income for which increased risk limits are established, consequently, which presence on the balance sheet raises the value of the bank's equity decreasing cost-effectiveness of the core business. The governing motive of the regulator is to ensure safeguarding of depositors' assets by introducing risk limits for investments in ecosystems' development on the basis of banking institutions. For this reason a part of ecosystems (Sber and Tinkoff) described above throughout 2022 changes the business ownership structure which is not embodied in the business strategy (apart from rebranding of some assets which, however, is also a result of sanctions regime toughening). Other regulatory authorities, except for the Federal Antimonopoly Service, did not take active norm setting measures. The Antimonopoly Service holds to the existing antitrust practice, i.e. in the legal sense deals of ecosystems do not differ from M&A of other legal entities. In general the regulatory aspect of ecosystems development is at the initial development stage and requires its own research.

At the same time it should be mentioned that FAS, subject to reservations, does not prohibit consolidation of certain markets to ecosystems (for example, purchase by Yandex. Taxi of call centers of its competitor Vezet or purchase by Sber of e-commerce of Goods renamed afterwards into SberMegaMarket).

Conclusions

Our research provides the following conclusions:

1) The aggregate financial result of ecosystems increases by 11.64% per a quarter; while the market share of ecosystems in the markets of presence grows by 0.61 p.p. per a quarter, in all markets – by 0.53 p.p. As long as the rate of change of population's expenditures in all markets it somewhat lower than in the markets of ecosystems' presence (143.79 against 122.5% based on index points) we can make the conclusions that ecosystems are more successful in getting into occupied markets.
2) The index of population's expenditures in the markets of ecosystems' presence for 2018–2021 is by 21 p.p. higher than growth of the general index of population's expenditures. This calculation confirms the assumption offered in paragraph 4 of formal features of ecosystems: revenue of ecosystem companies in the medium term overtakes dynamics of retail expenditures in the economy.
3) Influence of regulatory innovations is still to be evaluated: ecosystems of the Russian Federation have not been ordained to divide (as, for example, in PRC the government made Alibaba sell its media assets and Tencent had to choose not to make investments in games), change of risk sensitive limits is imposed by the CB of the RF only since 2023. Otherwise speaking the regulatory cap of consolidation of certain sectors has not been determined.

Ecosystem verticals are still not represented in the alcohol and tobacco markets, construction material, heating, housing and communal services markets. Entering the first two markets is hardly likely because not a single legislative initiative of distance selling of these excise duty products was supported on a routine basis. The housing and communal services market is a relatively low-margin one and over-regulated to a certain degree, i.e. economic costs, in all likelihood, exceed the potential profit. However, the construction material market despite the fact that it does not provide daily living needs may in the medium term be covered by ecosystem verticals: some ecosystems have their own subsidiaries in the construction sector and they may be a staging area for entering a new market.

The research did not address the issue of comparing the growth rates of ecosystems and other drivers of consumer spendings. In spite of the fact that population's expenditures in "ecosystem" markets grow quicker than in the markets without ecosystem verticals it is necessary to justify the reasons of this phenomenon with deliberate care. This may be subject for further studies of this topic.

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[4] See in more detail in reports and memoranda of the CB of the RF dedicated to Ecosystems: Approaches to Regulation for 2021–2022.

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Appendices

Appendix 1

Table A1. Revenue / turnover of ecosystems and the main macroeconomic indicators

Period	Total amount of population's expenditures, tln. RUB	Index of general population's expenditures, %	Population's expenditures in the markets of ecosystems' presence, tln. RUB	Index of population's expenditures in the markets of ecosystems' presence, %	Ecosystems' revenue, bln RUB	Index of revenue/turnover of ecosystems, %	Amount of revenue / turnover of advanced ecosystems, bln RUB	Amount of revenue / turnover of emerging ecosystems, bln RUB	GDP, tln. RUB	GDP index, %
1 qu. 2018	11 220.62945	100.00	7787.116839	100.00	404.204	100.00	271.63	132.574	22 474.5	100.00
2 qu. 2018	12 552.60467	111.87	8372.587313	107.52	430.0602	106.40	289.2972	140.763	24 969.8	111.10
3 qu. 2018	12 612.2912	112.40	8369.89941	107.48	479.9596	118.74	312.3416	167.618	27 196.8	121.01
4 qu. 2018	15 062.7745	134.24	10 741.96341	137.95	529.881	131.09	334.004	195.877	29 220.6	130.02
1 qu. 2019	11 654.84594	103.87	8107.283805	104.11	536.5795248	132.75	357.3845248	179.195	24 552.1	109.24
2 qu. 2019	13 322.94976	118.74	9125.554279	117.19	581.3570363	143.83	387.3120363	194.045	26 567.5	118.21
3 qu. 2019	13 526.35358	120.55	9206.080922	118.22	648.2943478	160.39	432.8693478	215.425	28 245.5	125.68
4 qu. 2019	15 966.49915	142.30	10 747.19639	138.01	725.4816018	179.48	482.4976018	242.984	29 876.4	132.93
1 qu. 2020	13 370.00646	119.16	10 968.99926	140.86	798.1045664	197.45	541.2095664	256.895	24 756.7	110.15
2 qu. 2020	10 875.97296	96.93	8475.388861	108.84	853.8233894	211.24	571.8973894	281.926	23 661.9	105.28
3 qu. 2020	13 818.16405	123.15	11 197.69563	143.80	982.5560796	243.08	682.5020796	300.054	27 580.8	122.72
4 qu. 2020	15 050.9099	134.14	12 072.52992	155.03	1166.701504	288.64	802.1295044	364.572	30 968	137.79
1 qu. 2021	13 745.53347	122.50	11 197.06321	143.79	1256.207	310.79	895.623	360.584	26 771	119.12
2 qu. 2021	14 975.20596	133.46	12 072.42033	155.03	1414.463	349.94	1005.786	408.677		
3 qu. 2021	16 124.499	143.70	13 080.11597	167.97	1653.43	409.06	1163.804	489.626		
4 qu. 2021	17 240.1382	153.65	13 852.1616	177.89	2071.078	512.38	1415.923	655.155		

Appendix 2

Table A2. General structure of household spendings

Spendings	Group of spendings	Are ecosystems present in the market?	Average share of spendings in 2018-2021, %
I. Consumer spendings	Purchase of goods	Yes	59.2
I. Consumer spendings	Payment for services	Yes	17.6
I. Consumer spendings	Payments abroad for goods and services	Yes	2.9
II. Compulsory payments and various contributions	Taxes and levies	No	6.7
II. Compulsory payments and various contributions	Insurance payments	Yes	1.0
II. Compulsory payments and various contributions	Contributions to public and cooperative organizations	No	0.4
II. Compulsory payments and various contributions	Interest paid by the population for loans (including foreign currency loans) granted by credit institution	Yes	3.5
III. Other expenditures	-	Yes	2.7
IV. Savings	-	-	6

Appendix 3

Table A3. Structure of consumption household spendings

Group of consumption spendings for:	Subgroup of consumption spendings for:	Are ecosystems present in the market?	Average share of spendings in 2018-2021, %
products for table food	-	Yes	32.8
meals out of home	-	Yes	2.2
spirits	-	No	1.7
non-food goods	clothes, shoes, underclothes and fabrics	Yes	7.1
non-food goods	information and communication equipment	Yes	1.8
non-food goods	recreational, sports goods and goods for cultural events	Yes	1.9
non-food goods	vehicles, accessories and petrol, oil, and lubricants	Yes	11.4
non-food goods	furniture, household equipment, homecare goods	Yes	5.2
non-food goods	construction materials	No	1.0
non-food goods	fuel for heating and home lighting	No	0.2
non-food goods	tobacco	No	1.5
non-food goods	medicines, medical and pharmaceutical products	Yes	4.2
non-food goods	personal care products and other non-food products	Yes	2.6
payment for services	housing and utilities services	No	10.3
payment for services	consumer services	Yes	2.1
payment for services	services of recreation and cultural events organization	Yes	2.9
payment for services	educational services	Yes	1.5
payment for services	medical services	Yes	1.7
payment for services	services of destination spa with medical services and health services	No (excluded from medical services)	0.2
payment for services	transportation, postal and courier services	Yes	2.7
payment for services	information and communication services	Yes	2.8
payment for services	hotel services and other accommodation services	Yes	0.4
payment for services	other services	Yes	2.7
Mean value			80.6

Appendix 4

Table A4. Financial results of ecosystems: estimate values and values from IFRS

bln RUB	1 qu. 2018	2 qu. 2018	3 qu. 2018	4 qu. 2018	1 qu. 2019	2 qu. 2019	3 qu. 2019	4 qu. 2019	1 qu. 2020	2 qu. 2020	3 qu. 2020	4 qu. 2020	1 qu. 2021	2 qu. 2021	3 qu. 2021	4 qu. 2021	1 qu. 2022
Yandex																	
Yandex taxi (turnover/ GMV)	31.00	41.00	51.00	68.20	76.40	88.10	117.80	144.90	89.29	64.25	108.89	121.16	119.40	161.84	185.22	212.47	167.418
Yandex Market (GMV)						3.81	4.45	7.40	7.83	7.20	6.91	8.66	24.49	35.14	41.83	58.77	64.58
Sber																	
Sber Ecom (GMV)					0.02	0.05	0.08	0.15	0.50	2.15	3.80	7.00	15.10	19.70	28.10	55.30	65.00
Sber Entertainment (revenue)					0.30	0.44	0.50	0.66	1.30	1.68	2.05	2.43	2.80	3.00	4.70	3.90	4.40
SberEapteka (GMV)					0.70	1.30	1.50	2.20	2.00	2.40	2.80	3.80	3.50	3.80	4.10	4.40	4.20
Sber (O2O, GMV)					0.97	1.09	1.20	1.74	20.20	24.50	30.80	40.00	40.60	45.10	48.10	53.40	56.30
Sber (com. income from individual persons)	53.50	53.50	53.50	53.50	54.00	54.00	54.00	54.00	53.10	55.10	55.10	55.00	53.50	64.00	68.40	70.00	69.00
Sber (interest income from loans to individual persons)	181.00	189.00	202.00	206.00	206.00	217.00	225.00	243.00	243.00	245.00	253.00	263.00	263.00	276.00	297.20	320.00	320.00
VK																	
VK (mmo games share in the RF)	1.35	1.36	1.55	1.40	1.46	1.76	5.80	2.26	2.39	2.86	2.48	2.55	2.31	2.89	2.32	3.13	2.99
VK (IVAS)	3.84	3.45	3.02	3.58	3.72	3.90	3.95	4.19	4.52	4.46	4.11	5.12	4.89	4.53	4.43	4.54	4.89
VK (other revenew)	0.94	0.99	1.27	1.32	1.34	1.50	2.35	2.29	1.70	2.34	2.35	4.16	2.25	2.53	2.33	3.39	2.25
VK (AliExpressRussia, GMV)					11.50	13.27	15.04	17.96	48.67	52.21	58.41	69.91	59.00	63.00	70.30	113.70	100.00
VK (O2O, GMV)					0.97	1.09	1.20	1.74	20.20	24.50	30.80	40.00	40.60	45.10	48.10	53.40	56.30
Tinkoff																	
Tinkoff (revenue)	24.26	25.49	27.36	32.11	32.42	37.16	38.79	37.56	40.98	43.37	42.74	45.3	49.93	57.45	63.16	70.00	74.00
Tinkoff (SME)	1.77	2.11	2.58	2.99	2.70	2.93	3.21	2.31	2.64	3.50	4.02	2.59	3.35	4.09	5.23	6.50	7.00
Tinkoff (acquiring)	0.83	0.89	0.97	1.30	1.42	1.47	1.40	3.63	2.12	1.37	1.54	5.05	3.69	5.15	6.30	7.50	6.40
Tinkoff mobile	0.02	0.05	0.07	0.10	0.20	0.25	0.30	0.39	0.35	0.41	0.60	0.83	1.00	1.20	1.40	1.60	1.80
Ozon																	
Ozon (GMV)	6.53	7.44	10.22	17.71	14.70	15.90	19.50	30.70	31.60	45.80	44.20	75.80	74.20	89.00	108.29	176.81	177.45

bln RUB	1 qu. 2018	2 qu. 2018	3 qu. 2018	4 qu. 2018	1 qu. 2019	2 qu. 2019	3 qu. 2019	4 qu. 2019	1 qu. 2020	2 qu. 2020	3 qu. 2020	4 qu. 2020	1 qu. 2021	2 qu. 2021	3 qu. 2021	4 qu. 2021	1 qu. 2022
MTS																	
MTS (revenue)	99.90	105.53	116.93	120.50	108.65	113.46	121.35	123.54	116.01	114.78	125.81	131.88	120.80	127.03	136.44	140.10	130.00
MTS (fixed line)	15.03	15.15	14.86	15.26	15.05	14.97	14.96	15.03	15.26	15.75	15.21	15.84	15.93	16.37	18.88	20.00	20.00
MTS (bank's revenue)			5.55	6.30	6.30	6.85	7.64	9.04	8.33	8.01	8.83	9.27	9.82	11.44	12.45	14.00	14.50
MTS (bank: interest income)			4.00	4.20	4.20	4.40	4.80	5.20	5.51	5.57	5.60	5.50	5.50	6.37	7.40	8.50	8.50
MTS (bank: fee income: settlement operations)			0.10	0.20	0.20	0.20	0.20	0.50	0.33	0.22	0.30	0.30	0.24	0.26	0.24	0.28	0.26
MTS (bank: fee income: cash transactions using plastic card)			0.10	0.30	0.20	0.20	0.20	0.20	0.28	0.20	0.20	0.30	0.40	0.62	0.74	0.85	0.95
MTS (bank: fee income: bank cards servicing)			0.40	0.20	0.20	0.10	0.20	0.20	0.20	0.20	0.20	0.20	0.21	0.20	0.22	0.22	0.22
Wildberries																	
Wildberries (GMV)	19.50	20.40	32.40	46.40	43.90	48.60	57.30	74.70	90.00	100.00	110.00	137.20	139.40	163.6	214.60	304.80	288.60
Upper limit (tolerance)																	
Sber (wealth management and brokerage services)	30.10	30.10	30.20	30.20	31.50	32.80	33.50	36.10	31.20	16.50	26.90	23.00	29.50	36.20	43.90		
Sber (risk insurance)	25.10	25.20	25.20	25.20	25.70	25.80	26.40	26.60	24.90	20.00	25.00	24.60	24.20	31.00	35.80		
MTC (fixed line)	15.03	15.15	14.86	15.26	15.05	14.97	14.96	15.03	15.26	15.75	15.21	15.84	15.93	16.37	18.88		

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The Impact of Ownership Structure on Dividend Pay-out: Evidence from Listed Companies in the Property Sector in Malaysia

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Abstract

This study investigates the relationship between the ownership structure and the dividend payout for listed firms in the property sector in Malaysia. By examining the correlations between different forms of ownership and the proportions of shareholdings held by a variety of ownership categories, this will help to provide a better picture about how the ownership structure of the companies actually affects the dividend decisions of companies.

46 listed companies from the Malaysian property sector are selected as the sample for this study, between the years 2011 and 2016. This study uses the random effect regression model to express the relationship between the ownership structure and the level of dividend payout for the relevant sample. The dependent variable is the dividend payout amount, and the independent variables include ownership concentration, institutional ownership, managerial ownership, and foreign ownership. Meanwhile, the control variables are firm size and firm leverage. Agency theory, signaling theory, Bird-in-the-Hand theory, and clientele effect theory, are used in this study.

Our results show that ownership concentration and institutional ownership have a positive and significant relationship with dividend payout in Malaysia. By contrast, managerial ownership and foreign ownership revealed an insignificant relationship with the dividend payout. This study may be useful to both academics and professionals in the property and investment segments of developed and developing economies, and concludes with recommendations on potential for future legal and regulatory implications of the findings.

Keywords: ownership structure, dividend pay-out, malaysian properties listed companies

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Introduction

Dividend policy is one of the most crucial issues in finance [1]. This is due to the fact that dividend payout policy is considered from a long-term perspective and hence has long-term impact on a company [2]. In this regard, [3] argues that the decision to pay dividends is among the most fundamental components of a company's policy. Dividend is principally the amount of money that the firm earns over a fixed period of time and being paid periodically to the shareholders. There are two common ways for firms to pay out cash to their shareholders: one of it is to distribute as a dividend whereas the other is the cash can be used to buy back the outstanding shares [4].

The distribution of dividends has become a topical issue in Malaysia. One of the main reasons could be due to the absence of specific rules and regulations governing the distribution of dividends. In this regard, firms are encouraged to make their own decisions on the dividend payout to their investors or the shareholders. Section 365 of [5] points out that the payment of the dividend should be made from the profits of the firm, but it did not specify whether the distribution of dividends should be from the current profits of the firm or the accumulated profits. This situation results in inconsistency of administration in terms of the dividend payout in Malaysia.

At this juncture, the structure of ownership of a company could be considered as one of the critical factors in examining the firm's distribution of dividend [6]. In this context, different types of ownership structures will lead to different dividend payments. Concentrated ownership, which is defined as where the majority of shares are held by a few shareholders, provides for a good level of control over the company. In this situation, the firm will only increase the dividend payment when there is an increase in the income or the profits of the firm.

Ownership by institutional parties, on the other hand, is oppositely associated with the distribution of the dividend. In this case, the payout will be used less often. The case of managerial ownership often sees a preference to keep the revenue of the company, which can be used for future investments instead of distributing it as the dividend. Foreign ownership correlates with a preference for dividend payments which can be used to lessen free cash flows and also control the behaviour of managers. As such, the payment of the dividend will act as an instrument to discipline the managers.

Considering the importance of ownership structure on dividend payout, no unanimity on the determining factor of dividend policy[6], as well as the lack of studies found looking at emerging markets [7], this study is therefore conducted to examine the relationship between the structure of ownership and the dividend payout in Malaysia.

The paper is organized in 5 sections. The next section presents the literature review and the hypothesis development of the study. This is followed by the research methodology section. Subsequently, the findings and discussions regarding the study are presented. The paper ends with the conclusion of the research.

Literature Review and Hypothesis Development

Agency theory provides that an agent is someone hired in order to do work that is delegated by a principal [8]. Agency theory is emphasized in terms of settling 'agency problems' in a business, which can be caused by the different directions that principals and agents wish the firm to go in the future. The principal will have different perceptions and goals to the agent, which shareholders wish to use to maximize their wealth. However, the objective of the management team is to maximize or boost the net profit of a firm. As such, a management team will need to set their aim so as to maximize the shareholder's wealth thereby minimizing the agency problem. The situation can also be that an agent's actions prevent the principal from finding out about problems that have occurred, or even preventing their access to relevant informational resources .

The payment of dividends from companies is believed to have the effect of increasing conflicts among the management team and the shareholders, as they have different perspectives on issues of dividend payment. Managers may wish to retain company earnings for the purpose of future company investments, whereas the shareholders may wish to have a dividend payment that would compensate them from taking the high level of risk attached to their own investments in the companies. If a company is not paying dividends to their shareholders, the shareholders may reflexively think that the managers are not effectively managing the company – or even that the managers had used that money for their personal use. Moreover, if dividends are not paid to the shareholders, the excess funds may indeed be used by the managers for their personal use, or they may invest in unprofitable projects, which may lead to losses for the companies in question. Hence, the payment of dividends will help to reduce agency problems among the management team and the shareholders in the companies.

[9] states that the agency problems will be diminished where there is a higher level of managerial ownership in the company. [10] found out that the agency cost of a company was negatively related to the level of managerial shareholdings. [11] stated that with a more concentrated ownership, the agency conflict is open to be reduced and the performance of a company will also be improved. In this regard, [12] notes a positive effect of corporate governance measures on dividend policy.

The signalling theory proposes that there is an information asymmetry between the management team and the company's shareholders. The management team of a company is not willing to share all of the financial information with the shareholders. Hence, by implementing a dividend payment, this will serve to provide information about the performance of the companies to its shareholders [3]. The dividend payout of the company acts as a signal or an instrument to transfer information to the shareholders about the expected performance or the profitability of a company, and the dividend announcement will generally contain information about the future expected performance of the

company. Managers will try to convey the information as to whether the future performance of a company is positive or negative, either to the insiders or the public. However, they may be unwilling to provide clear and transparent information to their shareholders and hence the dividend payment can be one of the ways to release information about the future prospects of a company.

Institutional investors tend to prefer the dividend payment as compared to the capital gains of a company. [13] observes that aside from the dividend payment of the companies, institutional ownership is believed to have an impact, and acts as a powerful signalling tool. As such, institutional investors are able to influence companies and can manage firm performance appropriately.

There have also been some theories proposing that the dividend payout of a firm may impact the firm's value. [14] proposed the 'Bird-in-the-Hand' theory, which indicates that a dividend policy can affect the value of a firm. It states that investors prefer dividends to the capital gains of the firms. The dividend actually depends on the demand and the supply of the shares of the firms in trading, whereas capital gains relies more on the performance of a firm – hence the dividend payment is more stable, compared with the earnings of a firm, which are more uncertain.

In this study, the 'Bird-in-the-Hand theory' is used to provide a clear description about the relationship between company ownership structures and dividend payouts in Malaysia. Firms which provide a higher dividend payment to its investors will be more attractive as investors prefer less uncertainty of the investment. This may result in an increase in the demand of a firm's shares and hence will contribute to an increase in the value of the firm. Hence, a better dividend payment to the investors will help to increase the firm's value as well. Shareholders normally prefer a higher dividend payment, as this will be reflected in their compensation regardless of the performance of the company. Shareholders are more likely to choose capital gains for today instead of a future uncertain gain from investment. As such, they tend to prefer a lower risk related to their investment.

[15] developed the 'clientele effect theory', and stated that companies will make their own dividend policy based on the types of investors that such companies wish to attract. There are various types of investors in the market, and different types of investors have different goals for their investors. With different goals, they prefer different types of dividend policies. Clientele groups consist of several types of investors such as institutional investors, individual investors, and foreigner investors. Clientele groups can also be classified by the age of the investors and also their income level. Retired investors prefer the dividends payout of companies which can asssure a regular income to maintain their expenditure, and moreover, they are more likely to be risk averse in general. Institutional investors also prefer the dividend payout option as opposed to the capital gains of the companies. This is because the capital gains of the companies are more uncertain when compared to the dividend payout of the companies.

[15] stated that the dividend decisions of the companies are linked to the clientele effect. Companies will try to change or alter their dividend decisions in order to attract the investors to be invested in the companies. If a company has a high dividend payment, it will attract groups of investors who prefer dividend payments. As such, demand on the company's shares will increase and hence the share price of the company will increase. The higher the dividend payout of the companies, the higher the confidence level of the investors in terms of investing.

Based on the above discussions, the following hypotheses are developed:

H1: There is a positive relationship between ownership concentration and dividend payout in Malaysia.

H2: There is a positive relationship between institutional ownership and dividend payout in Malaysia.

H3: There is a reverse relationship between managerial ownership and dividend payout in Malaysia.

H4: There is a positive relationship between foreign ownership and dividend payout in Malaysia.

Research Methodology

This study is a quantitative study. Companies that have been selected are listed companies from the Malaysian property sector between the years 2011 to 2016. All the selected companies have also been quoted at Bursa Malaysia. The data collected are based on the individual sampled companies and have been assembled according to year.

Model Specification

The present study accesses the relationship between the ownership structure and dividend payout in Malaysia. The estimation model for this study has been illustrated as follows:

$$D_{it} = \alpha + \beta_1 OWNC_{it} + \beta_2 IOWN_{it} + \beta_3 MOWN_{it} + = \beta_4 FOWN_{it} + \varepsilon_{it}.$$

From the above equation, D_{it} represents the dividend payout of firm i at the time period, t, $OWNC_{it}$ represents the ownership concentration for the firm i at the time period, t, $IOWN_{it}$ represents the institutional ownership of firm i at the time period t, $MOWN_{it}$ represents managerial ownership for the firm i at the time period t, $FOWN_{it}$ represents foreign ownership of the firm i at the time period t, and the ε_{it} represents the error term that exists in the model.

From the model above, α is the predicted dividend payout when all the explanatory variables equal zero. β shows the changes in the predicted dividend payout when each unit of the explanatory variables had increased by one unit. The error term in this regression is used to determine the fixed effects or the random effects. β is a good indicator to show the validity of the model in fitting its data to the model parameters and also the confidence interval. The validity of the model can be determined by comparing the observed values of y with the predicted values of y. The

changes between these two scores, known as the deviation or the residual of the model, will be a good index to show the validity of the model in predicting each of the data.

Data Collection Method

The secondary data have been used to carry out this study are applied to investigate the relation between the ownership structure and the dividend payout in Malaysia. Secondary data have been extracted from the sources of the annual reports of the selected companies, that is, the audited financial statements and also the annual reports of the companies.

The companies that have been selected are from the property sector between the years 2011 and 2016, and have been quoted at Bursa Malaysia. The data collected are based on the individual sampled companies. There are 46 companies in the property sector in Bursa Malaysia that have been selected as the sample in this study.

Variables Measurements

Ownership concentration (OWNC) can be calculated by comparing the number of shares held by the top 5 shareholders with the total number of shares issued. The higher the ownership concentration number, the more concentrated the ownership of the company.

$$\text{Ownership concentration} = \frac{\text{Shares held by top5 shareholders}}{\text{Total shares issued}}.$$

Institutional ownership (IOWN) can be measured by the institutional ownership concentration of the company. It can be calculated by comparing the number of shares of the company held by institutional investors with the total number of shares that had been issued by the company.

$$\text{Institutional ownership concentration} = \frac{\text{Shares held by institution}}{\text{Total shares issued}}.$$

Managerial ownership (MOWN) defines the amount of shares or the stocks held by the direct shareholders of the company. The higher the managerial ownership concentration of a company, the managerial shareholders will tend to retain more earnings of the company by paying less or reducing the dividend payment of the company.

$$\text{Managerial ownership concentration} = \frac{\text{Shares held by the direct and indirect directors}}{\text{Total shares issued}}.$$

Foreign ownership concentration (FOWN) can be measured by comparing the amount of shares held by foreigners to the total number of shares the company has issued. A higher number of shares held by the foreigners indicates a higher foreign ownership concentration of the company.

$$\text{Foreign ownership concentration} = \frac{\text{Shares held by foreigners}}{\text{Total shares issued}}.$$

Dividend payout (D) is the amount or the proportion of the earnings or income of the firm to pay out as the dividend to its shareholders. The dividend payout ratio can be calculated by dividing the total dividend payment of the firm by the net earnings of the firm attributable to the shareholders.

$$\text{Dividend payout ratio} = \frac{\text{Total dividend payment of the firm}}{\text{Net Income attributable to the shareholders}}.$$

Findings and Discussions

Descriptive statistics

Table 1. Descriptive statistics for the dependent variable, independent variables and control variables

Variables	Mean	Standard Deviation	Minimum Value	Maximum Value
DPO	0.2344828	0.2199674	0	0.9000545
OWNC	0.5501804	0.1909537	0.1387	0.9204
IOWN	0.3113421	0.2174439	0.005	0.957
MOWN	0.0971557	0.1347539	0	0.6721
FOWN	0.0421415	0.0555834	0	0.2989
FS	5.916443	0.5156107	4.751	7.272
FL	0.8775566	0.5643579	0.0317654	2.707531
N		276		
n		46		
T		6		

The result of the descriptive statistics shows the mean, standard deviation, the minimum value and also the maximum value of each of the variables. This study consists of 46 companies as the sample and together there have 276 observations within the time period of 2011 to 2016. For the dependent variable, which is the dividend payout, it shows an average value of 0.2345. The minimum value for the dividend payout is 0 while the maximum value is 0.900. The standard deviation for the dividend payout is 0.220. The companies that had been selected for the sample are including the companies that are not paying dividends every year for the time period that this study had been carried out so the minimum value for the dividend payout will be zero.

There are four independent variables which include the ownership concentration, institutional ownership, managerial ownership and also the level of foreign ownership. The ownership concentration has a mean value of 0.5502 which shows that the sample of this study has an average number of 0.5502 for the ownership concentration. The ownership concentration has a minimum value of 0.1385 whereas the maximum number is 0.9204. The standard deviation for the ownership concentration is 0.1909.

The institutional ownership has a minimum value of 0.005 and a maximum value of 0.957. The mean for the institutional ownership is 0.3113 and the standard deviation for the institutional ownership is 0.2174. The managerial ownership has an average value of 0.0972 which indicates that the overall sample of this study has an average 0.0972 for managerial ownership in their companies. A low mean value for the managerial ownership has shown that the managerial ownership in Malaysia is not concentrated, or it may be saying that the management team of the companies does not hold the share. The minimum value for the managerial ownership is 0 while the maximum value is 0.6721 and the standard deviation is 0.1348.

Foreign ownership has a mean number of 0.0421 while its minimum value is 0 and the maximum value is 0.2989. The participation of foreign investors in investing in Malaysia is shown to have a very low percentage since the average value of foreign ownership is only 0.0421, and the maximum value for foreign ownership is only 0.2989 As such, it shows a much lower value when compared to other variables in this study. The standard deviation for foreign ownership is 0.0556.

The control variables are the firm size and the firm leverage. The firm size has an average value of 5.916 while the minimum value is 4.571, and the maximum value is 7.272. The standard deviation for the firm size is 0.5156 whereas the standard deviation for the firm leverage is 0.5644. The firm leverage has a mean value of 0.8776. The minimum value for the firm leverage is 0.0318 while the maximum value is 2.7075.

Correlation Matrix

Table 2. Correlation analysis for the variables

	DPO	OWNC	IOWN	MOWN	FOWN	FS	FL
DPO	1.0000						
OWNC	0.1688	1.0000					
IOWN	0.2231	–0.1691	1.0000				
MOWN	0.0016	–0.2195	0.1118	1.0000			
FOWN	0.1457	–0.0172	0.2349	0.2151	1.0000		
FS	0.2589	0.0778	0.1821	–0.0848	0.2682	1.0000	
FL	–0.2551	–0.1869	0.1833	–0.0032	0.0364	0.1747	1.0000

The correlation matrix shows the correlation coefficients of each variable to other variables in the study. The diagonal for the correlation matrix is always equal to one. The correlation of each variable can be determined in either the positive or negative relationship and also either weak or strong correlations with the variables. Variables are said to be strongly correlated to another variable only when the figure in the correlation analysis indicates a value between 50% and 100%. The positive variables which correlated to other variables will have a positive sign in the correlation analysis result whereas a negative correlation will have a negative sign.

Variables which indicate a positive correlation to the dividend payout include ownership concentration, institutional ownership, managerial ownership, foreign ownership and firm size. Among these variables, managerial ownership shows the weakest correlation to the dividend payout, to which the correlation is only 0.16%. The control variable and firm leverage are negatively correlated with the dividend payout with a correlation of –25.51%. The ownership concentration is weakly positively correlated to the dividend payout which only shows 16.88% of correlation. Institutional ownership has a 22.31% value of correlation with the dividend payout value, and foreign ownership also shows a weak positive correlation with the dividend payout with a correlation of 14.57%. The firm size is also one of the control variables, it also shows a weak positive correlation with the dividend payout that equals 25.89% in the correlation analysis.

Among the independent variables, the correlation between ownership concentration to institutional ownership shows a negative correlation of –16.91% while the correlation between ownership concentration and managerial ownership is –21.95%. The ownership concentration has a correlation of –1.72% with foreign ownership while the correlation with firm size is 7.78%. The correlation for the ownership concentration to the firm leverage is negative, with –18.69%.

Institutional ownership has a positive correlation with the managerial ownership, foreign ownership, firm size and also firm leverage. Institutional ownership has a correlation of 11.18% with managerial ownership, 23.49% with foreign ownership, 18.21% with firm size and 18.33 for firm leverage. Managerial ownership has a positive correlation of 21.51% with foreign ownership whereas a negative correlation exists between firm size and firm leverage with managerial ownership. The correlation between firm size and firm leverage to the managerial ownership are –8.48% and 0.32% respectively. Foreign ownership has a correlation of 6.82% to firm size and 3.64% to firm leverage. Firm size is positively correlated to firm leverage with 17.47%.

Autocorrelation Test

Table 3. Result of autocorrelation

	F-statistic	p-value
Wooldridge Test	1.242	0.2710

The autocorrelation test is used to test whether the residual or the error term of an observation is correlated with the disturbance term of another observation. This will indicate if the mean for the error term in the model will be equal to zero, since the error term of one observation will be covered by another observation. The null hypothesis of the autocorrelation test stated that autocorrelation does not exist in the model, while the alternative hypothesis stated that the autocorrelation problem exists in the model.

The rejection rule for the autocorrelation test will be if the p-value is smaller than the significance level, for example a 5% significance level, and hence the null hypothesis will need to be rejected. On the other hand, if the p-value of the Wooldridge Test is larger than the significance level, here the conclusion may be that the null hypothesis cannot be rejected.

The probability of the autocorrelation test for this study is 0.2710. The significance level used to compare the p-value is 5%. Since the p-value for the autocorrelation test is larger than a 5% significance level, the null hypothesis cannot be rejected. It can be concluded that there is no autocorrelation problem in the model of this study.

Multicollinearity Test

Table 4. Result of variance inflation factor test

Variable	VIF	1/VIF
OWNC	1.12	0.889722
IOWN	1.14	0.880957
MOWN	1.13	0.886971
FOWN	1.19	0.842971
FS	1.16	0.859361
FL	1.10	0.911957
Mean VIF	**1.14**	

The multicollinearity problem of a multiple regression can be tested by using the variance inflation factor. Multicollinearity is said to exist in a model when the VIF of the model exceeds 10. The multicollinearity problem exists when there is a high correlation between independent variables which will tend to affect the accuracy of the model.

The ownership concentration, institutional ownership, managerial ownership, foreign ownership, firm size and firm leverage all show a variance inflation factor of smaller than 10. The mean VIF for this study shows a number of 1.14 which shows that the variables have a low correlation and the model exists under ideal conditions. It may be concluded that the multicollinearity problem does not exist in this model since the variance inflation factor does not exceed 10.

Random Effect Regression Model

Table 5. Result of random effect regression model

DPO	Coefficient	Std. Error	z	P>|z|
OWNC	0.1627638*	0.0867006	1.88	0.060*
IOWN	0.2153337***	0.0687005	3.13	0.002***
MOWN	–0.0428293	0.1184986	–0.36	0.718
FOWN	0.1083631	0.2916805	0.37	0.710
FS	0.1114339***	0.0341659	3.26	0.001***
FL	–0.0968898***	0.0255258	–3.80	0.000***

DPO	Coefficient	Std. Error	z	P>|z|
CONSTANT	–0.4967832 0.2010462		–2.47	0.013
R-square		0.2226		
F-statistics		39.88		
p-value		0.0000		

***significant at 1%; **significant at 5%; *significant at 10%.

The random effects model has been used in this study. From the table above, the ownership concentration shows a positive and significant relationship with the dividend payout in Malaysia for property sector firms. The result is in line with [7] which asserted that concentrated ownerships are significant and positively associated with dividend payouts. Also, the finding is consistent with [16] wherein the authors found that the ownership concentration appears to positively moderate the effect of earnings management on dividend policy. The positive relationship means that when the ownership concentration of a company has increased, this will also tend to increase the dividend payout of the company. The coefficient of the ownership concentration is 0.1627683 which shows that with an increase of 1 unit in the ownership concentration, this will lead to an increase of 0.163 units in the dividend payout of the firms. The standard error for the ownership concentration is 0.0867006.

The probability of the ownership concentration is 0.060 which is less than the significance level of 10%, which shows that the ownership concentration is significant at 10% significance level. The null hypothesis has been rejected since the p-value of the ownership concentration is less than 0.10. The alternative hypothesis H1 is accepted and shows that the ownership concentration has a significant positive relationship with the dividend payout.

The institutional ownership is also said to be positively significant to the dividend payout. The positive relationship with institutional ownership explains that when the institutional ownership increases for a company, this will tend to bring an impact so as to increase the dividend payout of the company. Such a result is in line with [17], which suggested that dividend payout decisions increase with institutional ownership. The standard error for the institutional ownership is 0.0687005. The coefficient for the variable of institutional ownership is 0.2153337 which provides a meaning that with an increase of 1 unit in the institutional ownership, this will also increase the dividend payout of the firms to 0.215 units.

The probability of institutional ownership is 0.002 which is less than the significance level of 1%, so there is enough evidence to reject the null hypothesis and hence accept the alternative hypothesis. The alternative hypothesis H2 is accepted and it may be concluded that the institutional ownership is positively related to the dividend payout with a significant relationship.

The level of managerial ownership shows a negative but insignificant relationship to the dividend payout. This finding is in line with [18], where they suggested that the managerial ownership was negatively related to the dividend payout The negative relationship between managerial ownership and the dividend payout shows that when there is an increase in managerial ownership in a company, this will tend to reduce the dividend payout of the company to its shareholders. The standard error for managerial ownership is 0.1184986 and the coefficient for the variable of managerial ownership is negative 0.0428293, which indicates that an increase of 1 unit in institutional ownership will decrease the dividend payout of the companies to 0.0428 units.

The probability of managerial ownership is 0.718, which is larger than the 10% significance level. Hence, there has been enough evidence to not reject the null hypothesis. It can be concluded that there is no significant relationship between managerial ownership and dividend payout.

Foreign ownership is seen to be positively but insignificantly related to the dividend payout. This positive relationship is consistent with [19]. The study showed that foreign ownership had a positive relationship with dividend payout in Nigeria. The positive relationship with institutional ownership explains that when foreign ownership increases for a company, this will tend to bring an impact which increases the dividend payout of the company. The coefficient for the variable of foreign ownership is 0.1083631 which means that with an increase of 1 unit in the foreign ownership this will also increase the dividend payout of the firms to 0.108 units – and that the standard error for the foreign ownership is 0.2916805.

The probability of institutional ownership is 0.710 which is larger than the significance level of 10% so there is enough evidence to not reject the null hypothesis and hence reject the alternative hypothesis. The null hypothesis is accepted and it can be concluded that foreign ownership is insignificant to the dividend payout.

R^2 can measure the variation in the dependent variable, which can be explained by the independent variables. It 22.26% composition of R^2, which indicates that 22.26% of the dividend payout of a company can be explained by the ownership structure of the firm, which is includes the ownership concentration, institutional ownership, managerial ownership and also foreign ownership.

In this study, the relationship between ownership structure and dividend payout is determined through the random effect regression model. The study established the following regression from year 2011 to year 2016 in Malaysian property sector companies.

$$DPO_{i,t} = -0.4967832 + 0.1627638OWNC_{i,t} + \\ +0.2153337IOWN_{i,t} - 0.0428293MOWN_{i,t} + \\ +0.1083631FOWN_{i,t} + 0.1114339FS_{i,t} - \\ -0.4967832FL_{i,t}.$$

From the regression model above, the intercept for this model is –0.497 which states that the dividend payout will be –0.497 while all the independent variables and control variables are equal to zero. The dividend payout ratio will increase by 0.163 units when there is an increase of one unit in the ownership concentration and the other variables remain constant. This shows that the ownership concentration has a positive relationship to the dividend payout. An increase of one unit in institutional ownership will lead to an increase of 0.215 units in the dividend payout, where other variables remain constant. With an increase of one unit in the managerial ownership, this will reduce the dividend payout by 0.043 units, where other variables are kept constant. The managerial ownership has a negative relationship to the dividend payout, but the effect of managerial ownership on the dividend payout is not that strong. The foreign ownership has a positive relationship to the dividend payout, whereby an increase in one unit for the foreign ownership value will lead to an increase of 0.108 units in the dividend payout, where other variables remain constant. The firm size, which is the control variable, has the positive relationship to the dividend payout whereby an increase of one unit in the firm size will cause an increase of 0.111 units in dividend payout, where other variables remain constant. An increase of one unit in firm leverage will make the dividend payout decrease by 0.497 units, where other variables remain constant.

For the correlation matrix, all the variables have the positive correlation to the dividend payout except for firm leverage, which is negative correlated to the dividend payout. The model has passed the autocorrelation test, therefore it can be said that there is no autocorrelation problem. For the variance inflation factor, the average mean for the model has not exceeded the value of 10 and so therefore it can be concluded that there is no multicollinearity problem in this model.

Breusch and Pagan Lagrangian Multiplier Test (BPLM)

Table 6. Result of Breusch and Pagan Lagrangian Multiplier (BPLM) Test

	Chi-Square Statistics	p-value
BPLM Test	30.60	0.0000

The BPLM test is used to test whether the most suitable model for use in the study is either the pooled OLS model or the random effect regression model. The null hypothesis of the BPLM test stated that the suitable model will be the pooled OLS model, while the alternative hypothesis stated that the random effect regression model is the appropriate model to be used in the study.

The rejection rule for the BPLM test will be if the p-value is smaller than 5% significance level, and hence the null hypothesis will be rejected. On the other hand, if the p-value of the BPLM test is larger than the significance level, then the conclusion will be the null hypothesis cannot be rejected.

The probability of the BPLM test for this study is 0.0000. The significance level used to compare the p-value is 5%. Since the p-value for the BPLM test is smaller than 5% significance level, the null hypothesis will be rejected. It can be concluded that the appropriate model for this study will be the random effect regression model.

Hausman Test

Table 7. Result of Hausman Test

	Chi-Square Statistics	p-value
Hausman Test	8.02	0.2368

The Hausman test can be used to determine whether the model either is the fixed effect model or the random effect model. The Hausman test has a null hypothesis, that states the model is a random effect model while the alternative hypothesis states that the appropriate model to be used is a fixed effect model.

The rejection rule for the Hausman test will be if the p-value is smaller than 5% significance level, and hence the null hypothesis will be rejected. On the other hand, if the p-value of the Hausman test is larger than the significance level, then the conclusion will be that the null hypothesis cannot be rejected.

The probability of the Hausman test for this study is 0.2368. The significance level used to compare the p-value is 5%. Since the p-value for the Hausman test is larger than 5% significance level, the null hypothesis cannot be rejected. It can be concluded that the appropriate model of this study will be the random effect regression model.

Conclusion and Implications of the Study

Regarding the relationship between the ownership concentration and the dividend payout, it can be concluded that there is a positive significant relationship between the ownership concentration and the dividend payout at 10% significance level. The hypothesis that stated that there has a positive relation between the institutional ownership and the dividend payout in Malaysia has been accepted at 5% significance level. Under 5% significance level, the hypothesis that postulated the relationship between managerial ownership and the foreign ownership to the dividend payout has been rejected.

This study illuminates certain practices of corporate governance in Malaysia with respect to the influence of the ownership structure on companies, affecting the dividend payout to the policy makers and the investors. The ownership structures of the companies are believed to have an impact on the dividend decisions of the companies.

The regulators or the policy makers can have a better perception when developing rules and regulations. From the findings of this study, it shows that when managerial shareholdings are present in a higher percentage, they are more likely to fail to fulfill their responsibilities to protect the interest and the benefits of the minority shareholders. Based on this situation, the policy makers or the regulators in Malaysia should consider this situation and try to amend or revise the current rules to govern the interest of the shareholders either the majority or the minority. By ensuring the interest of all shareholders are protected, this will facilitate a better, more reliable and effective legislation on corporate governance in Malaysia. With better legislation for corporate governance, investors will be more willing to invest and this will create a better investment environment.

In accordance with our research findings, this study can provide a better picture about how the ownership structure of the companies actually affects the dividend decisions of companies. This research proves that ownership concentration, and also institutional ownership, have a positive significant relationship to the dividend payout in Malaysia, which shows that they have direct relationship to the dividend payout. On the other hand, managerial ownership and foreign ownership have an insignificant relationship to the dividend payout. Managerial ownership also shows a negative relationship to dividend payout, and foreign ownership also shows a positive relationship to dividend payout.

This study examines the relationship between the ownership structure and the dividend payout in the Malaysian property sector. There are 46 listed companies in the sample in this study. Since the sample of this study is from only one of the sectors in Malaysia between the years of 2011 and 2016, the results cannot be generalized to other sectors or for other time frames in Malaysia.

Future researchers in this sphere can use a longer time period for their time frame when collecting the data. Further, the sample of the study can be widened by including different types of sectors. By having a sample of various types of sectors, it will perhaps show a more diversified result where different industry sectors are believed to have different types of ownership structures – and hence will have different dividend policies. The sample size can also be increased since a larger sample size can give a broader picture of the current dividend policies across Malaysia.

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Determinants of Successful Crowdfunding Campaigns: Evidence from Russian Crowdfunding Platform Boomstarter

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Abstract

According to practice, about half of the projects on crowdfunding sites (based on rewards) do not collect the declared amount of funding. This is largely due to the lack of experience in running crowdfunding campaigns and ignoring factors that are important to take into account when managing crowdfunding campaigns. Many foreign publications have studied the nature of the influence of various determinants on the success of fundraising on crowdfunding platforms, in particular, on Kickstarter, Indiegogo, Ulule, Eppela and others. As for research on Russian crowdfunding platforms, there is an extremely small number of such studies. Based on the construction of OLS regressions for 300 projects from July 2020 to May 2022 by the end date of the project from the Russian crowdfunding platform Boomstarter, we firstly obtained that such determinants as choosing a reasonable financial goal of the project, the number of sponsors, the number of project comments and the availability of video materials about the project have a positive impact on the success of the crowd campaign. In addition, we have developed a model based on logit regression testing, which has a high predictive power. This model can be used to predict the results of a crowd campaign with given parameters.

In further research in this area, it is possible to increase the number of observations, change the set of factors that potentially affect the success of a project's fundraising on crowdfunding platforms, and also consider the influence of factors depending on the category of the project. A promising area of research is the analysis of social interactions between investors in the framework of crowdfunding campaigns and the identification of the nature of the dependence of the volume of collected financial resources throughout the entire project financing cycle in the Russian market.

Keywords: crowdfunding, crowdfunding platforms, funding, sponsor, reward-based crowdfunding project

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Introduction

Over the last years crowdfunding has become a popular source of fundraising for startups, however, more than a half of the projects fail to collect the necessary amount of financial resources declared by organizers. Thus, at one of the largest platforms Kickstarter in June 2020 the overall rate of success in fundraising amounted to less than 38% while 88.34% of all unsuccessful projects finally achieved less than 20% of their initial goals [1, p. 27713].

At the same time collection of sufficient amounts allows to create high-demand high-tech products, embody promising creative ideas and carry out charity projects. Many studies [2, p. 147; 3] confirm social and economic importance of crowdfunding. Crowdfunding projects result in establishing of new companies which later generate significant revenues, hire thousands of employees, facilitate innovation growth [2, p. 146]. Therefore the purpose of this paper is revealing the most important factors which may have a positive impact on collection of a sufficient amount by means of crowdfunding. This will enable project promoters to organize the collection process with higher quality and the sponsors – to define expediency of investments in a certain idea taking into consideration characteristics of the projects which they wish to support.

The logic of the paper is as follows. In the Literature Review we systemize results of previous studies concerning influence of various determinants on success of crowdfunding and select factors for empiric testing. Then we generate and substantiate hypotheses for further empiric verification of the nature of influence of such factors on fundraising by means of crowd campaigns. We consider the main methods and models used in scientific publications in this sphere. In the next section we substantiate the study design: used models, description of the sample, preliminary data analysis. On the basis of the research results we show the way in which the considered determinants influence fundraising by means of crowd campaigns. The obtained results allowed us to offer recommendations concerning the parameters of project promotion on which their promoters should focus. In the conclusion we summarize the results of the author's research.

Literature Analysis and Substantiation of the Research Hypotheses

Crowdfunding platforms offer to entrepreneurs far-reaching possibilities for publishing their project ideas and fundraising in order to put their ideas into action. The fact that the author is sure that his/her project should be implemented and that his/her idea is promising does not mean that there will be persons wishing to join the project. It is important to present the project, disclose its details, otherwise investors will not be interested in the marketing message. In order to conduct a successful crowd campaign one needs time, a thorough preliminary planning of the project, organizing and management of the campaign. The project promoter needs to make sustained efforts in order to collect the necessary amount. Consequently, the issue of what and to which extent influences successful financing of projects, i.e. getting the target amount, is of great importance. The modern literature generalized experience and determined the important reasons for success of a project or for failure of fundraising.

In the first instance, the interrelation between the authors and sponsors makes the most important contribution in the campaign success [4]. It is impossible to overestimate the importance of interrelation with prospective project sponsors. When shaping the idea and further at the stage of its presentation an entrepreneur has to answer the question of how to make a successful pitch for fundraising at a crowdfunding platform. Linguistic styles used to make projects more intelligible for sponsors enhance the success of social projects [5]. It is important to find the right words so as to convince investors to take part in the project. It is possible to attract audience if the idea is described not just with great talent but also in a way intelligible for investors.

It is important to note that sponsors are more prone to react positively to the projects where entrepreneurship is considered as an opportunity to help others and less positively – when the project is presented as fundraising for a business idea [6]. It is remarkable that sponsors' cognitive features and the context in which an investment decision is taken have a serious impact on sponsors' motivation to support the project but they have been scarcely studied. Besides, declaring that the project is a charitable one and sponsor's personal motives influence the decision on participating in the project [7].

According to studies there is a range of factors which exert a negative impact on the project success, they are, but not limited to, as follows: a stretch financial goal, too long period of funds' collection, spelling mistakes in the project description, no video on the page and no updates (publishing of news) [8]. However, there is an opposite view in the literature concerning the abovementioned parameters. There are studies [9] which do confirm the negative relation between enhancing the financial goal and the degree of success but confute the negative influence of the project duration on the campaign success. The research also points out that prospects of success are related positively to the amount contributed by sponsors on the same day.

Social capital and the author's experience level increase the chances for success of the project. Some researchers apply a complex approach to define the factors which influence crowdfunding success considering the problem of failure to obtain the target amount both from the point of view of the project promoter and from the point of view of the investor [10]. The authors of this paper assert that the project founder's previous experience in creating other crowdfunding projects has no significant impact. In our opinion, it is a questionable statement, because when the author uses the platform again he/she already knows in detail this fundraising instrument. Among other matters the project description of the project page, existence of images and videos characterizing the project and the issue wheth-

er the project founder has supported (but has not been a promoter) other projects facilitate successful fundraising. However, the opposite opinion is confirmed by the fact that crowd campaigns initiated by the entrepreneurs who have previously supported others have a higher success rate, attract more backers and collect more funds [11].

The latest studies [12] offer to consider positive psychological capital. *Positive psychological capital* is the level of psychological resources of a person or organization which consists of hope, optimism, firmness and assurance [13], it is considered as a significant signal in crowdfunding. Investment in positive psychological capital allows to enhance productivity of persons working on the project. Sources of competitive advantage result from the resources which are difficult to be copied by competitors because they are of a specific nature or closely interwoven with the corporate history, its culture. In this case positively-oriented strengths of human resources and psychological abilities which may be developed and managed for productivity enhancement are used [13]. The research of a sample of 1,726 crowdfunding projects on Kickstarter showed that the projects which applied positive psychological capital achieved better results in fundraising [12, p. 470]. Papers in the sphere of economics of information confirm the hypothesis that the probability of obtaining funding by the project grows when: a) the project author (promoter) is an experienced player in the studied market; b) outside information sources are used (like mass media) for project promotion. The authors assert that in case of such conditions concerns of information asymmetry in relation to the project quality and confidence in the founder are mitigated [14].

Publications dedicated to the modern crowdfunding market comprise such aspect as gender identity of projects' founders. Studies showed that sex of a certain project promoter provides no advantage in fundraising on a crowdfunding platform. The authors note that "discrimination against women is mitigated due to "wisdom of the credit crowd" [15].

Ability of crowdfunding as a form of financing of projects offered by social and other entrepreneurs which face a limited access to traditional sources of capital increases when an enterprise / project is oriented to sustainable development. Besides this interrelation depends on project creativity and approval of third parties (for example, mass media) [16]. However, the sustainable development context is not always justified in fundraising at crowdfunding sites. In particular, no positive relation is observed between the environmental orientation of crowdfunding projects and probability of their successful funding [17]. Thus, we can assume that certain qualitative characteristics of the project will not exercise the expected positive impact on company's success, it is necessary to conduct further research.

Xie et al. in their research [18] on the basis of an innovative method made interesting conclusions: a set of variables which define success of a crowdfunding campaign varies depending on the project category. If one enters the page Recordholders in the crowdfunding platform Boomstarter he/she will notice that the projects which managed to collect the amounts significantly larger than the ones declared at the project launch belong to such categories as film production, making games, publishing comic books, album records, socially important projects. Therefore, taking into consideration the category when studying the considered problem is of interest.

Summarizing multiple studies in this sphere carried out by foreign authors one should emphasize that a lot of factors influence efficiency of a crowd campaign. In Table 1 these factors have been divided into three categories (project characteristics, author's characteristic features, communication), and it states the papers in which the authors made a certain conclusion concerning the nature of influence of these determinants on success of crowd campaigns (help to succeed / impede success / the nature of influence has not been defined).

Table 1. Groups of factors which influence success of a crowd campaign

	Factor	Helps to succeed	Impedes success	Nature of influence has not been defined
Communication	Third parties' approval (for example, comments)	Calic and Mosakowski (2016); Courtney et al. (2016)	–	–
	Publishing through other mass media	Courtney et al. (2016)	Mollick and Kuppuswamy (2014)	–
	Updates / news	Kuppuswamy and Bayus (2015); Efrat et al. (2019)	–	–

	Factor	Helps to succeed	Impedes success	Nature of influence has not been defined
Author's characteristic features	Author's previous experience	Zvilichovsky et al. (2015); Courtney et al. (2016)	–	Koch and Siering (2015)
	Author's sex	–	–	Barasinska and Schlafer (2014)
Project characteristics	Design of the project page (adding photos, videos etc.)	Koch and Siering (2015); Courtney et al. (2016); Anglin et al. (2018)	–	–
	Explanation of the idea (getting it through)	Allison et al. (2014); Koch and Siering (2015); Parhankangas and Renko (2017); Anglin et al. (2018)	Allison et al. (2014)	–
	Narratives (history behind the project)	Allison et al. (2014); Calic and Mosakowski (2016); Parhankangas and Renko (2017); Hoegen et al. (2018)	Hörisch J. (2015)	–
	Project duration	Cordova et al. (2015)	Mollick and Kuppuswamy (2014)	–
	Financial goal	–	Mollick and Kuppuswamy (2014); Cordova et al. (2015); Kuppuswamy and Bayus (2015)	–
	Amount of funds already collected	Cordova et al. (2015); Kuppuswamy and Bayus (2015)	–	–
	Number of backers	–	Kuppuswamy and Bayus (2015)	–

Source: compiled by the authors.

As for the papers about Russian crowdfunding platforms we should mention the research based on analysis of 100 projects placed at the Boomstarter platform for 2013–2019 in four categories (technology, equipment, software, books and games). The author made the conclusion that the following has impact on success of the crowd campaign: "four factors: the declared amount and such social-economic factors as number of news published by the author, comments left by sponsors and number of reposts in social networks" [19, p. 398]. However, in our opinion, results of this research require an additional verification. This is due to a rather small sample of the research comprising 100 projects and a rather long period of observation from 2013 to 2019 in which crises occurred in the Russian economy. Apart from that the Boomstarter platform founded in 2012 in the abovementioned period was in the formative stage, the model of attracting financial resources was forming, a small number of projects was placed on the platform. Besides, our research is of relevance because there are almost no empiric papers concerning determinants of successful crowd campaigns dedicated to Russian crowdfunding platforms. In our research we will increase the number of projects for analysis, specify the period of projects and will offer the author's set of factors for testing on a Russian crowdfunding platform.

After analysis of foreign and Russian literature and study of the opportunities of data collection concerning certain factors which influence a successful choice of means within a crowd campaign we determine the following factors:

- financial goal of the project;
- number of sponsors, comments, new of the project and offered remuneration;
- minimal contribution;
- project duration;
- author's previous experience;
- presence of photos / videos about the project.

Now we pass on to generation and substantiation of research hypotheses concerning influence of key factors on success of crowdfunding projects. On the basis of the factors stated in table 1 we form and substantiate nine hypotheses which will be verified on the sample of projects placed on the Russian Boomstarter platform.

We start analysis with the amount of funds which a promoter of a crowdfunding project plans to collect or with the financial goal of the project. As rightly remarked in the studies, "inflated monetary expectations diminish the project's chances of success" [19, p. 405]. The project promoter has to review experience of implementation of similar projects on the existing crowdfunding platforms and establish a realistic amount of funds to collect. On the Boomstarter platform which we use to analyze projects in this research two fundraising models are used: all-or-nothing and keep-it-all. As long as there is a small number of studies from this platform we will use studies from the American platform Kickstarter which also applies the model of all-or-nothing or a threshold model when the project promoter may take the sponsors' money only if the project financial goal is achieved. An overambitious funding goal may result in fundraising failure [20]. The studies which analyzed projects on the Kickstarter platform showed that increase of the amount of the project goal is related negatively to the campaign success [8; 9]. If an investor participates in a large project he/she understands that his/her contribution is unlikely to be decisive for the project, therefore it is more important for him/her to like the project. An average contribution represented by a percentage of requested amount is higher in small projects, consequently, the investor's contribution is more important for success of small projects [8].

We should mention that a project has to collect the whole amount within a limited period, otherwise the money promised by some sponsor will not be transferred to the project initiator. In this case the project promoter may contribute his/her funds in order to support the crowdfunding campaign and collect the necessary amount by means of self-financing. Obviously, this way of "saving" suits small projects better than large ones. Therefore, in this case also the project for which a rather low financial goal has been set may expect to succeed.

Projects with the fundraising model keep-it-all used on the Boomstarter platform also need a realistic financial goal because a stretch goal will raise investors' doubts about implementation of the project because collection of a large amount may take too much time. Taking into consideration the abovementioned reasons we have generated the following hypotheses.

Hypothesis 1. When the financial goal of the project increases the ratio of the collected amount to the declared one decreases.

A crowdfunding campaign is intended to attract backers who fund projects. At the same time studies on Kickstarter showed that there is a positive relation between the absolute value of the number of sponsors and crowd campaign success [8, p. 122]. Although it is an expected interrelation significance and contribution of each sponsor in the final amount of collected funds are not totally clear. For this reason study of the following hypothesis is of interest.

Hypothesis 2. Increase in the number of sponsors has a positive impact on success in fundraising as a part of a crowd campaign.

The number of comments on the project page shows the audience's interest in the concept offered by the author. Comments are a channel of investors' communication between themselves and with the promoter. A large number of comments may be a sign of sponsors' confidence in the project. When prospective sponsors take a decision on investing in a project they read comments of other investors about it. It allows to reduce information asymmetry of a crowdfunding project [21, p. 41]. So it seems reasonable to test the following hypothesis.

Hypothesis 3. As the number of comments increases the ratio of the collected amount to the declared one grows.

After the campaign launch the promoter has to keep up interest of the existing audience and inspire interest of the

prospective one. This may be done by publishing news about the project on its page. Thus, the author makes his/her project more "transparent" for the sponsor: people may get information on some specific features of the project, thus, getting involved in the project.

Hypothesis 4. As the number of news on the project increases the ratio of the collected amount to the project financial goal grows.

For crowdfunding platforms based on remunerations (such as Boomstarter and Kickstarter) it is extremely important to offer to the project sponsors attractive awards (products or privileges). Without unconventional attractive awards the project will not "take off" [22, p. 79]. The remunerations are usually ranged depending on the amount of contribution: a higher remuneration is offered to the investors who have made a more significant contribution into the project. Often sponsors' motivation to make a contribution into a crowd project is related to the desire to get the product in which creation they invest their contributions. So, in the project of smart watch by Pebble Smartwatch the majority of sponsors (96% out of 68,929) promised to contribute at least 99 US dollars which was the minimum threshold. If it was exceeded the sponsors could get the product, namely the watch [23, p. 86]. So, the number and diversity of offered remunerations increase sponsors' interest which manifests itself as frequency and amount of their contributions, therefore we generate the following hypothesis.

Hypothesis 5. The more remunerations are expected from the crowd campaign the higher the ratio of the collected amount to the financial goal.

As long as nonprofessional participants are often investors on crowdfunding platforms they can make just a small contribution. When the project authors define a large minimum amount for a contribution to the project it may limit participation of some project backers. This may happen because they do not understand reasonability of the participation threshold as well as because they cannot contribute the necessary amount for personal reasons. As a result promoters will fail to attract funding from a significant number of backers. This is why we test each hypothesis.

Hypothesis 6. The larger the minimum contribution the smaller the ratio of the amount collected by the project through a crowdfunding platform to the financial goal.

Usually the more complex the project and larger the necessary amount of funding the more time it takes to collect funds. Such project should spark the interest of its backers, otherwise it will be impossible to collect the necessary amount. As for influence of the fundraising campaign duration on its success the literature does not offer an uncontroversial conclusion. A series of papers proves that for a sample of large projects as well as for all Kickstarter projects a positive relation between the project duration and a successful fundraising was revealed because the longer the period of fundraising the higher the probability that contribution will equal or exceed the amount declared by the promoter [9, p. 120]. At the same time according to V. Kuppuswamy and B.L. Bayus the project duration has a negative relation with funding success. The authors note that on Kickstarter the maximum project duration was reduced from 90 to 60 days. This is due to the fact that the principal amount from sponsors comes on the first and last weeks of the project financing cycle, the length of the interim period is of low importance for the final success of the project [20, p. 173]. On Boomstarter a part of the projects may be implemented on the basis of the keep-it-all model, so it is important to evaluate the way the duration of Russian promoters' projects is related to their success.

Hypothesis 7. The longer the declared duration of a crowd campaign the smaller the ratio of the collected funds to the declared amount.

Such factor as entrepreneurial expertise or experience in crowd campaigns of the author is an important signal for investors which facilitates decrease of information asymmetry concerning the project quality and enhancement of trust to the promoter [14]. The studies emphasize that sponsors on crowdfunding platforms are often inexperienced in investment and also, as a rule, make no official verification of projects [24]. Hence, as A.H. Anglin et al. rightfully note, crowdfunding is often conducted without unbiased information on the company (author) which declares fundraising, formal standards of conduct, requirements to inspection of companies, and investment is often made by unsophisticated investors. The investment process on crowdfunding platforms is conducted in such a way that unpaid signals concerning project quality may have an impact on investors. Entrepreneurial experience is one of such signals and is indicative to investors of the entrepreneur's ability to launch and develop the project successfully [12, p. 473]. Experience which project promoter has in conducting crowdfunding campaigns means that he/she knows better how to launch a campaign. It is necessary for successful fundraising and, as a result, it is a signal for investors that he/she is capable of fulfilling the promises concerning the project and remunerations [12, p. 477]. However, there are papers where the author's previous experience in creating projects on the platform does not have a significant impact [10]. Therefore empirical verification of the following hypothesis is of interest.

Hypothesis 8. The author's previous experience in creating projects on a platform has a significantly positive impact on success of a crowdfunding campaign.

Nowadays a person is information-laden, therefore a prospective sponsor may be discouraged by reading of a large monotonous text on the project (more so that hundreds of ideas are placed on crowdfunding platforms and there is always a choice), therefore it is easier to watch a video. According to statistics 40% of site visitors first watch videos and only if the video is interesting they pass on to reading the text [22, p. 71]. But in case of crowdfunding contribution of each sponsor is important. J. Rich in his practical guide on crowdfunding asserts that a promotional video is the most powerful crowdfunder's instrument of persuasion which attracts prospective sponsors and it is also an instrument of presale and customer attraction to the project page. The video should be informative, enthralling for

the viewer from the first seconds, it should disclose the quality level of the product or service [25, p. 121]. Unique and thought-out photos and videos on the project page are instruments for visualization of the project idea. Apart from attracting sponsors' attention these instruments may be used to simplify understanding of the project concept value which will also, probably, result in growth of the number of prospective investors [10]. In view of this we put forward the following hypothesis.

Hypothesis 9. Adding of photos / videos to the project increases the ratio of the collected amount to the declared one.

The hypotheses tested for verification of the abovementioned influence are indicated in Table 2.

Table 2. Hypotheses on influence of factors on success of fundraising on the Russian crowdfunding platform Boomstarter.

Regressor	Presumable influence* (zero hypothesis)
Financial goal of the project	–
Number of sponsors	+
Number of comments	+
Number of news on the project	+
Minimal contribution (if any)	–
Number of offered remunerations	+
Project duration in days	–
Previous author's experience in creating projects (if any)	+
Existence of a video about the project	+

Note: "–" – negative influence, "+" – positive influence.

Source: compiled by the authors.

Table 3 offers the variables which will be used in further research and units of measure of variables and their designation in the models which will be built in our research.

Table 3. Factors of influence on effectiveness of a crowdfunding campaign of fundraising.

	Variable	Variable description	Unit of measure	Designation
Variable of interest (dependent variable)	Collected amount	A crowdfunding platform provides an opportunity to collect the amount exceeding the project financial goal. In view of this, study of the ratio of the collected amount to the financial goal amount, in percent, is of interest	%	Fact
Regressor (independent variable)	Financial goal of the project	Funds in roubles planned to be collected by the crowd campaign	RUB	Goal
	Number of sponsors	Number of project investors	pcs	NBackers
	Number of comments	Number of comments on the project page left by users	pcs	NComm
	Number of the project news	Number of news on the project page placed by the author	pcs	NNews
	Minimal contribution (if any)	Minimal contribution in roubles established by the project author	RUB	SumMin
	Number of offered rewards	Number of various noncash remunerations offered by the project author on the project page	pcs	NFee

	Variable	Variable description	Unit of measure	Designation
Regressor (independent variable)	Project duration	Number of days for raising funds	days	NDays
	Previous author's experience in project creation (if any)	Number of projects created by the author previously	pcs	NProj
	Existence of videos about the project	Binary indicator equaling 1, if there are photos / videos on the project page, and 0 – otherwise	0/1	Video

Source: compiled by the authors.

Model Research

Studies of the factors which influence success of crowdfunding are stated in dozens of modern papers. Let us list the main methods and models used by modern authors.

1) In order to evaluate the factors which may show to the sponsors which project is more likely to fail logit and probit regressions are often used in studies when the probability of project success is regressed according to the variables chosen by the author [2; 9].
2) The panel data model is rarely used for study of dynamics of project funding during its cycle [20, p. 153]. Although crowdfunding campaigns last just for several weeks V. Kuppuswamy and B.L. Bayus on the basis of analysis of projects on Kickstarter studied dynamics of support of projects for the period of their implementation using panel data. On the basis of daily dynamics the authors made the conclusion that sponsors' support during the project financing cycle is U-shaped, i.e. the sponsors are more likely to make contributions in the project on the first and last week, and are less likely – in the middle of the project implementation cycle [20, p. 169].
3) OLS is used rather extensively in study of crowdfunding projects, often together with other methods mentioned above. In particular, paper by A. Cordova et al. along with probit regression uses OLS regression in which the authors add only successful projects. The overfunding indicator, i.e. the amount for which the collected funds exceed the project financial goal is used as the dependent variable. Regressors are the same indicators as in the probit model [9]. The OLS advantage consists in the opportunity to study influence of various factors on success of a crowdfunding campaign.

In our research we use a linear-logarithmic OLS regression and logit regression. Thus, apart from defining the nature of influence and extent of effect of each significant factor there is an opportunity to assess the probability of achieving the financial goal by the project with specified characteristics.

First, we consider the first specification of the OLS model where the financial goal is included with the logarithm (Model I).

Model I:

$$Fact_i = \beta_1 + \beta_2 \cdot NBackers_i + \beta_3 \cdot NComm_i + \\ + \beta_4 \cdot NNews_i + \beta_5 \cdot SumMin_i + \beta_6 \cdot NFee_i + \\ + \beta_7 \cdot NProj_i + \beta_8 \cdot Video_i + \beta_9 \cdot ln(Goal_i) + \varepsilon_i. \quad (1)$$

Further we use the classification model (Model II) where we choose the *Success* variable as the dependent variable which equals 1 if the project is successful and 0 – otherwise. In an explicit form we have Model I:

$$Logit(F) = \frac{1}{1+e^{-F}}; \quad (2)$$

$$p_i = P(Y_i = 1) = Logit(F_i) = \\ = \frac{1}{1+e^{-F_i}} - probability\ of\ a\ favorable\ outcome \quad (3)$$

$$F_i = Fact_i = \beta_1 + \beta_2 \cdot NBackers_i + \beta_3 \cdot NComm_i + \\ + \beta_4 \cdot Video_i + \beta_5 \cdot ln(Goal_i). \quad (4)$$

Description of the Research Sample

The initial sample comprised 300 projects from the web site of the Russian crowdfunding platform Boomstarter (boomstarter.ru) in the period of 17.07.2020 to 31.05.2022 according to the project completion date. We chose this period, first, in order to exclude the pandemic shock and, second, use the most relevant data. Sponsors' behaviour on crowdfunding platforms may be considered as an indicator of the economic cycle phase. Thus, according to comments of analysts from the leading Russian crowdfunding platforms (Boomstarter, Planeta.ru) during crises the average amount of contributions decreases but the number of transactions grows. It should be noted that the chosen period is rather homogenous in terms of the state of macroeconomic parameters. At the same time the issue of investors' behaviour on crowdfunding platforms during crises requires a separate research.

Data Analysis

Let us perform a preliminary data analysis. We should note that the projects have been divided into 20 categories: *Music, Design, Photo, Publishing, Society, Sports, Technology, Theatre, Tourism, Skolkovo, Art, Business, Film and Video Production, Choreography, Education, Events, Fashion, Food, Games, Health*. If the project did not belong to the basic categories we assigned it to one of specific categories (for example, the project with the category of Fictional Film was assigned to Film and Video Production).

As long as for the majority of projects from the sample there is no data on project duration in days we decided not to consider this regressor. See the descriptive statistics of the research variables in Table 4.

Table 4. Descriptive statistics of the initial sample

Indicator	Observations	Mean value	Standard deviation	Min.	Max.
Fact	300	35,887.76	619,069.00	0	10,722,677.00
Goal	300	899,866.90	5,809,661.00	1	98,000,000
NBackers	300	128.25	272.93	1	3,497
NComm	300	3.42	11.34	0	117
NNews	300	5.96	11.93	0	123
SumMin	300	242.19	494.38	0	7,000
NFee	300	10.19	6.88	0	75
NProj	300	2.00	4.70	0	19
Video	300	0.52	0.50	0	1

Source: compiled by the authors.

Let us analyze the results concerning the *Fact* variable. Descriptive statistics show that the sample is heterogeneous because there are projects which collected dozens times as much funds as the declared financial goal. Most probably, those projects were placed on the platform for marketing purposes. We will adjust the sample excluding such projects which will amount to approximately 10% of the sample. After reductions we have 276 observations. Let us consider the descriptive statistics for the reduce data in Table 5.

Table 5. Descriptive statistics of the adjusted sample

Indicator	Observations	Mean value	Statistical deviation	Min.	Max.
Fact	276	101.01	106.83	0,03	869.97
Goal	276	976,420.90	6,051,764.00	100	98,000,000
NBackers	276	116.33	176.75	1	1,601
NComm	276	2.92	9.50	0	117
NNews	276	6.16	12.20	0	123
SumMin	276	239.69	490.76	0	7,000
NFee	276	10.05	7.04	0	75
NProj	276	0.91	1.96	0	19
Video	276	0.49	0.50	0	1

Source: compiled by the authors. Observations 1–276 were used.

Now statistics related to the *Fact* variable look satisfactory. Let us consider values for other variables. The mean value for the *Video* variable means that in our sample 136 out of 276 projects have videos on their pages.

As for the results of the *NBackers* variable we may make the conclusion that on average the projects included in the sample had about 116 investors. Besides, the sample does not comprise projects without sponsors. The minimum number of sponsors is 1, the maximum – 1,601.

Let us analyze results for the *NComm* variable. Table 5 shows that on average projects have at least three comments on their page. At the same time there are projects in the sample without comments at all. The situation is similar with the number of news on the project page.

Let us consider descriptive statistics for the *SumMin* variable. Table 5 shows that the average minimal amount of the original contribution is RUB 239.69. The sample also comprises projects without a minimum contribution. The largest minimal contribution among all projects is RUB 7,000.

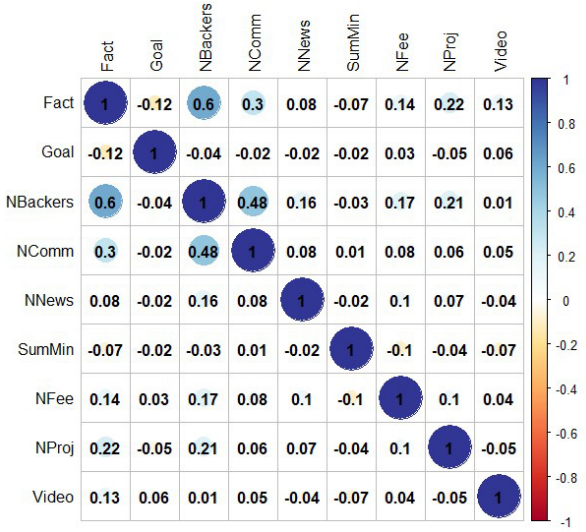
As for the factor of previous authors' experience in creation of projects on the Boomstarter platform we have the following information. The most experienced author took part in 19 projects. However, the overwhelming majority of authors have not presented projects on the considered platform before.

Let us analyze results for the *NFee* variable. Table 5 shows that the sample comprises projects without alternative (non-fee) remunerations.

Correlation Matrices

In order to study relations between variables and to detect the possible multicollinearity we will build and consider a correlation matrix of variables (Figure 1).

Figure 1. Correlation coefficients



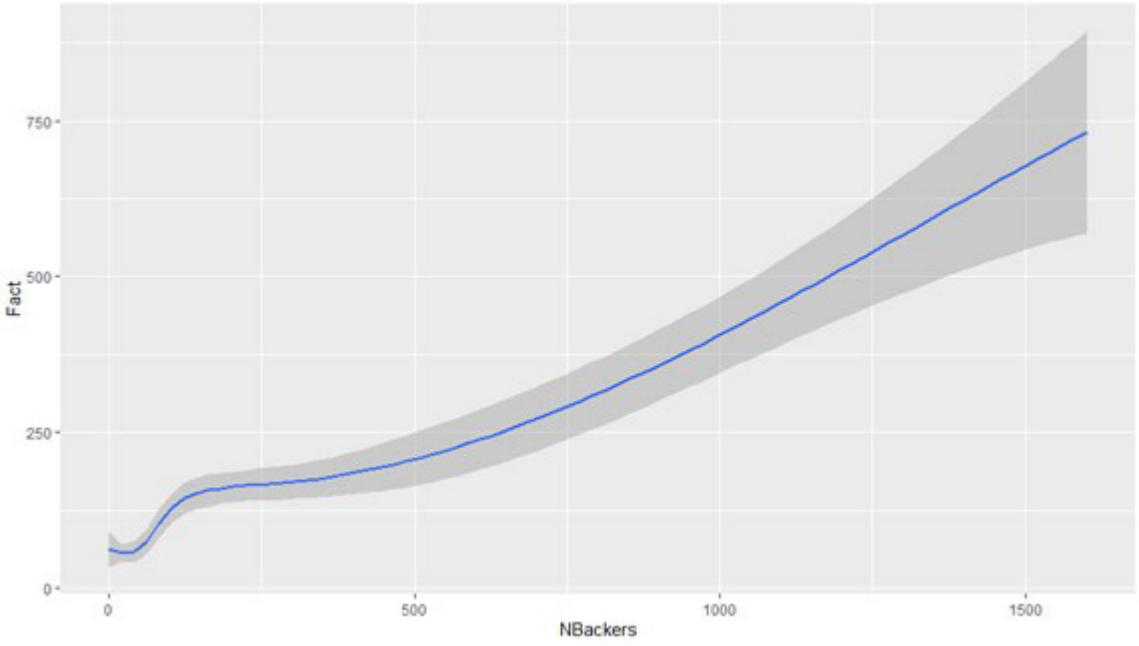
Source: compiled by the authors. Observations 1–276 were used.

The *Fact* variable correlates positively with the *NBackers*, *NComm*, *NFee*, *NProj* and *Video* variables.

Taking into consideration a respectively substantial significance of correlation we see that the projects which authors are experienced in creating projects on the platform, on average conduct crowd campaigns more successfully. The projects with a significant number of investors and comments (which is quite predictable) have more success in financing.

One can notice a small negative correlation between the *Fact* and *Goal* variables. This relation implies that a too high financial goal impedes success of crowd campaigns. In this case an additional analysis is necessary.

Figure 2. Diagram of dependence of *Fact* on *NBackers*



Source: compiled by the authors. Observations 1–276 were used.

In general values of correlation between regressors do not imply multicollinearity.

Scatter Diagrams

In order to establish the type of relation between variables we build a scatter diagram which characterizes dependence of the amount of collected funds (campaign success) on the number of sponsors, i.e. *Fact* on *NBackers* (Figure 2).

As is the case of pair correlation coefficients a positive relation is observed between the variables.

The scatter diagrams for other variables imply use of logarithms of variables. However, the logarithm may be used only for the *Goal* variable. If we apply the logarithm to other variables we will face the problem of omitting a significant amount of data and, consequently, erroneous results.

Research Results

Evaluated *Model I.1*. Robust errors added.

$$\widehat{Fact_i} = 347,44_{(26,34)} + 0,40_{(0,05)} \cdot NBackers_i + 0,10_{(0,71)} \cdot NComm_i - 0,01_{(0,33)} \cdot NNews_i - 0,0004_{(0,004)} \cdot SumMin_i + 0,72_{(0,72)} \cdot NFee_i + 1,75_{(4,29)} \cdot NProj_i + 18,70_{(9,06)} \cdot Video_i - 25,63_{(2,15)} \cdot ln(Goal_i) \quad (5)$$

$$n = 276 \quad Adjusted\ R^2 = 0,526.$$

Equation (5) is in general significant (because a corresponding P-value = 0.000 <0.01), hence, it makes sense to interpret it. The following variables are among the ones significant at a 1% significance level: logarithm of financial goal and number of investors, at a 5% level – existence of videos on the project page. Then we exclude variables using the Akaike criterion. Model I.1 is converted into Model I.2.

Model I.2.

$$Fact_i = \beta_1 + \beta_2 \cdot ln(Goal_i) + \beta_3 \cdot NBackers_i + \beta_4 \cdot NProj_i + \beta_5 \cdot Video_i + \varepsilon_i. \quad (6)$$

Observations 1–276 were used.

Evaluated *Model I.2.* Robust errors added.

$$\widehat{Fact_i} = 357,98_{(29,18)} - 25,88_{(2,38)} \cdot ln(Goal_i) + 0,41_{(0,05)} \cdot NBackers_i + 18,84_{(9,09)} \cdot Video_i \quad (7)$$

$$n = 276 \quad Adjusted\ R^2 = 0,532.$$

Equation (7) is in general significant (because a corresponding P-value = 0.000 <0.01), hence, it makes sense to interpret it. The following variables are among the ones significant at a 1% significance level: the logarithm of financial goal and number of investors, at a 5% level – existence of videos on the project page.

Comparing models on the basis of the Wald test one can make the conclusion that a short regression is better than a long one because the corresponding P-value is larger than any reasonable significance level. The second model is also more attractive from the point of view of a larger value of adjusted R^2. Among other matters we conducted verification for multicollinearity detection using the variance inflation factor. In the modifications of Model I multicollinearity was not detected.

Then we conducted the Ramsey test for Model I.2. The zero hypothesis of correctness of equation specification is accepted because the corresponding P-value = 0.940 > 0.000.

The Box-Cox test for including the dependent variable logarithm showed that it was unnecessary.

Thus, after testing modifications of Model I we got the result indicated in Table 6.

Table 6. Results of evaluation of Model I modifications

Model	Model I.1	Model I.2
Dependent variable:	Fact, %	
Const	347.442***	357.982***
	(26.337)	(29.175)
ln(Goal)	–25.633***	–25.878***
	(2.150)	(2.378)
NBackers	0.402***	0.414***
	(0.045)	(0.051)
NComm	0.096	–
	(0.706)	
NNews	–0.007	–
	(0.330)	
SumMin	–0.0004	–
	(0.004)	
NFee	0.724	–
	(0.721)	
NProj	1.754	–
	(4.287)	
Video	18.703**	18.841**
	(9.062)	(9.093)
Number of observations	276	276
R2	0.540	0.537
Adjusted R2	0.526	0.532
F-statistics	39.190	104.998

Note. All models are evaluated by means of OLS. Robust standard errors are indicated in brackets under coefficient estimates. The Symbol of *** means significance at a 1% level, ** – significance at a 5% level.

As for hypotheses confirmation see Table 7.

Table 7. Results of hypotheses verification

Hypothesis No.	Factor	Expected sign, according to hypothesis	Factor significance, OLS	Hypothesis confirmation
1	Project financial goal	–	1%	Yes
2	Number of sponsors	+	1%	Yes
3	Number of comments	+	Insignificant	No
4	Number of news in the project	+	Insignificant	No
5	Number of offered remunerations	+	Insignificant	No
6	Minimum contribution	–	Insignificant	No
7	Project duration	–	excluded factor	–
8	Author's previous experience in project creation	+	Insignificant	No
9	Existence of video about the project	+	5%	Yes

Source. Compiled by the authors.

Interpretation of Results of Model I Modifications

On the basis of the results of constructed models and veracity of corresponding tests we may make the following conclusions.

First, the financial fundraising goal established by the project produces a significantly negative impact. Therefore it is necessary not to overstate its amount. All else being equal, when the financial goal increases by 1% the ratio of the collected amount to the financial goal decreases on average by 0.26%. The larger the project financial goal the harder it is to achieve and, consequently, to fulfill obligations to the sponsors. For this reason sponsor's motivation concerning investment in a project with a high financial goal decreases as well as the probability of achieving of the financial goal by the project.

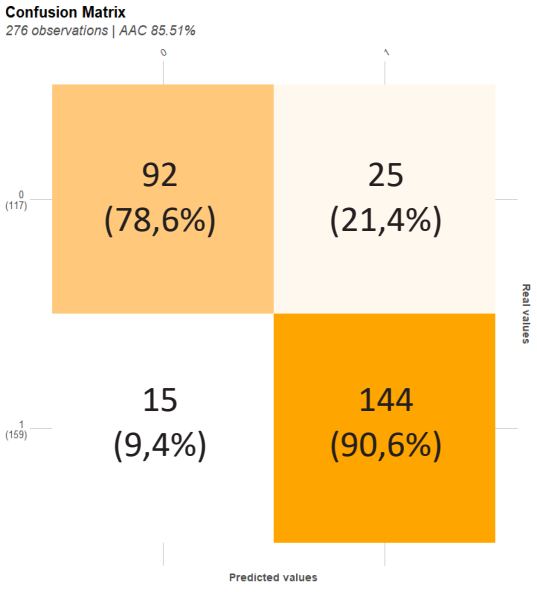
Second, we can talk about a significantly positive influence of a large number of investors on efficiency of crowdfunding projects. All else being equal, when the number of sponsors increases by 1 the ratio of the collected amount to the declared one increases on average by 0.4%. Partially this may be due the "herd effect": a sponsor decides to invest in the project because he/she realizes that it is popular among investors. The impact of this regressor on the dependent variable is insignificant, so further consideration of the amount contributed by one sponsor and the factors influencing the contribution size is of interest.

Third, the supposition that design of the project page (expressed in terms of existence of videos on the page) has the greatest positive effect among significant factors. All else being equal, on the studied platform projects with videos on the page have the ratio of the collected amount to the financial goal on average higher by 18.8%. In some cases just photos or a textual representation is not enough for complete understanding of the project concept. Besides, a video is a simpler way of getting information than a text. If there are no video materials about the project some visitors of the project page may not even try to get information necessary for making a decision on funding. More so that after watching a video a prospective investor may feel more acquainted with the project content and decide to make a contribution.

The project duration factor was excluded from the research due to insufficient data. Besides, other research factors turned out to be insignificant. Consequently, hypotheses concerning their influence are not confirmed. This may be due to insufficient number of observations. Over time, when Boomstarter will host more projects the sample may be expanded.

Now we pass on to analysis of quality of the classification model. First, we will consider a contingency table for *Model II* (Figure 3).

Figure 3. Contingency table



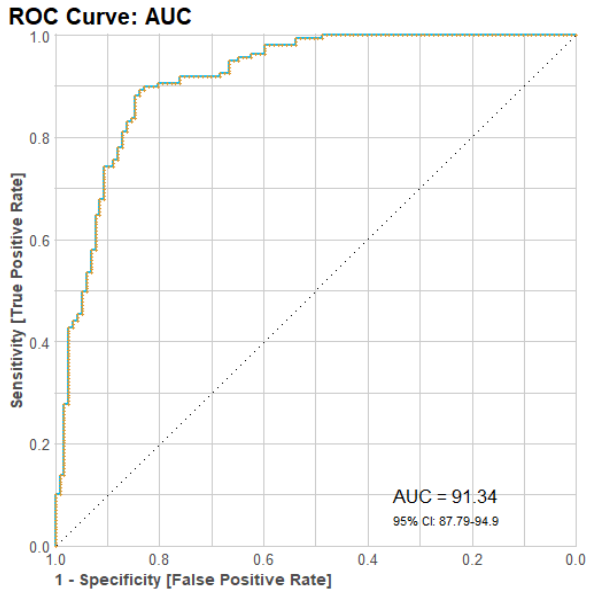
Source: compiled by the authors.

In particular we have the following results:

- percentage of correctly predicted results = 85.51%;
- percentage of correctly predicted successful projects = 90.57%;
- percentage of correctly predicted unsuccessful projects = 78.63%.

Then we will consider Figure 4 representing the ROC curve.

Figure 4. ROC curve



Source: compiled by the authors.

The area under the ROC curve is 0.913. In general it is indicative of the model's higher quality and that it may be used to predict results of crowd campaigns.

Then we may pass on to the results of evaluation of the classification model stated in Table 8.

Table 8. Results of evaluation of the classification model

Model	Model II
Dependent variable:	Success
NBackers	0.020***
	(0.007)
NComm	0.186**
	(0.091)
Video	0.559*
	(0.333)
ln(Goal)	-1.006***
	(0.201)
Constant	10.363***
	(2.219)
Number of observations	276

Note. Assessment was performed using OLS. Robust standard errors are indicated in brackets under coefficient estimates. The Symbol of *** means significance at a 1% level, ** – significance at a 5% level, * – significance at a 10% level.

Apart from a high predictive power of the model we confirmed robustness of the results obtained before and defined the coefficients of evaluating the success probability of a project with preset parameters. In order to perform a quantitative interpretation of the results we calculated corresponding marginal effects indicated in Table 9.

Table 9. Marginal effects

Dependent variable	Success
NBackers	0.003***
	(0.001)
NComm	0.032**
	(0.014)
Video	0.097*
	(0.061)
ln(Goal)	-0.176***
	(0.035)
Constant	1.808***
	(0.376)
Number of observations	276
Akaike informative criterion	224.813

Source: compiled by the authors

Interpretation of the obtained results as a part of testing of Model II:

1) the probability of success of a crowd campaign increases by 0.3% when the number of sponsors grows by 1;
2) the probability of success of a crowd campaign increases by 3.2% when the number of comments grows by 1;
3) the probability of success of a crowd campaign increases by 9.7% if there is a video on the project page;

4) the probability of success of a crowd campaign decreases by 17.6% when the financial goal logarithm increases by 1.

Finally Model II is as follows:

$$p_i = P(Y_i = 1) = Logit(F_i) = \frac{1}{1+e^{-F_i}} -$$

probability of a favorable outcome

$$F_i = Fact_i = 10,363_{(2,219)} + 0,02_{(0,007)} \times$$

$$\times NBackers_i + 0,186_{(0,091)} \cdot NComm_i +$$

$$+0,559_{(0,333)} \times Video_i - 1,006_{(0,201)} \times ln(Goal_i). \quad (8)$$

Recommendations

In order to start raising funds on a crowdfunding platform a project should be approved by a moderator of the corresponding platform. However, even after a successful completion of this stage many projects fail to collect the necessary amount because they do not focus on further project promotion. On the basis of our research results we defined the nature of influence of the key determinants on successful fundraising as a part of crowdfunding and now we pass on to stating empirically justified recommendations for entrepreneurs who wish to get the necessary funding for their projects on crowdfunding platforms.

First, it is useful to remember that a stretch financial goal is often not achieved and a diminishing return takes place. Besides, it is reasonable to explain in detail how exactly the sponsors' money will be spent indicating the principal expenditure items in order to decrease information asymmetry. So, it is highly important for the promoters to calculate the financial goal of the project and not to overstate its amount.

Second, the more sponsors the project promoter can attract and the larger each sponsor's contribution the higher the probability of the campaign success. That is why it is so important to make regular efforts in order to keep interest to the project and provide traffic on the project page.

Third, it is important to place a video about the project on its page. However, it is necessary to know the technique of making videos in order to make the project stand out from a large number of other projects. The practical guide by J. Rich describes in detail principles of making promotional videos for a project [25, p. 120].

Fourth, it is important to maintain communication with sponsors by means of publishing comments. When a sponsor supports the project he/she will be interested to observe its progress, get replies to questions, express his/he opinion about the project and finally get information about the successful project implementation. Therefore, it is important for the project authors to answer investors' comments on a regular basis disclosing additional information on the project and emphasizing the importance of feedback from sponsors.

Conclusion

Crowdfunding is a way of collective funding for creative and social initiatives. It has advantages and disadvantages in comparison to alternative sources of initial investment. The most significant advantages of the studied type of financing are related to communication of the project authors with prospective consumers of products / services behind the projects. The disadvantages are, on the one hand, related to immaturity of this way of fundraising due to scarce experience, on the other hand – to poor elaboration of the project promotion strategy.

Crowdfunding is performed through special Internet platforms which service the financing process. American Kickstarter is the most famous crowdfunding platform which maintains the model of collective financing by means of contributions. This platform is known worldwide and each year increases the amount of collected funds. The Russian equivalent of the American platform is Boomstarter. This platform is committed to the initial concept of crowdfunding – opportunity of attracting funds from ordinary people, possibly, having nothing to do with real business. In view of this the research has been made on the basis of data collected on the abovementioned platform.

In order to define the factors which influence successful fundraising by means of crowdfunding platforms and to generate hypotheses as a part of the research we analyzed Russian and foreign literature. We found out that among the key factors which influence successful fundraising by means of crowd campaigns the following factors may be distinguished: financial goal of the project, number of sponsors, comments, news of the project and offered remunerations; minimal contribution; project duration; author's previous experience; photos / videos about the project. On the basis of the selected factors we defined the variables for further econometric research. Analysis also allowed to generate nine hypotheses concerning influence of the studied factors on achievement of the financial goal by the project.

Based on data of 300 crowdfunding projects from the Russian platform Boomstarter which was collected from July 2020 to May 2022 by the end date of the project, we built regression models and determined parameters which have a significant influence on successful project implementation. The issue was considered both from the point of view of the amount of collected funds and from the point of view of probability of obtaining the target amount.

On the basis of the research results we made the conclusion that the number of investors, video materials about the project have a positive impact on the ratio of the collected amount to the financial goal. The same factors (as well as the number of comments) exert a positive impact on achievement of the financial goal by the project. Consequently, in order to attain success and augment the amount of collected funds on crowdfunding platforms it is necessary to increase indicators of these parameters. The established financial goal of the project has a significantly negative influence both on the ratio of the amount of

collected funds to the declared one and on the probability of achieving the target amount. It is better to raise funds for small projects on crowdfunding platforms. Influence of other factors is insignificant. Thus, we defined the key factors which influence successful fundraising by means of crowdfunding platforms and determined the nature of influence and extent of effect of each significant factor. Besides, we defined coefficients to determine the probability of achievement of the financial goal by the project with preset parameters.

Successful fundraising on the crowdfunding platform for each project is a marker of the society's interest in prospective service / product or the one offered by the investor. This factor may become a driver for attracting additional financing from alternative sources.

The scientific potential of the present paper consists in expansion of the sample, change of the set of factors likely to influence the success of fundraising by a project through crowdfunding platforms and in considering the impact of factors depending on the project category. Additionally, one can study the factors which contribute to growth of the number of sponsors and examine into other crowdfunding platforms. Apart from that, one may focus on influence of positive social capital on success of crowd campaigns. Study of social interaction between investors as a part of crowdfunding campaigns may be of interest. Behavioral aspects of crowdfunding on Russian platforms, in particular, defining the dependence of the sponsor's contribution amount on the stage of the financing cycle are still insufficiently studied.

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Performance of Green Bonds in Emerging Capital Markets: An Analysis of Academic Contributions

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Abstract

The ongoing experience of the global transition from fossil fuel-based economies to renewable-fuel-based economies shows that sustainable finance is an important step that enables this transformation in developed and emerging capital markets. As such, understanding the performance drivers of green bonds becomes important for development of new corporate models based on sustainability goals.

Our research presents a systematic literature review on financial and non-financial drivers of performance of green bonds in the emerging capital markets. Using a unique hybrid technique for textual analysis of articles published between 2010 and 2022, we propose to identify the main research clusters (renewable energies, investments, climate change and sustainable development, green bonds, and green finance) and the most representative emerging capital markets to consider in terms of assessing new trends.

Future research directions may be devised based on the trends of the keywords which are created herein using information extracted from the 'Scopus' application, processed with 'VOSviewer', and structured using 'Online Analytical Processing' (OLAP) principles with the help of 'Visual Basic for Applications' (VBA) programming through spreadsheets.

Our results demonstrate that non-financial performance factors are more influential in emerging capital markets because of the early stage of development of green bonds issuance, and because of the reduced regulatory framework regarding green financing.

Keywords: green bonds, green finance, sustainable development, systematic literature review, green economy, socially responsible investment, emerging capital markets, non-financial drivers

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1. Introduction

The contemporary global social and economic zeitgeist is intensively focused on the process of transformation towards sustainability goals and new corporate models in order to fulfil the requirements for the allocation of sustainable finance. The extent of sustainable finance and its direct connection with organizational ESG transformation is exemplified by the analysis of Rystad Energy[1]. This showed that the gap between global capital spending on renewables and oil-and-gas is narrowing at a minimum level, thus for 2021 approximately $311B was spent in terms of oil and gas capital and $243B in terms of wind and solar. Indeed, the issuance of corporate green bonds (to provide the funds for climate initiatives) instead of conventional bonds creates additional value for companies, not only by improving their environmental performance, but also by stimulating a positive stock market response to such sustainable finance corporate initiatives, thus lower operational risks [1]. The developed capital markets reacted to the global climate transformation immediately, allowing for the building of new financial system infrastructure, which became efficiently functional. Related innovations include technical platforms, digitalization, regulatory and legal frameworks etc.

Due to the less flexible character of emerging capital markets, their sustainable transformation development lags behind the global trends, which makes these countries lose competitiveness in attracting 'green' capital to cope with the new global sustainable development architecture. Generally, the economic and financial system of emerging countries is not fully calibrated to the fundamental principles of green financing, specifically in terms of green bonds. The financial systems of emerging capital markets still rely on foreign direct investment. Thus, there is a possibility of losing economic, financial, and political competitiveness at least in the medium term if these countries do not achieve their climate targets. Despite the external pressures of globalization processes in the medium and long term, the adherence of these countries to global climate initiatives and the likelihood of them achieving climate and CO_2 emissions targets become uncertain.

The development of the green bonds market and its performance is affected by different financial and non-financial factors. Most of the relevant academic research papers analyze these aspects of companies acting in developed capital markets, and there is limited academic evidence about performance of green bonds issued in emerging capital markets.

The performance of both green and conventional bonds is sensitive to macroeconomic factors: the uncertainty of economic policies, daily economic activity, oil price, changes in financial market returns [2], and individual countries' specific fiscal and monetary policies for sustainable development and the transition to a green economy [3]. Other academic papers have analyzed the relationship between green bonds issuance, stock market performance of these companies, and ESG profile – which ultimately improve the bond's liquidity. D.Y. Tang and Y. Zang [4] found that green bonds issuance brings performance through green premium, and stock markets performance (higher returns) for companies issuing green fixed-income instruments. In their research the authors analyzed issuances from 28 countries (both developed and emerging capital markets) in the period 2007–2017. They assess how country financial market regulations directly "dictate" the level of green bonds market development and its performance, and the evidence found for both developed (incl. OECD countries) and emerging capital markets [5; 6].

Our contribution is twofold. First, this paper provides an analytical summary of research findings on green bonds in emerging capital markets, including existing academic research clusters and empirical evidence about performance of green bonds and its influential factors. Second, our paper provides analysis and conclusions on the future trends of research in green bonds in the emerging capital markets.

The rest of the paper is structured in four sections. Section 2 presents our research methodology, section 3 shows the outcomes of our methodological application and presents the academic findings on the performance of green bonds in the emerging capital markets as compared to developed markets. Finally, we discuss the results and present our conclusions in the fourth section.

2. Methodology

To identify the academic contributions about green bonds markets in the developing countries, we apply VOSviewer[2] for text mining and data processing. Several steps were undertaken to achieve the scope of the paper. First, we define our specific research questions. Second, we examine 'Scopus' and 'Web of Science' using 6 relevant keywords through titles, abstract and keywords of the papers. The keywords were selected to refer to the full spectrum of the meaning of the green bonds: "green bond" or "green bonds" or "sustainable bond" or "sustainable bonds" or "climate bond" or "climate bonds". Third, we applied three criteria for filtering the database to get the batch of selected academic documents: period 2010–2022, only academic articles (including review articles), English language articles within all subject areas. Fourth, information retrieved from the Scopus was processed with the help of VOSviewer software to identify keywords clusters. For the purpose of our research, the system data analysis considered the following dimensions: title, abstract, and keywords of the articles.

[1] URL: https://www.rystadenergy.com/newsevents/news/press-releases/renewables-spending-set-for-new-record-in-2021-luring-service-suppliers-as-oil-and-gas-gap-narrows/

[2] A bibliometric network can be identified and created using the following criteria: citation, bibliographic coupling, co-citation, or co-authorship relations. The system permits a user to run text mining based on different criteria, and also to construct and visualize a co-occurrence network of keywords (keywords clusters) extracted from different structures of scientific literature (in our case from title, abstract, and keywords of the articles).

Table 1. Generic green bonds market value chain

	Buyers of green bonds	Green bonds issuers	Supporters of GB issuance	Beneficiaries of the GB issuance
GB market participants	Investors and financial institutions	Corporations / Financial institutions	Governments, NGOs, stock exchanges, regulatory financial authorities, rating agencies etc.	Civil society, business community and environment
Strategies	Internalisation of sustainability	Internalisation of sustainability	Assurance of GB regulatory ecosystem	Monitor and challenge the GB market improvement
Performance and metrics of GB	Risk-adjusted returns, increased public reputation and image	Lower cost of capital, improved corporate performance	GB regulatory framework, GB standards, rating, indexes, etc.	Achievement of sustainability targets

Fifth, 'Online Analytical Processing' (OLAP) principles for data management were applied with the help of spreadsheets[3] to retrieve the most relevant research papers for our research scope. To increase the representativeness of the selected research papers, we combined citations index and the number of identified keywords per each cluster. The combination of these two factors reveals the most relevant papers for our research. Visual Basic for Applications (VBA) programming was used to retrieve the number of keywords with no restriction of text bodies (see Appendix 1).

Finally, at the sixth step the identified relevant articles were critically assessed to determine the academic contribution of the performance of green bonds in the emerging capital markets. To have a clearer view about green bonds market structure and dynamics, we redesigned the framework for sustainable finance and investment market proposed by F.A.F. De Souza Cunha et al. [7] and present it in Table 1.

The above framework describes the green bonds market from the perspective of market participants, their strategies in terms of green finance, and the performance metrics of green bonds of each type of the participants. We may postulate that investors which acquire green bonds will consider the internalisation of green bonds features into the corporate business model as a basic organisational commitment for sustainable development and climate change. In exchange, these companies will receive not only financial rewards (e.g. risk adjusted returns), but also non-financial benefits (e.g. better public reputation and image) and ultimately improved organisational ESG scores.

Organisations which issue these types of sustainable financial instruments will internalise sustainability ambitions into their operational business models, but in a different structural format. Thus, these companies will reshape the operational business model (including technological and human resources) towards sustainability and environmental protection, the implementation of CSR, and the implementation of sustainability policies. As a result, the impact of issuing green bonds will result in a lower cost of capital for the issuer and improved financial and operational performance.

Supporters of green bonds issuance also play a critical role in the efficiency of the green bonds market functioning. It is also possible that supporters can be issuers and buyers as well (e.g., governments, local authorities). The role of such supporters, from a strategic point of view, is to build and ensure the regulatory platform at all levels considering different structural components of green bonds market development (e.g., financial markets components, framework for sustainable development etc.) and indirectly, to cope and achieve the climate change targets. As a result, the performance of the green bonds market will be determined by (among other things) the existence and efficiency of the regulatory framework, standards and criteria, the functionality of the green bonds ratings, and indexes.

Beneficiaries of green bonds issuance are reaping the rewards, as are those that represent voices which positively appreciate the impact and the benefits of green bonds issuance. As such, strategically, they continuously challenge the other 3 categories of participants to make the green bonds market and the system functional and more efficient. As a result, they will assure the achievement of climate targets, climate protection, net-zero emissions, and positive social impacts which will in fact indirectly impact the performance of green bonds.

The fullest realisation of performance of the green bonds market will be achieved only when the benefits are shared directly and indirectly between all the parties to assure the mutual value growth. These mutual financial and non-financial benefits are the main motivational drivers for developing the green bonds market in any jurisdiction. The performance of green bonds, along with the proposed generic value chain, should also be considered in rela-

[3] Microsoft Office.

tion to strategic timing, which is the key aspect of keeping all the parties satisfied *(e.g. civil society can benefit from green bonds issuance only after 2–3 years from the moment fixed-income instruments are put on the market)*.

3. Research Questions

Social, environmental, regulatory, macroeconomic, and financial factors all influence the dynamics of the green bonds market. This is achieved through a combination of an investor's motivation, the characteristics of the particular bonds, the applicable risk profile, consideration of the strategic perspective, and the ambition of the ultimate outcome. The following sections present the answers to the main research questions of this paper. First, we will define and understand the concept of performance of green bonds.

In the academic and non-academic literature, the performance of green finance is presented in different ways, and as mentioned earlier, the concept generically called "performance" has different meanings for different stakeholders. This can be split into financial and non-financial performance. Most academic papers are focused on the traditional approach to the performance of green bonds, called "green premium" or "greenium". The International Capital Markets Association (ICMA) was among the first to conceptualise the nature of green bonds considering its role towards transition to a net-zero economy model. ICMA defines green bonds as: *"any type of bond instrument where the proceeds will be exclusively applied to finance or re-finance, in part or in full, new or / and existing eligible green projects"* [8]. The key element in the definition is the use of financial funds, which according to the green bond principles should be utilised in the following areas: renewable energy, energy efficiency, pollution prevention and control, environmentally sustainable management of living natural resources and land use, clean transportation, etc.

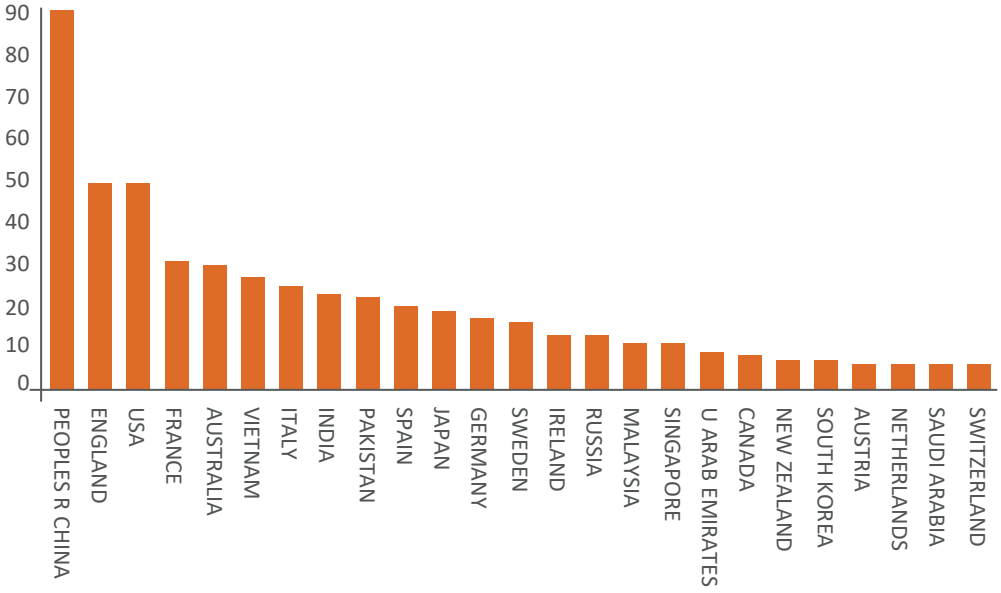
'Green premium' is the main direct performance indicator which reflects the attractiveness of the green bonds for the investors' world and its success to mitigate climate change. The green bonds function similarly, with conventional non-green fixed-income securities to which it has assigned a "use of proceed" pledge towards environmental activities. The "green" characteristic of the security can bring additional value to it, but also additional risk (e.g. "green premium" vs "greenwashing").

Another approach to measure the performance of green bonds refers to subscription level (e.g. under-subscription vs over-subscription). According to a 'Climate Bonds Initiatives' report "Green bond pricing in the primary market H1 (Q1–Q2) 2020", in most of the cases the number of times of over-subscription of green bonds compared with 'vanilla' (i.e. non-green) bonds was much higher for both EUR and USD issues: for EUR bonds, the average over-subscription was 5.2x for green bonds, and 3.1x for vanilla equivalents. For USD bonds, the average oversubscription was 2.6x for green bonds and 2.3x for vanilla equivalents [9].

3.1. What are the most relevant (dynamic) emerging markets for green bonds financing?

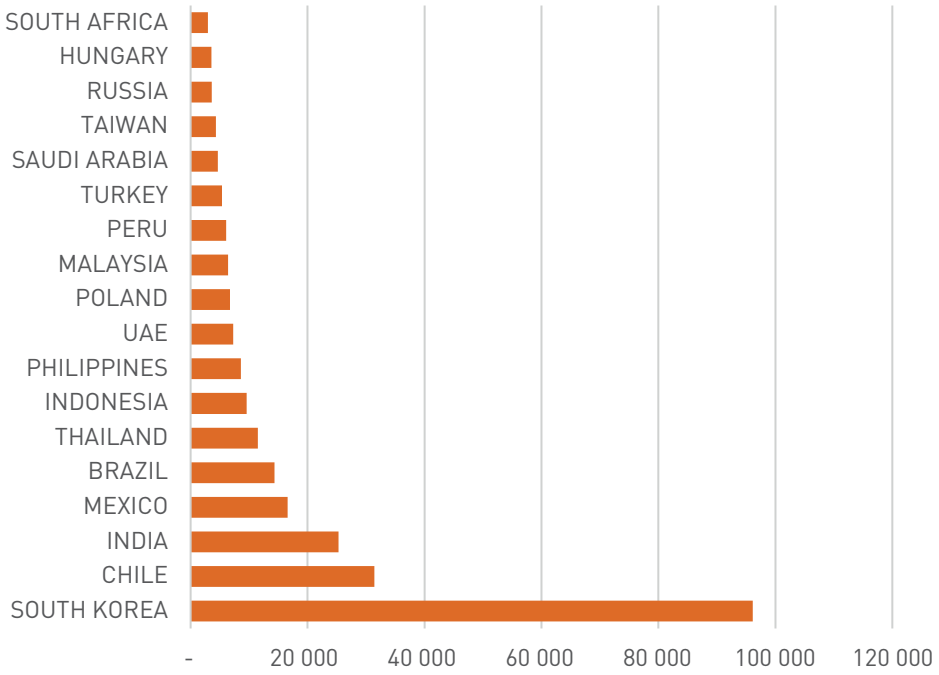
The number of research topics about green bonds in developed countries is much higher compared to emerging markets considering both the number of publications issued by these countries and the volume/value of green bonds issued in the last 12 years. Moreover, emerging countries are still facing barriers for green bonds market development which contradict the interests of the market participants. In the literature the following type of barriers were identified: (1) institutional barriers, technical skills for monitoring and assessing, lack of knowledge, and inappropriate institutional arrangements, and (2) market barriers: the issue of minimum size, the currency of issuance, and high transaction costs associated with green bond issuance etc. [10; 11].

Figure 1. Number of articles per each country of publication



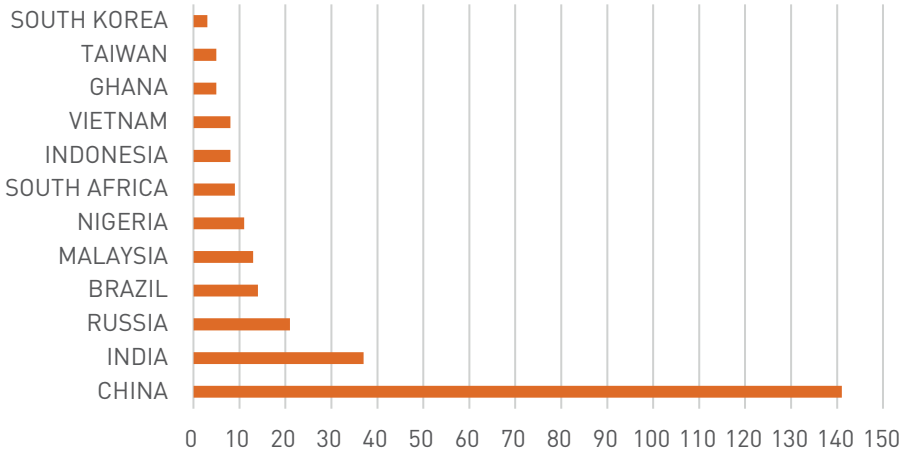
Source: Web of Science.

Figure 2. Value of GB issuance (2014–2020) – emerging countries except China



Source: Climate Bonds Initiatives; diagram made by the author.

Figure 3. The identified number of keywords representing the name of the countries mentioned in the articles'



Source: Scopus; diagram made by the author.

To identify the relevant emerging countries which are the subject of our research the information from two sources were combined. First, data extracted from Web of Science Core[4] collection was structured per country of publication and number of published articles (see Figure 1).

Except for China, Vietnam, India, and Pakistan, the top 10 countries which are publishing papers represent developed economies. Second, the information extracted from and provided by Climate Bond Initiatives[5] was structured in such a way so as to have the value and volumes of green bonds issuance only recorded from developing countries (see Figure 2).

By combining the list of emerging countries which publish papers about green bonds and countries which issued these instruments, the followings were identified for further analysis: India, Russia, Malaysia, Nigeria, Vietnam, Brazil, Indonesia, South Africa, Ghana, and South Korea. This is the only list of emerging countries whose names were mined and identified throughout the articles extracted from Scopus (see Figure 3).

The comparison of the three graphs shows that the trend of papers published by different countries do not follow the same trend of green bonds issuance for the same pe-

[4] Data extracted as of 1st September 2022.

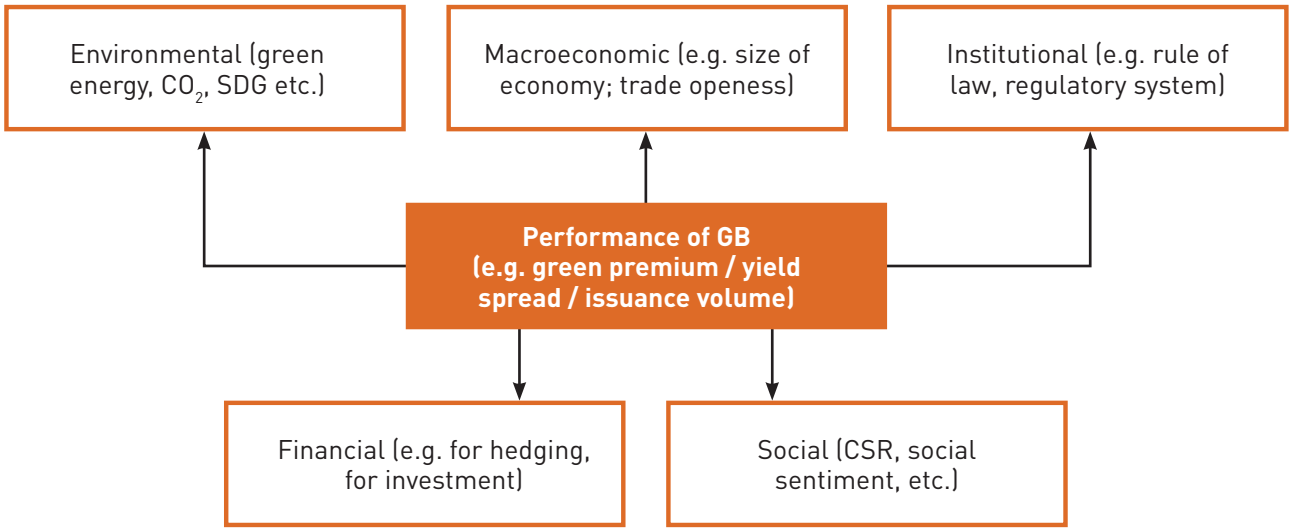
[5] Climate Bond Initiatives is an investor-focused not-for-profit organization which was among the first initiators of providing expertise for promoting and certifying green bonds, which ultimately is an active player for supporting a "transition to a low carbon and climate resilient economy". The activity of Climate Bonds Initiative is concentrated on three main workstreams: green bonds market intelligence; the development and monitoring of the Climate Bonds Standard and Certification Scheme; providing policy models and advice (URL: https://www.climatebonds.net/).

riod, therefore our approach was partially selective for choosing the relevant countries for the current analysis. The selected countries seem to be in a transition process of green bonds market development, where we consider the size of the country, the level of industrial and social development, and the value of the green bonds issued in USD equivalent.

3.2. The drivers of green bonds performance

As presented in Figure 4, a green premium is the central performance indicator for the green bonds. The motivation for understanding the factors affecting the performance of green bonds has arisen from both academic and professional bodies to reveal the efficiency and value growth impact of the new financial instruments used for climate change mitigation. C. Tolliver et al. [6] identified 3 categories of drivers: macroeconomic (size of the economy, stock market capitalisation and trade openness), institutional (capital account openness, rule of law, regulatory quality), and environmental, through 'Nationally Determined Commitments'. 'Social drivers' refers to a wider spectrum of data when it comes to the impact on the performance of green bonds. It can vary from the influence of social networking and social sentiments [12] on the performance of green bonds to the impact of corporate social responsibility (CSR) on it [13; 14].

Figure 4. Classification of the drivers of green bonds performance



Source: diagram made by the author.

Environmental factors seem to be the central research pillar regarding the performance of green bonds with direct and indirect implications on sustainable development and mitigation of climate change. Specifically, increasing and promoting green energy production (in contrast to the reduction of CO_2 emissions) are among the core drivers for green bonds issuance and primary motivations to buy these instruments for both developed and emerging countries. I. Hanif et al. [15] is stressing the importance of issuing green bonds in upper-middle and lower-middle income economies from Asia as a core solution for reducing carbon emissions through building renewable energies production facilities. European countries also participate in this process, where asset managers invest in green bonds, and consider the use of proceeds for acquisition or exploitation of low-carbon assets [16]. Similarly, investment directions are undertaken by Nigerian central authorities who are interested in reducing CO_2 emissions and increasing the production of renewable energy through green bonds financing [17].

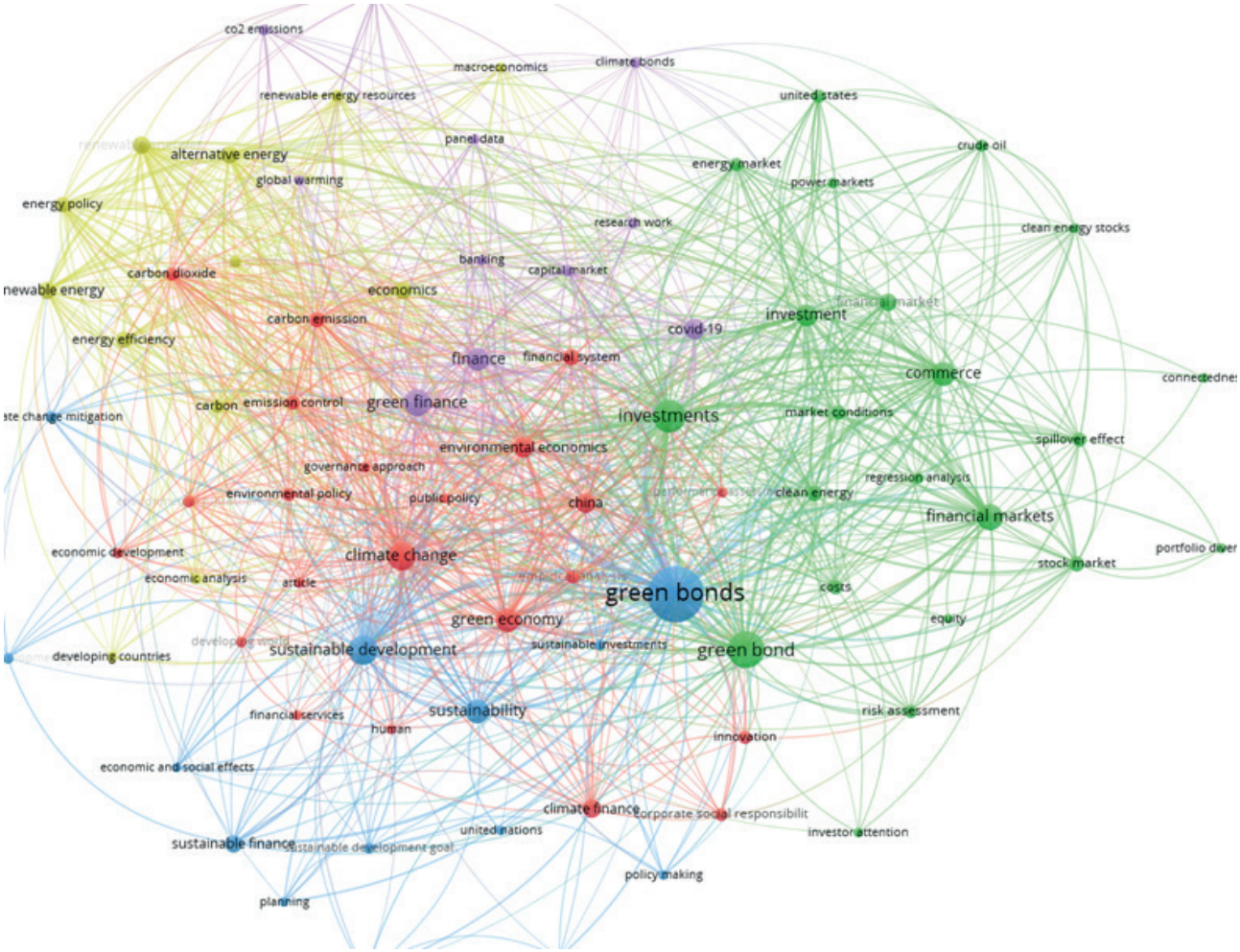
As alluded to previously, financial drivers are analysed in academic publications with a focus oriented more on developed capital markets. Possible reasons include the maturity of the market and data availability for the research. Two streams were identified in this "class of drivers": (1) green bonds as risk management instrument for hedging, and (2) green bonds as an investment class of assets for gaining access to green premiums. In the first stream, most of the authors concluded that green bonds become an important hedging instrument against climate risks, financial risks, as well as rare disasters, such as in the context of the recent pandemic [18–20]. This may be methodologically explained through asymmetric spillover effects between green bonds and other financial markets assets.

Literature research clusters

After filtering and interrogating data at the 3rd and 4th steps of the research methodologies, 328 articles[6] were identified. Then, at the 5th step data was processed through VOSviewer and 5 clusters were obtained shown on the map in Figure 5. In Appendix 2, we present details about keywords structures generated per each cluster.

[6] Data extracted as of 1st September 2022.

Figure 5. Visualisation of key words clusters processed and retrieved through VOSviewer



Identified Clusters:

Cluster 1: Climate change.

Cluster 2: Investments.

Cluster 3: Green bonds.

Cluster 4: Renewable energies.

Cluster 5: Green finance.

Renewable Energies

To identify the relevant articles within the "renewable energies" cluster, we combined the most cited articles and the co-occurrences of the depicted keywords.

With the use of our selection criteria and data processing we have extracted those articles that study green bonds as instruments for financing renewable energy sector while reducing the CO_2 emissions. These papers analyse a wide spectrum of aspects about renewable energy and CO_2 reduction. The authors concluded that CO_2 reduction and an increase in renewable energy production capacities can be achieved through green bonds financing, as per the positive experience of developed countries. These aspects have two implications for developing economies: first, the level of green investments will trigger an increase in GDP (profit will reduce and wages earners receive higher share of GDP), and second, the CO_2 reduction through decrease in coal consumption (especially in China, India) will trigger the increase of green energy production from 42% to 46% by 2030 [21; 15]. Moreover, it was found that to build an efficient green energy infrastructure in Asian emerging countries, an outstanding regulatory system for green bonds market development should be implemented [22; 23; 5].

The "renewable energies" cluster also refers to papers that analyse the impact of various non-financial drivers on development of the green bonds market: GDP per capital, CO_2 emissions and energy consumption in Nigeria [17]; economic infrastructure for public-private collaboration in the renewable energy sector [24]; macroeconomic, fiscal, and social-economic policies to change the flow of subsidies from fossil-fuel energy production to renewable ones [3]; and regulatory constraints about green energy and green finance [25].

To analyse the performance of green bonds in connection with the renewable energy sector, the empirical analysis in most of the articles use country-level data grouped as follow:

- specific developing countries (e.g. China, Indonesia, Malaysia and Singapore);
- mixed data about developed and developing countries without clearly specifying the names of the countries [26];

- mixed data about country specifics where research analysis is made at country level but still research conclusions are presented together [21; 27; 6].

In conclusion, the identified papers in the "Renewable energies" cluster do not explicitly present the quantified performance impact of using renewable energy production for reducing CO_2 emissions for green bonds issuing companies from different countries. Moreover, lack of this empirical analysis is not providing clear evidence about the impact on the performance of green bonds. Researchers share the same academic opinion that the poorly-designed regulatory framework for green finance ecosystem and renewable energy sectors will negatively influence the performance of green bonds market.

Investments

The "investments" cluster has a simple structure which mainly refers to research topics about the performance of green bonds in connection with other financial market drivers. We identified two research directions: (i) green bonds as hedging instruments and (ii) green bonds as investments assets (including portfolio management and design).

Most of the present authors were interested to find out the behaviour of green bonds compared to other financial assets / drivers from the capital markets. On the one hand, it was interesting to see the performance of green bonds correlated to conventional fixed income instruments (e.g., brown bonds, treasury bonds) and on the other hand, the behaviour of green bonds compared to other classes of assets (e.g., green equities, brown equities, price of CO_2, oil price etc.). Therefore, the spillover effect of different capital market assets is among important topics of the performance of green bonds. Most of the authors conclude that green bonds strongly co-move with corporate and treasury bond markets, and weakly co-move with stock and energy commodity markets [28]. The dynamic of the spillover effects is dependent also on different investment horizons. For example, J.C. Reboredo et al. [29] found that strong connectedness persists between GB (green bonds) and brown bonds in short and long periods. [30; 31] identified that spillover effects between green bonds and green equity is short-lived, and that connectedness decreases in the medium and long terms. X. Ren et al. [32] shares a different opinion about the level of relationship between carbon futures and green bonds. They found an asymmetric and strong influence of carbon futures in the medium to long term and an erratic performance in the short-term compared to the green bonds.

Green bonds as hedging instruments have been analysed by researchers for the nature of their connectedness with other capital markets assets, with special attention paid to time-variation and the nature of this relationship. T. Saeed et al. [33] found that clean energy stocks are more effective for hedging than green bonds, especially for crude oil, while W. Kuang [34] presents the different opinion that both green bonds and clean energy stocks provide equal risk diversification benefits for investors when compared to dirty energy stocks. [35; 36] share a similar research opinion about the level of time-frequency connectedness across the global green bond market and other capital markets assets, meaning that a stronger relationship appears only at shorter time horizons. R. Ferrer et al. [35], in their paper state that GB "appears as a valuable tool to fight against climate change without having to sacrifice part of the return generated by traditional assets".

In conclusion, most of the studied authors agree that the dynamics of correlation and spillover effects are dependent on time-variation aspects, and have a negative relationship with specific market assets. This may be presented as follows:

- green bonds vs clean energy markets are asymmetric, and more pronounced during extreme financial markets' downward or upward movements, including COVID-19 pandemic [37; 38];
- green bonds and dirty energy assets (crude oil and energy ETF) with an "average level of return co-movements estimated at the mean/median is 29%, whereas it reaches 65% when estimated at the left and right tails" [33];
- the level of negative correlation (asymmetry) between green and conventional bonds was more pronounced during COVID-19 global pandemic. The authors concluded that "during a black swan event" green bonds have a potential to become an effective hedging instrument for investors in traditional assets [18; 39].

Both research directions (investments and hedging), still do not clearly present the level of relationship between performance of green bonds and other capital markets assets in emerging capital markets. Most of the papers utilise global or European indices datasets to describe the green bonds markets which comprise mixed information about developed and developing countries. Moreover, the structure of global/regional green bonds indices across time changes, which adds more bias to the understanding of the spillover effect on green bonds compared to other assets in emerging capital markets (including also hedging possibilities for these markets).

Green finance and green bonds cluster

Most of the articles within the "green finance" and "green bonds" clusters are focused on factors that affect the performance of the green bonds within different market contexts. Three categories of factors were identified: the characteristics of the green bonds, the corporate financial characteristics of issuer companies, and the macroeconomic factors which include also financial market specifics. M. Nanayakkara and S. Colombage [40] analyse all three factors that impact the performance of green bonds: (i) characteristics of the green bonds; (ii) currency of issuance; (iii) issuer specific characteristics; (iv) macroeconomic characteristics; and (v) capital market risk characteristics. M. Flaherty et al. [41] analyses the performance of green bonds from the perspective of the third category, which specifically refers

to the following: a 3-month treasury bill rate which is used as a proxy for short-term interest, inflation, Chicago Board Exchange market volatility index, long US dollar futures index, and an industrial production index. Z. Li et al. [42] research the performance of green bonds for Chinese companies by considering green bonds characteristics (labeled/non-labeled, rating, type, maturity) and characteristics of green bonds issuer (CSR performance, credit rating, return on equity, EBITDA/interest, and turnover of fixed assets). [43; 44] analyse the performance relationship between green bonds and CO_2 emissions per capita (as a macroeconomic driver) in the top ten economies that support green bonds market development. They conclude that green finance seems to be the most efficient financial strategy for climate change mitigation.

Ranking these factors, we preliminarily conclude that the characteristics of green bonds are the main influential drivers. Macroeconomic factors are the second most influential factors in terms of the performance of green bonds, and thirdly in terms of primacy come the financial characteristics of the issuer.

This conclusion is still preliminary, because it is not clear from the papers what is the magnitude of these factors when analysed separately for developed and developing countries, except for China. F. Taghizadeh-Hesary et al. [45], narrows this gap in their research because they analyse the performance of GB markets in 3 regions: US, Europe, and Asia-Pacific. Their paper is focused on the GB characteristics (rating, maturity, certification) and industry specifics (*Banking & Finance*, *Manufacturing*, *Power & Utilities*, and *Other*). Indeed, the granularity of this analysis is also much higher. The results show that overall risk-return profile of the green bonds in the Asia Pacific region is high when compared to Europe, which is low, and moderate for the US. The impact of sector is also interesting: in Asia-Pacific the banking and finance sector is dominant, while for the US and Europe the sectors of green bonds issuers are balanced.

In addition to the above, this cluster also explores the impact of social networks and investor sentiment on the performance of green bonds for corporate sustainable development. [12] use 'investors sentiment' as a research proxy – i.e. the information processed through Stanford CoreNLP software to measure the sentiment of each posted message. They found that a positive correlation between green bonds index and investors sentiment implies that messages posted in Twitter influence the performance of the index.

The complexity of drivers of green bonds performance are high, therefore the general conclusion is that the financial design of green bonds' issuance for a company should be carefully "projected". The behaviour of the green bond is not fully understood, as it internalises characteristics that include sustainability components. The identified academic papers from this cluster do not divide the countries between developing and developed, except some papers (e.g. [45; 10]) which still provide limited empirical evidence.

Climate change and Sustainable Development

The climate change cluster refers to the general scope and climate targets which were defined during Paris Agreement and later regulated through UN Sustainable Development Goals. These articles mostly refer to the identification and analysis of the green premium as one of the main performance thresholds for green bonds market. In most of the cases, authors identified negative premium when they compare green bonds and conventional bonds considering the same financial characteristics in the primary and secondary markets (e.g., bond type, risk, maturity etc.) [40; 46–49]. This means investors are ready to assume a lower return, and issuers are benefiting from a lower financing cost for sustainable development projects. Other researchers did not find a green premium for these types of fixed income instruments or show little evidence about green premium [4; 50; 51]. Still, the academic opinions did not reach a complete consensus about the existence or non-existence of "greenium".

Such green premium is calculated differently across research papers. For example, [46] has calculated the yield spread at issuance between matched green- and conventional bonds issued by the same company. [4] found a negligible negative premium in their research by calculating through yield spread at the issuance date. [52] calculated and identified a negative premium by using the matching process of daily 'i-spreads' of green-labeled and similar non-green labeled bonds. [53] have used propensity score-matching and average treatment effect to identify the existence of negative green premium on both primary and secondary markets bonds issuance. Generally, in the research about green premiums, authors use mixed information of green bonds market from developing and emerging capital markets e.g. [40]. Separate empirical evidence about the magnitude of green premium in emerging capital markets is limited, except in the case of China [47], which currently is the largest developing country that issues green bonds (approx. USD250 bn, as of 2022[7]).

Green premium is an indirect indicator that measures the risk of 'greenwashing'. Thus, [54] explore in their research the potential sources of greenwashing risk through green bonds issuance. Using propensity score matching (PSM) and a difference-indifference (DiD) regression model, they show how to identify greenwashing risk by analysing the impact of financial and non-financial drivers through performance of green bonds. The side effects of modeling the performance of green bonds can help companies to reduce investment risk in the sustainable projects and increase transparency, thus counteracting the agency conflicts between bondholders and shareholders.

[7] Climate Bond Initiatives.

Table 2. Journals which published articles about performance of GB in the emerging capital markets (nr. of citations and nr. of keywords)

Journals	Citations	Nr. of KeyWords
Energy Economics	436	494
Finance Research Letters	416	286
Journal of Cleaner Production	404	478
Journal of Sustainable Finance and Investment	336	210
Energy Policy	285	314
Sustainability (Switzerland)	252	348
North American Journal of Economics and Finance	92	37
International Review of Financial Analysis	74	163
Pacific Basin Finance Journal	57	32
Environment and Planning A: Nature and Space	51	39
Resources Policy	47	163
Third World Quarterly	41	17
Science of the Total Environment	40	32
Energies	39	126
Asian Economic Policy Review	34	15
Development Southern Africa	27	47
Journal of Asian Finance, Economics and Business	27	68
Emerging Markets Finance and Trade	26	40

Besides the analysis of green premium, this literature cluster also approaches the influence of non-financial drivers on the performance of green bonds. [55] analyse and simulate the level of 'greenness' from the perspective of the following factors: effectiveness of green technology, level of sustainability advantage/disadvantage, level of corporate tax rate, level of assets volatility etc. [6] identify a diversified spectrum of factors that can affect the size of green bonds markets and its issuance volume. In their research, the authors analysed data from both developed and developing countries in accordance with the following variables: macroeconomic factors, institutional factors, the strength of nationally determined commitments. They found that these factors positively affect the level of green bonds issuance volume in both categories of countries.

S. MacAskill et al. [56] provides a systematic literature analysis wherein they identified and classified the factors of green premium according to 3 categories: environmental factors, social factors, and economic factors. Additionally, they revealed that the green bonds characteristics (analysed by different authors) are important drivers of the level of greenness (e.g., bond governance[8], bond credit rating, bond type, study timeframe etc.).

In most of the papers from this cluster, the data used for the analysis is mixed, and refers to both developed and developing countries, without indicating separate performance dynamics of green bonds for a specific country, except in the cases of China or the US. This academic gap should be addressed in future research and a more detailed analysis is needed for specific countries.

Research themes about performance of Green Bonds in emerging capital markets

A methodological approach that combines machine-based content analysis and OLAP principles for data management assists us in the retrieval of relevant articles about

[8] 'Bond governance' refers to those green bonds' characteristics, such as adherence to recognized GB certification standards (e.g. those outlined in accordance with the Climate Bonds Initiative), and the engagement of a third-party reviewer to validate and report on the use of proceeds and adherence to the green bonds principles [56].

green bonds market at country level. The following journals appeared to publish papers about green bonds and selected emerging capital markets considering the cumulative number of citations and the keywords (see Table 2).

Academic and financial market statistics are showing that China is the biggest country in terms of green bonds issuance in the Asian region and second overall worldwide. It is worth mentioning that the academic analysis about the Chinese green bonds market is advanced when compared with other emerging capital markets. From the Scopus database we identified about 36 academic research papers that refer to the Chinese sustainable finance system, representing about 10% of the total number of identified articles.

Reviewing the most cited articles from the data selection, the following research vectors were identified. First, a regulatory framework was used to represent the main driver that propels the performance and market development for green bonds (*especially in the case of Hong Kong as a Global Financial Centre of China (GFCC) in the overall process of institutional legitimacy for sustainability – and influenced by a national policy and financial market forces*) [23]. The next most cited topic refers to the identification and analysis of the green premium. The Chinese green bonds market has a more prominent green bonds pricing premium when compared to other financial systems because of the economic magnitude of the Chinese market [47]. The issuance of green bonds for companies can represent an important signal for stock markets that such companies embrace a sustainable development path, and therefore stocks can react positively. [13] explored this topic and found that Chinese companies issuing green bonds improve its stock prices, increase its corporate financial performance, and strengthen the corporate social responsibility (CSR) position.

Russia, Brazil, India

Academic contributions about the green bonds market in Brazil is limited: from the database only 4 articles were identified, focusing on the market analysis of macroeconomic drivers and regulatory forces. The Brazilian macroeconomic structure has two important industrial pillars: oil and gas and forestry. These sectors require the allocation of sustainable finance resources because of the impact on the social and environmental spheres. T. Ferrando et al. [57] concluded that bivalent dynamics (public-private) of the Brazilian regulatory system for the development of the green bonds market is important to mitigate the erosion of forestry resources. This was the motivation for the first attempts at green bonds issuance, which started with pulp industry. In the same vein [58; 59] are stressing the importance of the impact of macroeconomic context for green bonds market development. The authors identified structural barriers (e.g., unstable macroeconomic environment, inadequate legal protection system for investors, unstable political environment etc.) and market development obstacles (e.g., lower than expected risk-adjusted returns of low-carbon investments, the cost of meeting green bond requirements etc.). Still, empirical analysis in the identified papers is missing, therefore a case-effect of green bonds performance analysis is weak.

Almost all the research papers which refer to the Indian green bonds market were published in 2021, focusing on a wide variety of topics (e.g., performance, regulatory frameworks, etc.). P. Sarma and A. Roy [60] analysed the level of development of green finance market in India, and they found that Indian financial market implemented only 8 out of 18 green finance instruments: green indices, green venture capital, green bond, green loans, green insurance, guarantees, green banking, and risk-sharing tools). Moreover, L. Chakraborty [61] found that introducing sustainable fiscal and monetary policy initiatives in India in relation to green finance can help the country to easily recover after the covid-19 pandemic. R.K. Verma and R. Bansal [62] undertook the only research that empirically approaches the spillover effect of bonds issuance on the stock prices of issuer before and after the date of issue, and authors show positive impact.

Russia has the same pace of GB market development as was the case for India and Brazil. In Scopus, 9 articles were identified about green bonds market in Russia. Most of the papers are classified in the cluster referring to the climate change and sustainable development with the focus on the regulatory framework (4 articles) and general economic context (3 articles). The research direction refers more to the importance of implementation of the regulatory systems in the area of sustainable development, green finance, renewable energy etc. In this sense the Moscow Stock Exchange and the Russian Union of Industrialists and Entrepreneurs (RUIE) signed an agreement to design and compute a sustainable development index. In August 2019 the Moscow Stock Exchange launched the sustainable development sector on its platform [63], and the regulatory framework for disclosing non-financial information [64]. Still, empirical evidence is missing, as well as a separate analysis of the Russian green bonds market. This is a research gap which should be addressed in the future by academics in order to reveal the drivers of Russian GB market quantitatively.

Vietnam, Malaysia, Indonesia, South Korea

Asian countries other than China experienced a strong development of green bonds market comparing to other emerging countries. The leading country within this region is South Korea, which in the last 10 years issued about 27.7 billion USD[9] of green bonds. Nevertheless, the number of published papers about the performance of green bonds is low. Two articles were identified about the green bonds market in Korea: one referring to the growth duality of green innovation and green finance in Asia (including Korea) and the other referring to the relationship between cost of capital and climate risk (published in the Korean language). C. Tolliver et al. [65] found that green innova-

[9] Climate Bonds Initiative.

tion and green finance (especially green bonds) in South Korea "go hand in hand" to ensure sustainable development of the country through competitiveness.

From the selected database we identified only 4 articles about the Indonesian green bonds market which were published in 2020. The research is focused on the general macroeconomic context of the country which should be reoriented towards sustainable development through green bonds market development. First, the use of proceeds from issuing green bonds should be addressed to increase green energy production capacities of the country and to invest in energy efficiency projects. Second, the authors found that to effectively implement the Paris agenda, a proper regulatory framework should be implemented in the country [66; 25; 22]. Moreover, [67] is showing that an enhanced regulatory system with regard to the transparency and to traceability of the funds used to finance green projects plays a key role in furthering green bonds market development in Indonesia.

The Malaysian green bonds market is better positioned in the region. This idea is supported also by the number of papers published, mainly in 2020 and 2021. Most of the research topics relate to the climate change and sustainable development cluster which specifically refers to the importance of setting an efficient regulatory framework for green *sukuk* market development. It was found that J.S. Keshminder and M.S. Abdullah are the authors with particularly high interest in working together on this research area, they published together 3 out of 7 identified articles.

[68; 69] stress that financial markets have limitations about the issuance and role of green sukuk to finance climate projects. Therefore, the greenwashing risk for international investors is still high. The big challenge is to integrate the green sukuk into the overall context and principles of Islamic finance, and in parallel to achieve the target and objectives of climate change in Malaysia. Furthermore, M.S. Abdullah and J.S. Keshminder [70] refer to the role of policymakers to explore the importance of green sukuk for country competitiveness, legitimation, and ecological responsibility. This aspect, in fact, will influence the performance of the Malaysian green sukuk and green bonds markets. N.H. Noordin et al. [71] analysed and compared the differences between the terms and conditions of green sukuk principles, and the information memorandum and principles of the International Capital Market Association's Green Bond Principles (GBP). They found that such differences are affecting the optimal functionality and overall performance of green bonds market in Malaysia.

The above aspects show that in the Asia region green bonds markets are still under-developed and where the focus is not on the financial performance of the green assets (empirical evidence is still missing) but on the efficiency of its functionality which in the end represents a research gap for the whole region.

Kenya, Ghana, Nigeria, South Africa

The green bonds market in Africa has the lowest level of development compared to the other regions because of the low level of economic development and low degree of industrialization. Even though that is a challenging situation, the African financial community is currently discussing the importance of different forms of sustainable finance to cope with Paris agreement and to achieve sustainable development goals. This is because the pollution, the environmental damage, and global warming do not have any geographical borders.

As for other emerging countries, the use of proceeds (especially in relation to renewable energy projects) represents the scope and reason behind the issuance of green bonds in Ghana. [72; 73] interviewed CEOs, directors, managers, and financial analysts (which belong to financial institutions) in order to understand the motivation for issuing/buying green bonds. They found that "good credit ratings, provision of local guidelines, proper green qualifications criteria, and prioritizing viable projects" are the most important factors that affect green bonds market development. Similar factors were identified by [17] for the Nigerian market. The authors show that commitment to reduce CO_2 emissions assumed by the ministry of finance and the ministry of the environment is the main motivation to issue green bonds, and to finance renewable energy projects.

[74; 58; 45] showed that South Africa, together with Kenya and Nigeria (as economic hubs on the African continent) are among the initiators of issuing green bonds in the region. Thus, private-public partnership, integrated policies, and effective and optimal institutional frameworks will help these markets to develop and attract more green finances for their national and regional climate projects.

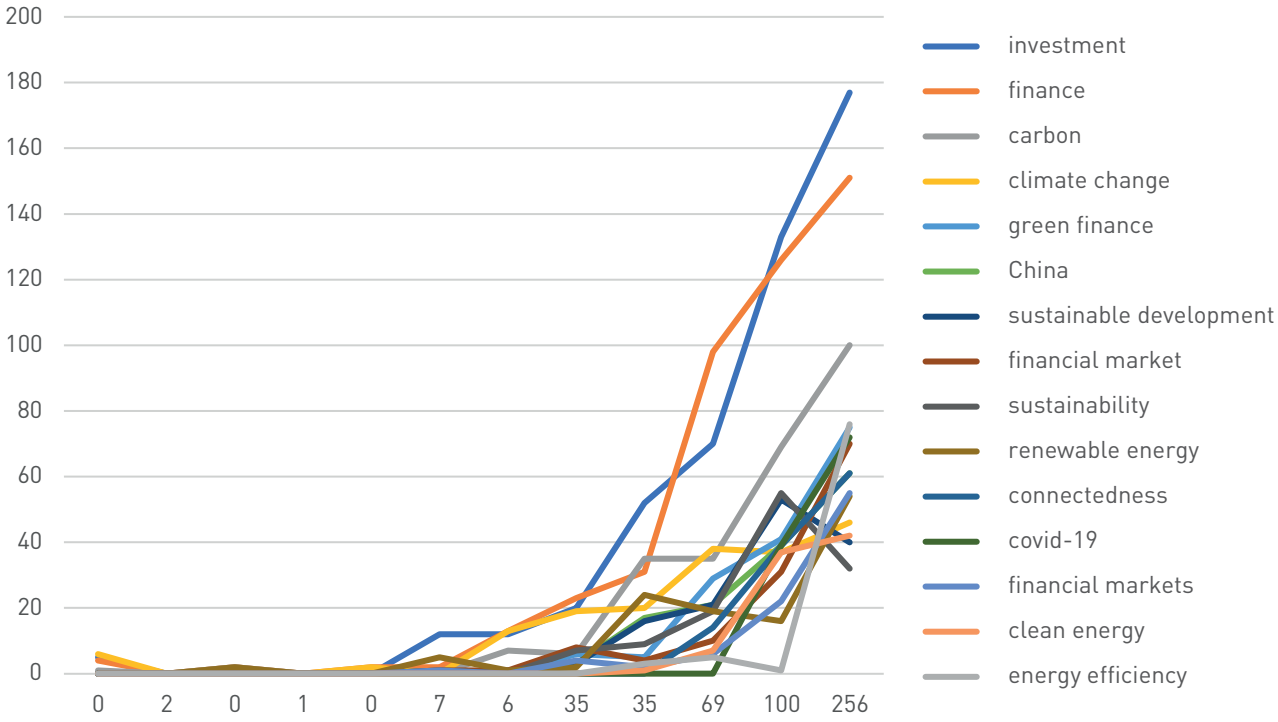
Empirical evidence about performance of green bonds in the emerging capital market is poorly developed, indeed the level of market development and financial trading dynamics are low, and therefore the quantitative analysis is limited. However, an empirical analysis of green bonds market performance can be undertaken for small geographical clusters (e.g. Asian developing countries, Eastern European countries, African countries etc.). This type of analysis can be relevant also because of the role of multilateral development banks (e.g., focused on the global south) which attempts to foster alternatives to the Bretton Woods institutions, for example the New Development Bank, the Asian Infrastructure Investment Bank etc. These types of financial institution are interested in stimulating these regions and capturing information about the green bonds market development especially in the emerging countries [58].

The future research trends of Green Bond's performance in the emerging capital markets

Machine-based content analysis is a complementary method to classical approach to literature review [75]. To identify the trends of the future research direction, an evolution of keywords was considered. Based on the data extracted from Scopus, which was processed through VOSviewer the obtained results were structured and organised using OLAP principles with the help of VBA programming through spreadsheets.

The results shown in Figure 6 conclude that sustainable finance, dominated by green fixed income bonds, are instruments designed for "investments", whose scope is for "financing" project to reduce the "carbon" emissions and to mitigate "climate change" in respect of "sustainable development".

Figure 6. Visualisation of key words trends extracted through OLAP principles from Scopus database and VOSviewer



Source: Graph made by the author.

Future academic research will continue to develop in two directions: (1) investments direction (to buy/issue green bonds for investment purposes); (2) non-investment, to finance organisational sustainable development paths. The first conclusion that may be drawn is that investors are not keen to get immediate financial benefits by investing in green bonds, rather than participating and involving in the sustainable development, climate change and supporting transition to a net-zero economy. Due to this reason, the green premium is the financial measurement performance addressed towards medium- and long-term investments. It seems that this trend in the research will continue because of the high complexity of the green bonds market and low level of regulatory framework development, especially in emerging capital markets.

The second conclusion is that "China" and European countries will continue to develop the green bonds market more than other regions in terms of both corporate and government organisation. The main instrument for promoting and implementing the European "Green Deal" program are green finances. China is contrary to Europe, which is the one biggest consumer market in the world[10], in that China is one of the biggest manufacturing markets in the world[11]. This is one of the main reasons why China and EU countries will continue in the future to develop more green bonds markets in order to redesign both the macroeconomic processes towards sustainable development and net-zero economy.

The third conclusion is that sustainable bonds are still dominant when compared to financial "renewable energy" industries. This will also continue into the future and will act indirectly as a "CO_2 emission control" instrument. The identified research topics and future academic direction show that the empirical evidence about the performance of green bonds and its spillover effect is still limited, especially for the energy sector and for emerging capital markets. In fact, this represents a research gap which should be considered in future studies as the green bonds market in these regions is developing rapidly. The fourth conclusion refers to the role of the "COVID-19" pandemic in accelerating the development of the green bonds market and green finances towards mitigation of climate change vectors. The accelerated trend of the "covid-19" keyword in 2021 (and partially in 2022) in the context of green bonds academic literature analysis is evidence of this. The general keywords trend analysis is showing that the research direction is almost similar with the keywords trend of the selected emerging capital markets.

[10] World Bank: Household final consumption expenditure.

[11] WEF: https://www.weforum.org/agenda/2020/02/countries-manufacturing-trade-exports-economics/

Conclusions and implications

The representation of the performance of green bonds in the academic literature research has different facets. The most common measurement is through "green premium" or *greenium*, always calculated in contrast with the conventional bonds or so-called brown bonds. Performance is represented also through the spillover effects in connection with other financial/capital markets instruments (e.g. oil price, green stocks, IT stocks, etc.). Some academic papers are analysing the green bonds performance in connection with economic, non-financial factors (e.g., FX rate, adherence of the country to OECD, level of development of regulatory system etc.). Thus, our first conclusion is that the performance of green bonds has a multifaceted character, and to reach a scientific consensus through the empirical analysis about it is difficult.

The analysis of the current academic contributions, focused mainly on emerging capital markets, presents the concern about the low level of regulatory framework in these countries. Indeed, ambiguous legal frameworks and lack of motivation from local or central authorities will increase the level of uncertainty about a country's sustainability policies and strategies (e.g., to meet 2030 climate targets, transition to net-zero economy, etc.). The second conclusion is that these market realities might have a double negative effect: high performance risk for green finances and barrier for the development of green bonds market.

'Performance' in the context of our research does not mean only the premium, coupon, or any other direct performance measurements. It also refers to those drivers which indirectly might affect its dynamics and further attractiveness to investors and willingness of issuers to attract green finances. We identified the following categories of drivers: macroeconomic, social, environmental, institutional (regulatory), and financial. Our third conclusion refers to the low predictability of green bonds performance in emerging capital markets. It is difficult to measure performance because it internalises the effects of all the stated drivers which are highly dynamic in developing countries (e.g., high inflation, low economic stability, high FX volatility, political instability etc.).

Emerging capital markets have a wide variety of social, financial, macro-economic, and political specifics that do not allow analytics and/or academia to identify a pattern of green bonds market development. Consider the economic contrast between Russia and Malaysia: these two countries have almost identical levels of green bonds issuance, but the nature of the instruments are completely different because of different financial principles of adherence (green bonds vs green sukuk). Additionally, we may exemplify the contrast of the green bonds market development between China and India. Different green bonds market dynamics, levels of instrument performance, and different levels of regulatory contexts of the sustainable finance markets make up the big difference between India and China, which are ranked among the global leaders in terms of bonds issuance. Due to these reasons the performance drivers and factors for green bonds markets are diversified and specific for each country. The fourth conclusion is that green bonds issued by organisations from "emerging capital markets" should not be analysed in a systematic manner from a geographical perspective. The analysis should be done for individual countries (e.g., China) or small cluster of countries (e.g., East European countries) depending on the macroeconomic characteristics and level of green bonds market development.

We finally conclude this academic review with the observation that non-financial factors mostly affect the performance of green bonds in emerging capital markets while the financial factors dominate the performance of green bonds in developed countries. Indeed, once the financial markets are mature, stable, and sufficiently regulated (included in terms of transparency) the flow and availability of capital is much higher. The competition between different types of capital is much higher in developed countries, therefore, the academic community is more concerned about the financial drivers affecting the performance of green bonds. The level of financial markets regulations and their transparency, the national regulatory framework for sustainable finance, macroeconomics drivers, and the existence of tax stimulus are among the factors international investors are looking at when deciding whether to invest in green bonds in emerging-market countries.

Limitations of this academic review include non-homogeneity of the data for empirical analysis (e.g. the sample size, timeframe, mixed financial data from developed and emerging capital markets etc.), and so the conclusion about influential non-financial factors should be addressed further. This will be possible only with the continuous growth of the green bonds market, which will bring more availability of robust data sets. Also, in this review we analysed only English language papers. In future research, this limitation might be addressed, especially those papers which refer to a country regulatory framework where the local language is needed for a better legal understanding.

In view of the methodology of the machine-based content analysis, it can be concluded in preliminary terms that future trends in the academia research will not be focused on the purely financial performance of the green bonds but on the role of such instruments in terms of sustainability. Following this logic, in the future we expect to see more issuance of green bonds in both developing and developed countries in order to achieve the climate targets set out in the Paris Agreement. The volume will increase as the formal "climate deadline" is getting closer (by 2030).

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Appendix 1 (VBA code for keywords data retrieve)

```
Function NrAparitii(ByVal FindText, ByVal InText)
vNrAparitii = 0
vInText = IIf(IsNull(InText), "", InText)
vFindText = IIf(IsNull(FindText), "", FindText)


lgInText = Len(vInText)
lgFindText = Len(vFindText)
If lgFindText <> 0 Then

   If lgFindText > lgInText Then
      vNrAparitii = 0
   Else
      PosInit = 1
      Pos = 1
      While Pos > 0
         Pos = InStr(PosInit, vInText, vFindText, vbTextCompare)
         If Pos > 0 Then
         vNrAparitii = vNrAparitii + 1
         PosInit = Pos + lgFindText
         End If
      Wend
   End If
Else
vNrAparitii = 0
End If
NrAparitii = vNrAparitii
End Function
```

Appendix 2

Green finance	Renewable energies	Investments	Green Bonds	Climate change and Sustainable development
Banking	alternative energy	clean energy	carbon dioxide	bond yield
capital flow	carbon	commerce	carbon emission	climate change
capital market	developing countries	costs	climate finance	climate change mitigation
Certification	economic analysis	crude oil	developing world	environmental protection
China	economic growth	energy market	environmental economics	green bond
climate bonds	economics	energy markets	environmental policy	green financing
conventional bonds	emission control	financial markets	finance	planning
corporate social responsibility	energy policy	green economy	financial services	risk assessment
covid-19	europe	investment	fintech	sustainability
credit rating	financing	investments	global warming	sustainable development
empirical analysis	fossil fuels	investor attention	governance approach	sustainable development goal
financial market	macroeconomics	market conditions	green bonds	sustainable development goals
financial system	renewable energies	power markets	innovation	sustainable finance
green bond premium	renewable energy	spillover effect	municipal bonds	sustainable investments
green finance	renewable energy projects	stock market		
panel data	renewable energy resources	united states		
performance assessment				
regression analysis				
research work				

Structure of the keyword's clusters generated by VOSviewer.

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