

Empirical Model for Estimating Sustainable Entrepreneurship's Growth Potential and Positive Outlook

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Abstract. In recent years, the expanding concern of environmental, innovative, and sustainable development has advanced sustainable entrepreneurship. Hence, sustainable innovative entrepreneurship can be considered as a running space for business development, auditing, data analytics, and validation practices with modern, positive, and competitive initiatives. The main aim of this paper was to consider the role of Pearson's ρ as a quality measure initiative on sustainable entrepreneurship growth dynamics, reflecting the strength in and direction of the linear relationship between the corporate's EBIT profit and several quality corporate factors related to the sustainable growth potential with a positive outlook. A new ρ -based empirical econometric model was proposed, tested on a Western Balkans case study, and validated. Applications and implications of the model are considered in the context of corporate sustainable profitability with a social footprint.

Keywords: sustainable entrepreneurship, econometric analysis, economic growth potential, key performance indicators, empirical early warning model.

1. Introduction

The term "sustainable entrepreneurship" dominates in recent years in corporate finance and business administration. In this article, the concept of "*sustainable innovative entrepreneurship with growth potential and positive outlook*" was introduced as a key element of this hot term.

Also, the index "*sustainable growth dynamics*" which estimates the sustainable growth dynamics of profitability of one innovative business was introduced. As a prerequisite for a reliable operation of this index, the hypothesis that innovative companies provide more favorable ground for greater growth of corporate operating profit (EBIT profitability) with a social footprint was considered.

The "*sustainable innovative entrepreneurship with growth potential and positive outlook*" concept expresses the sustainable growth potential (dynamics) of corporate profits as well as the positive outlook. This dynamic is non-linear since the process of corporate profitability is complex with the participation of many non-linear parameters

(production process, costing, human resources, technology, lending, etc.). In the context of this article, however, the concept was considered in its linear dimension as expressed by corporate operational EBIT profit (earnings before interest and tax, i.e. corporate operating profit) and relative parameters related to the viability of corporate profitability (quality management, innovation, eco-innovation, etc.).

1.1. Sustainable innovative entrepreneurship

Sustainable entrepreneurship can be considered as business development practices with a positive outlook, and innovative functionalities (Soltysik et al., 2019). Companies increasingly focus on and direct their competitive position through creative actions, leadership, originality, and initiatives in the field of sustainability (Chovancová and Vavrek, 2022).

Sustainable or eco-innovation is any innovation resulting in serious and symbolic progress approaching the “sustainable growth” target, by reducing the environmental impacts of manufacturing and production, as well as increasing nature’s flexibility to environmental tensions and natural resources (Eco-innovation Observatory, 2022). Sustainable innovation is also a competitive space and hope for enterprises. Eco-innovation helps encapsulate new growth opportunities, leads to reduced costs, and strengthens the corporate’s image with a positive outlook.

Also, it can be declared that sustainable entrepreneurship provides new opportunities for the development of corporate responsibility (CSR) with great innovative initiatives, behavioral culture, and corporate functionalities with a social footprint (Streimikiene et al., 2009; Nikiforova and Bicevska, 2018). CSR-like thinking principles determine the organization’s philosophy thus enabling focus on customers and manufacturing according to customer demand (Nikiforova and Bicevska, 2018).

1.2. Europe’s innovation growth potential and outlook

The European economy needs a productivity uplift and improvement from sustainability, innovation, dispersion, and dissemination of digital high-tech technologies to support their flexibility, growth, and positive outlook (Karnitis et al., 2018; Karnitis et al., 2017). Hence, “the European Union needs to advance and stimulate the transformation of good ideas into people-friendly products and services by removing economic and regulatory fences and promoting awareness and investments” (Bughin et al., 2019).

While the EU still has considerable energy, power, and durability functionalities, it is really falling in adopting and investing in digital innovations, digital documentation, historical living systems, science management, and environmental policy (Styliadis et al., 2003; Styliadis, 2007; Hasanagas et al, 2010a; Hasanagas et al., 2010b).

According to Bughin et al. (2019) the five (5) ways in which Europe could disseminate its sustainable and innovation initiatives are:

- Europe Union must draw on its industrial durability and energy to benefit from its spread and the dispersion and dissemination of innovative hi-tech initiatives across supply chains, blockchain technologies, distributed ledger databases, data centers, validated data analytics, etc.
- Europe Union must rethink big data, metadata, information, data analytics, and user access and standards to level the playing field, connect data pools, and protect citizens’ personal data and rights (i.e. data science applications).

- Europe Union must use its substantial public-sector acquisition spread to advance innovation of digital products, applications, standards, and services.
- Europe Union must try to refund for dissolution and decentralization with blockchain technologies, distributed ledger technologies (DLT), openness and connectivity, incorporating high-skill immigration flows, connecting local ecosystems, etc.
- Europe Union must control, leverage, and advantage the spread and scale of global firms to its benefit.

In this domain, by supporting new initiatives, projects, technologies, kickoffs, and start-up companies that make business on a leading-edge, sustainable eco-innovation, Europe optimizes its growth potential and positive outlook while addressing critical threats such as resources insufficiency, economic and financial crises, climate change, deflation, and recession biodiversity (Eco-innovation Observatory, 2022).

2. Related Work

2.1. Sustainable innovative entrepreneurship

The international literature on sustainable entrepreneurship growth is very important and rich, but there are no references to any theoretical or empirical approach based on Pearson's correlation coefficient (ρ), i.e. the key parameter of the proposed in this article model that formulates and estimates corporate development dynamics for a sustainable EBIT profitability, while at the same time highlights the company's positive outlook.

International trade investments as growth stimulators in transition economies (the case of Western Balkans) are well explained in Tsitouras, Koulakiotis, Makris, and Papapanagos (2017). Also, the innovation functionality of political elections, abnormal returns, and stock price volatility are discussed in detail, with projections to the Balkan area, by Koulakiotis, Papapanagos, and Papasyriopoulos (2016). In this domain, Fotopoulos, Papapanagos, and Siokis present in detail the determinants of the foreign banks' expansion in the south-eastern Europe Western Balkans area (2016).

The non-parametric efficient frontier methods, such as data envelopment analysis, free disposal hull, as well as more advanced mathematical tools like order- α frontier analysis, find great application in the field of efficient (frontier) productivity evaluation, regarding regions in developing countries. Particularly, these mathematical programming methods allow evaluation of the effectiveness of regional spatial aspects. In recent studies, efficient frontier methods are applied to evaluate regional policy issues of the European Union (Dzemydaitė and Galinienė, 2013).

The global pandemic, which began in 2020, ushered in a significant time in the hi-tech fields of computing, information technology, and data sciences, when the performance of work duties, the receipt of services, and mutual communication became most directly dependent on information and communication technologies (Cakula and Pratt, 2021; Gorbunovs, 2021). Obviously, this new digital work environment poses new problems and challenges for business leaders in duty for sustainable entrepreneurship with growing functionalities (Wauchope et al., 2021; Bicevskis et al., 2021; Knez et al., 2022; Karnitis et al., 2023).

In the sustainable entrepreneurship research domain, the linear relationship

between eco-innovative management/entrepreneurship and corporate finance in the post-pandemic world has been reported recently (Basdekidou, 2022). Also, studies have recently been published for sustainable innovative entrepreneurship terms like “fashion design thinking and education”, “corporate digital transformation”, “corporate metaverse transformation”, “green entrepreneurship”, and “work-from-home entrepreneurship” (Zarina, 2020; Basdekidou, 2021). In this field, the initiation of the term “agile entrepreneurship” as a new concept, demonstrates great innovation functionality in sustainable entrepreneurship, particularly in transition economies like Western Balkans (Basdekidou, 2021).

The *shadow economy* occupies a large percentage of economic activity globally (and particularly in Western Balkans countries) and remains a significant problem in post-Soviet countries and less economically developed economies. “Even though there are a lot of economic and social arguments for the emergence of the shadow economy, it remains the question of how much of the *shadow economy*, as well as an intrinsic willingness to pay taxes, could be explained by social norms, business ethics, and illegal business practices that come from the cultural and historical background” (Dzemydaitė and Savilionytė, 2018). So, the structure, spread, and functionalities of the *shadow economy* must be examined as a moral dilemma and a non-linear parameter when dealing with an econometric early-warning model for corporate profit dynamics and outlook with social footprint.

Finally, Basdekidou discusses corporate management in Greece in the context of sustainable entrepreneurship and the recent debt crisis (Basdekidou, 2015), and a sustainable innovative entrepreneurship project in *Lahanokipoi* area of Thessaloniki, Greece (Basdekidou, 2007).

But even though the term “*sustainable innovative entrepreneurship*” has been covered in detail, no literature is discussing approaches to formulating and estimating corporate development dynamics for sustainable EBIT profitability with a social footprint. Obviously, it is difficult to establish a powerful and prosperous theoretical method to formulate the underlined relations and to measure the level of financial constraints and regulations for innovation, business growth potential, and corporate outlook (Moder and Bonifai, 2017; Bicevskis et al., 2021; EBRD, 2021).

In the last decade, however, the literature in this domain and data analysis tools have been extended to include open access databases, spatio-temporal big data, remote data centers, data analytics tools, distributed knowledge networks, and inter-Europe, cross-country firm-level surveys, providing an increasingly reliable source of data, metadata, information, and high-tech functionalities like blockchain and distributed ledger technologies (DLT) for evaluating the “*sustainable innovative entrepreneurship with growth potential and positive outlook*” concept’s conditions (Knez et al., 2022; Szelaowski and Lupeikiene, 2020; Karnitis et al., 2023).

2.2. Corporate determinants as sustainable growth parameters

A considerable body of literature has been devoted to assessing corporate primitive determinants (factors), like the micro-level characteristics and macro-level indicators, as sustainable parameters for evaluating entrepreneurship growth dynamics and positive outlook. The most influential research in the past few years has been the extensive work carried out by the World Bank and the European Bank for Reconstruction and Development (EBRD, 2021).

Bibliography refers that publicly listed and single-owned enterprises (companies) with not quality corporate primitive determinants (like an ecological footprint, flexibility on digital transformation initiatives, low-dependence of bank loans/non-performing loans, quality auditing, quality data analytics, CEO/government effectiveness, etc.) are more possible to face difficulties in obtaining finance from external resources like the stock markets, whereas sustainable, innovative, and/or audited firms are less likely (Thomadakis, 2016).

Primitive determinants, i.e. first-level corporate key performance indicators (KPIs), in relation to the corporate operational profit (EBIT) cannot, however, fully explain the “sustainable innovative growth dynamics” procedure as a linear relationship; even more, the credit, structure, status, and quality of eco-innovative management with growth potential and positive outlook. Also, a higher share of NPLs (nonperforming loans), proxied by the ratio of loan/credit loss reserves to total loans/credit, leads to a lower probability of banks being willing to support them financially (Thomadakis, 2016; Moder and Bonifai, 2017). Furthermore, inflexible, and narrow capital requirements, as well as a larger presence of foreign banks, obviously worsen access to external financial support (Thomadakis, 2016).

Firms can face much fewer financial difficulties if they operate in a more disciplined innovative ecosystem with corporate primitive determinants as sustainable growth parameters (Karnitis and Karnitis, 2017; Karnitis et al., 2021).

3. Entrepreneurship sustainable growth framework

The study's framework was based on a quantitative research design with primary (EBIT and corporate data for sustainable growth parameters) and secondary data (Pearson's correlation coefficient values).

3.1. Aim

Setting as an aim the sustainable increase in corporate operating profitability with a social footprint, the main goal of this paper was to introduce an empirical model equation for formulating and assessing a corporate's sustainable growth potential and outlook.

So, the introduced concept of “*sustainable innovative entrepreneurship with growth potential and positive outlook*” can be used to initiate new spaces, hopes, and opportunities for a company's growth dynamics with corporate social responsibility (CSR), renewable energy initiatives, modern flexible leadership, cutting-edge technologies like data analytics, and digital learning for business purposes (Karnitis and Karnitis, 2017; Zarina, 2020; Gorbunovs, 2021).

In the section “Results and discussion” the proposed econometric framework was tested on several conventional and innovative Eurozone firms and Western Balkans companies, discussed and its reliability validated.

3.2. Statement

Sustainable entrepreneurship development (growth) should be described by an econometric model (equation) using as an assessment unit the Pearson correlation coefficient (PCC).

The PCC ρ values were used as a measure of the linear correlation between two appropriately defined sets, set A (historical values for the corporate operating profit as a measure of the company's success and growth potential) and set B (series of historical data for several corporate factors as sustainable growth parameters/corporate KPIs) (Karnitis et al., 2023; Wauchope et al., 2021). For the corporate operating profit, the EBIT (earnings before interest and tax) values were preferred over PBT (profit before tax) because they better reflect the financial success of a business (Basdekidou, 2015).

Properly selected corporate factors can better reflect the growth dynamics of a company as they reflect the strength and direction of the linear (EBIT/sustainable growth) representation and could evaluate the quality (i.e. the healthy and sustainable dimensions) of entrepreneurship's growth dynamics potential. Hence, all the parameters involved in the proposed framework for the econometric model (equation) must be detected, estimated, and documented. (Beck et al., 2005; Bicevskis et al., 2021; Karnitis et al., 2023).

The framework of this model equation was defined as follows: On the left side, recording (measurement) of the company's development dynamics on a healthy and long-term basis; and on the right side the ρ values for several of the company's characteristics, indicators, conditions, parameters, and opportunities (Soltysik et al., 2019). As weighting factors in the elements of the equation, temporal-defined values were used (Karnitis et al., 2021; Karnitis and Karnitis, 2017).

3.3. Hypothesis

With the aim of formulating and assessing entrepreneurship sustainable growth potential and outlook, the following hypothesis is assumed:

«Sustainable innovation (eco-innovation) increases business functionality when it is projected on the *sustainable growth potential with positive outlook* axis».

Hence, the hypothesis raised considers that the metrics of healthy and sustainable entrepreneurship development deliver better results to innovative businesses and are strongly correlated to several quality firm characteristics, banking indicators, macro-economic and micro-financial conditions, company governance parameters, and access-to-finance opportunities (Karnitis et al., 2022; Kubiszewski et al., 2021; Moder and Bonifai, 2017).

3.4. Applications

The proposed econometric model would be used in many corporate applications (e.g. new energy policy with a reduction in dependence on natural gas and oil, investments in renewable technologies, introducing a new data analytics department, debt restructuring, etc.) in the context of viable profitability with a social and environmental footprint, because building sustainable products and services is beneficial to people and planet (sustainable profitability) (Streimikiene et al., 2009; Karnitis and Karnitis, 2017; Urbaniec, 2018; Karnitis et al., 2021).

4. Methodology

The proposed methodology analysis was based on the Pearson Correlation Coefficient (PCC, ρ) as a measure of linear correlation between two sets of data: (set A) corporate operating profit (EBIT) data; and (set B) corporate data as sustainable growth KPI parameters related to the following six entrepreneurship categories (i) firm characteristics; (ii) banking indicators; (iii) macro-economic conditions; (iv) micro-financial conditions; (v) company government parameters; and (vi) access to financial opportunities, that influence a healthy and sustainable entrepreneurship growth potential (Karnitis et al., 2022; Osmond and Corkery, 2017).

Hence, for each of the above six corporate KPIs ("metadata constraints"), a value of the ρ was estimated as a quality index of a healthy and sustainable company's growth potential reflecting the strength, in the same direction, of the linear relationship (corporate EBIT/company's sustainable growth that is affected by the specific quality KPI corporate parameter). Also, the sum of the six ρ , after applying the appropriate weighting factors per category, was thought to represent a metric for a healthy and sustainable entrepreneurship growth potential.

4.1. Econometric analysis

The proposed model for the econometric analysis of sustainable entrepreneurship development metrics was focused on net business profit (PCC/set A), and the following six corporate factors as sustainable growth KPI corporate parameters (PCC/set B):

- Firm characteristics (Ecological footprint; Flexibility to high-tech improvements; Reducing dependence on natural gas/diesel/electric power prices) (Figure 1: Top-left) (Beck et al., 2005).
- Macro-economic banking sector indicators (Reducing dependence on bank loans; Reducing summary of non-performing loans) (Figure 1: Top-right) (Basdekidou, 2015; Fotopoulos et al., 2016).
- Macro-economic conditions (Reducing company's deficit and debt; Increasing company economic activity and credit) (Figure 1: Middle-left) (Kuntchev et al.; Basdekidou, 2015).
- Micro-financial conditions (Reducing the company's operation and product development costs; Increasing job positions/personnel) (Figure 1: Middle-right) (Thomadakis, 2016; Bughin et al., 2019).
- Company governance parameters (Human resources/specialized jobs; Internal control procedures; Auditing quality; Government effectiveness; Reducing dependence on corruption) (Figure 1: Bottom-left) (Dzemydaitė et al., 2013; Dzemydaitė et al., 2018) and
- Access to finance opportunities (Funding flow efficiency; Funding quality; Possibility of international financing on competitive terms) (Figure 1: Bottom-right) (IMF, 2015; Tsitouras et al., 2017).

4.2. Model equation

The proposed empirical econometric model was formulated from the six KPIs and it was set up as follows:

Sustainable entrepreneurship growth dynamics (metrics) =
 $\alpha_1 \times \text{PCC } \rho$ (Firm characteristics) +
 $\alpha_2 \times \text{PCC } \rho$ (Banking sector indicators) +
 $\alpha_3 \times \text{PCC } \rho$ (Macro-economic conditions) +
 $\alpha_4 \times \text{PCC } \rho$ (Micro-financial conditions) +
 $\alpha_5 \times \text{PCC } \rho$ (Company governance parameters) +
 $\alpha_6 \times \text{PCC } \rho$ (Access to finance opportunities),

where α_i are the coefficients of gravity in the equation (weights). These α_i coefficients are temporal-defined weighting factors (i.e. depending on the current economic situation).

The PCC ρ values reflect the strength and direction of the linear representation (company's EBIT historic data/series data per corporate's growth parameters) and estimate the "quality" (i.e. the healthy and sustainable dimensions) of entrepreneurship's growth potential.

The above equation is utilized in the following "Results and discussion" section. For the Western Balkans case study, it was exercised on an individual basis per company in the context of a historical study of the change in corporate operating profit (series of EBIT data) in combination with the six KPIs (series of corresponding corporate data).

Also, this model equation could be used, with mean values, in a study of the sustainable dynamics of a corporate group (group of companies) operating as a collection of parent and subsidiary corporations that function as a single economic entity through a common source of control. These types of groups are often owned by a holding company and their forming usually involves consolidation via mergers and acquisitions after assessment of the development perspective (another application field for the econometric model).

5. Results and discussion

European Union firms and Western Balkan companies are financially constrained when they are unable to support future investments through an internal mechanism (IMF, 2015; Urbaniec, 2018). Hence, the concept of "*sustainable innovative entrepreneurship with growth potential and positive outlook*" is entitled to particular importance in the perspective of seeking sustainable practices for the development of corporate profitability and financing in difficult economic times.

Given the low levels of available financial information in many emerging transition economies, survey-based research becomes critical and crucial, particularly regarding small or/and medium-sized enterprises (SMEs) (Kuntchev et al., 2014). This seems to be the case, especially in emerging markets (for instance, the Western Balkans economies).

Primary data. The proposed model equation has been tested on a Western Balkans case study. For this study, primary data was obtained through a quantitative survey. Particularly, the corporate operating profit data (EBIT) for the last ten years (2012-2021) was obtained, in July 2022, from the ECD index for the Eurozone countries, and from the World Bank and European Bank for Reconstruction & Development (EBRD) for Greece and the Western Balkans countries with emerging economies.

Additional data collecting procedure, for the six corporate factors as sustainable growth parameters and for the same 10-year trial period, was operated between January - September 2022 for data mining from (i) EDB index (easy doing business) for European

companies; (ii) firm-level surveys and interviews with small and medium-sized firms for Greek companies; and (iii) BEEPS datasets (EBRD and World Bank past surveys) for Western Balkans companies.

Finally, statistical analysis of primary and secondary data was performed with the IBM SPSS Statistics 29 software.

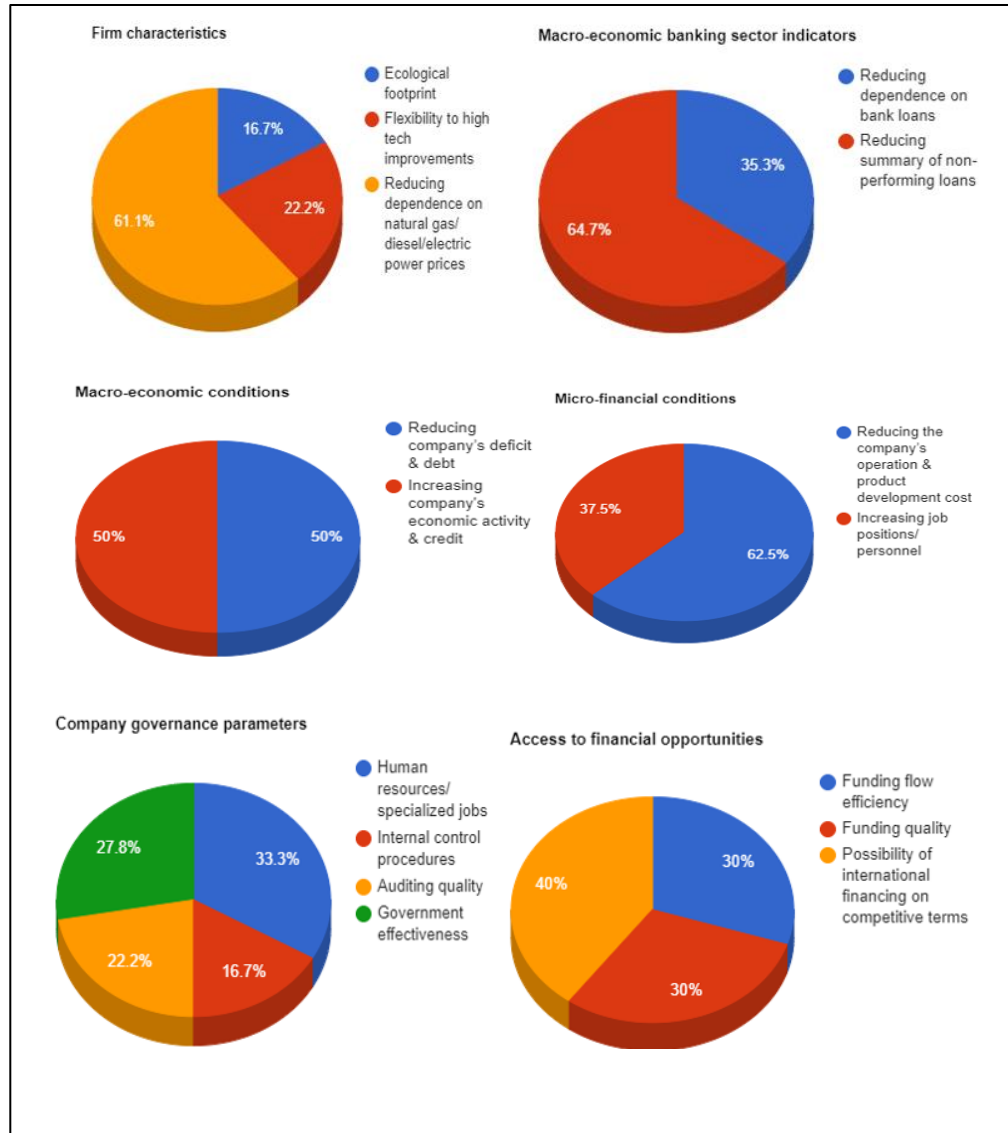


Figure 1. The six corporate factors as sustainable growth KPI parameters

5.1. Corporate sustainable growth parameter data

The following four Tables (Tables 1-4) have been created from primitive mean 2021 EBIT, as well as data related to the KPI corporate metadata features (characteristics, indicators, conditions, parameters, and opportunities) per company. The first two tables referred to conventional companies and the last two to companies that stand out in the field of innovation.

In Tables 1-4 the empirical footprint of the six quality KPI corporate parameters (“metadata constraints” for sustainable growth potential) of the companies' performance (as mean values per companies' group) for the year 2021 was recorded, on a scale of 0-100, by considering the percentage weight of several (related to sustainable innovative growth dynamics) quality corporate parameters as they were presented in Figure 1. Also, in Tables 1 and 3, the corporate EBIT profitability is presented as an average value of the companies per group for the year 2021. The mean values presented in Tables 1-4 are from primary data obtained through a quantitative survey from a sample balanced group of 10 companies from the EU, 10 from Greece, and 10 per Western Balkan country (EU Commission Recommendation, 2003).

Hence, the presented values in Tables 1-4 (year 2021) as well as in similar Tables for the rest 9 years (2012-2020), are yearly, weighted (according to percentages displayed in Figure 1), 10 companies mean averaged and express entrepreneurship's performance (on a scale from 0 to 100) per corporate factor as a sustainable growth KPI parameter. Similar Tables have been developed for the remaining 9 years within the 10-year trial framework (2012-2021).

Table 1. EU, Greek & Western Balkans conventional companies (part A).

Primary data from 3 small companies, 4 medium-sized enterprises, and 3 big firms; mean values from 10 companies (referred to the year 2021).

	Corporate operational profit (EBIT)	Firm characteristics	Banking sector indicators	Macro-Economic conditions
EU	€12,8 million	95	90	91
Greece	€8,6 million	80	65	75
Albania	€2,7 million	54	52	55
Bosnia & Herzegovina	€4,8 million	64	63	69
North Macedonia	€3,1 million	60	58	62
Montenegro	€5,2 million	67	62	66
Serbia	€3,3 million	63	60	66

Source: ECD and EDB indexes, World Bank, EBRD, and BEEPS datasets (EBRD and World Bank surveys).

Table 2. EU, Greek & Western Balkans conventional companies (part B).
Primary data from 3 small companies, 4 medium-sized enterprises, and 3 big firms;
mean values from 10 companies (referred to the year 2021).

	Micro-financial conditions	Company's governance parameters	Access to finance opportunities
EU	96	98	97
Greece	84	81	79
Albania	50	49	51
Bosnia & Herzegovina	66	65	72
North Macedonia	61	53	64
Montenegro	69	69	70
Serbia	61	67	61

Source: ECD and EDB indexes, World Bank, EBRD, and BEEPS datasets (EBRD and World Bank surveys).

Table 3. EU, Greek & Western Balkans innovative companies (part A).
Primary data from 3 small companies, 4 medium-sized enterprises, and 3 big firms;
mean values from 10 companies (referred to the year 2021).

	Corporate operational profit (EBIT)	Firm characteristics	Banking sector indicators	Macro-Economic conditions
EU	€10.2 million	97	95	95
Greece	€6.9 million	84	75	79
Albania	€1.2 million	55	60	58
Bosnia & Herzegovina	€3.4 million	69	72	74
North Macedonia	€2.2 million	66	63	69
Montenegro	€3.7 million	74	69	71
Serbia	€2.9 million	68	71	70

Source: ECD and EDB indexes, World Bank, EBRD, and BEEPS datasets (EBRD and World Bank surveys).

Table 4. EU, Greek & Western Balkans innovative companies (part B).
Primary data from 3 small companies, 4 medium-sized enterprises, and 3 big firms;
mean values from 10 companies (referred to the year 2021).

	Micro-financial conditions	Company's governance parameters	Access to finance opportunities
EU	97	98	98
Greece	85	84	82
Albania	53	53	56
Bosnia & Herzegovina	68	69	77
North Macedonia	66	55	67
Montenegro	72	71	72
Serbia	69	70	64

Source: ECD and EDB indexes, World Bank, EBRD, and BEEPS datasets (EBRD and World Bank surveys).

5.2. Correlation coefficients

According to Article 2 of the Annex to the SME Recommendation (EU Commission Recommendation, 2003), small companies are defined as enterprises that have fewer than 50 employees and have an annual turnover not exceeding EUR 20 million and/or an annual balance-sheet total not exceeding EUR 15 million. Medium-sized enterprises are defined as enterprises that have 51-250 employees, an annual turnover of up to EUR 50 million, and/or an annual balance sheet of up to EUR 43 million.

In the Western Balkans case study, for a balanced sample group of companies (i.e. 3 small companies, 4 medium-sized enterprises, and 3 big firms) 4 x 10 Tables were created (4 Tables per year for the 10-year trial period). In these 40 Tables, the imprint of the performance of companies in sectors related to sustainable innovative entrepreneurship was recorded empirically for a series of 10 years.

Also, the corporate EBIT profitability for the same 10-year series was recorded. Then, with data from these 40 Tables (20 for conventional companies and 20 for innovative ones) six (6) correlation coefficients were calculated per country between the corporate EBIT 10-year dataset and the corresponding 10-year sets for the 6 quality corporate parameters. These coefficients in a tabular format are presented in Table 5 (tabulated ρ values for a balanced group of 10 conventional companies per country for the period 2012-2021) and Table 6 (tabulated ρ values for a balanced group of 10 innovative companies per country for the period 2012-2021).

5.2.1 Correlation coefficients for conventional companies

Table 5 displays the PCC ρ values for EU, Greek, and Western Balkans conventional companies. These ρ values were calculated by using the *cor()* function from the 10-year mean EBIT data per sample group of companies / per country, as well as the 10-year

mean data per sample group of companies / per country / per KPI corporate parameter; and then were used in the proposed econometric model for estimating the sustainable growth potential of a typical Greek or Western Balkan company (Thomadakis, 2016; Moder and Bonifai, 2017).

Table 5. PCC ρ secondary data for conventional companies
(Balanced sample group of 10 enterprises per country, 2012-2021).

	Firm characteristics	Banking sector indication	Macro-economic conditions	Micro-financial conditions	Company governance parameters	Access to finance opportunities
Corp. EBIT (EU)	0.940	0.808	0.822	0.801	0.907	0.822
Corp. EBIT (Greece)	0.490	0.543	0.549	0.533	0.762	0.569
Corp. EBIT (Albania)	-0.198	-0.109	0.128	0.120	0.231	0.129
Corp. EBIT (Bosnia & Herzegovina)	0.121	0.205	0.243	0.223	0.340	0.208
Corp. EBIT (North Macedonia)	0.090	0.187	0.190	0.175	0.241	0.204
Corp. EBIT (Montenegro)	0.100	0.179	0.244	0.220	0.365	0.198
Corp. EBIT (Serbia)	0.018	0.158	0.196	0.179	0.301	0.160

Application Example. By applying the above empirically estimated ρ variables for the conventional firms and companies, the proposed model equation has been formulated as follows (Bosnia & Herzegovina companies' case, i.e. coefficients from the 4th row in Table 5):

[Bosnia & Herzegovina conventional company] Sustainable entrepreneurship growth dynamics (metrics) = 1.3166 =

$$\begin{aligned}
 & (\alpha_1) 1.10 \times 0.121 \text{ (Firm characteristics)} + \\
 & (\alpha_2) 1.05 \times 0.205 \text{ (Banking sector indicators)} + \\
 & (\alpha_3) 0.92 \times 0.243 \text{ (Macro-economic conditions)} + \\
 & (\alpha_4) 0.92 \times 0.223 \text{ (Micro-financial conditions)} + \\
 & (\alpha_5) 0.92 \times 0.340 \text{ (Company governance parameters)} + \\
 & (\alpha_6) 1.09 \times 0.208 \text{ (Access to finance opportunities)},
 \end{aligned}$$

where α_i are the normalized coefficients of gravity in the equation (weights).

The recording of the influence of the crises on a corporate's EBIT profitability and the company's outlook has been done with an empirical assessment of the weighting coefficients based on the recent literature (Cakula and Krumins, 2020; Duca, 2021). Hence, as weighting factors temporally defined (depending on the last 10-year global

economic parameters and Western Balkans political situation, i.e. the 2012-2021 case study period) the following normalized values were used:

$\alpha_1=1.10$ (10% impact of the 2010-today energy crisis);

$\alpha_2=1.05$ (5% impact of the 2014-2019 global economic crisis);

$\alpha_3=0.92$ (normalized value);

$\alpha_4=0.92$ (normalized value);

$\alpha_5=0.92$ (normalized value); and

$\alpha_6=1.09$ (9% impact of the 2014-2019 local financial crisis).

Discussion. While the perfect ρ value for healthy and sustainable EBIT development dynamics, with a positive outlook, is the unit (+1), the negative ρ values in the case of Albania (contractual enterprises) mean that the growth of EBIT profitability does not keep pace (i.e. same direction on linear relationship) with the relative quality KPI corporate indicators (“Firm characteristics” and “Banking sector indicators” in this case) and is therefore not healthy and sustainable (3rd row in Table 5). That is (country case “Albania”), in the context of the linear relationship for the 10-year trial period (2012-2021 data), a corporate’s EBIT profitability and the “Firm characteristics” and “Banking sector indicators” KPI factors move in different directions.

In the event that the weighting factors were not used, i.e. the influence of the energy, economic, and financial crises was not taken into account, the price for the (Bosnia & Herzegovina conventional companies case, 4th row in Table 5) sustainable entrepreneurship growth dynamics (metrics) will be 1.3400 instead of 1.3166; i.e. the influence of last decade’s energy, economic, and financial crises is estimated at -1.75% (negative) corporate sustainable growth potential.

5.2.2 Correlation coefficients for innovative companies

Table 6 displays the PCC ρ values for EU, Greek, and Western Balkans innovative companies (sample group).

Application Example. By applying the above empirically estimated ρ variables for the innovative firms and companies, the proposed model equation has been formulated as follows (Bosnia & Herzegovina companies’ case, i.e. coefficients from the 4th row in Table 6):

[Bosnia & Herzegovina innovative company] Sustainable entrepreneurship growth dynamics (metrics) = 1.5169 =

$(\alpha_1) 1.10 \times 0.201$ (Firm characteristics) +

$(\alpha_2) 1.05 \times 0.219$ (Banking sector indicators) +

$(\alpha_3) 0.92 \times 0.261$ (Macro-economic conditions) +

$(\alpha_4) 0.92 \times 0.266$ (Micro-financial conditions) +

$(\alpha_5) 0.92 \times 0.359$ (Company governance parameters) +

$(\alpha_6) 1.09 \times 0.230$ (Access to finance opportunities),

where α_i are the normalized coefficients of gravity in the equation (weights).

Table 6. PCC ρ secondary data for innovative companies
(Balanced sample group of 10 enterprises per country, 2012-2021).

	Firm characteristics	Banking sector indication	Macro-economic conditions	Micro-financial conditions	Company governance parameters	Access to finance opportunities
Corp. EBIT (EU)	0.967	0.866	0.855	0.832	0.921	0.905
Corp. EBIT (Greece)	0.605	0.594	0.589	0.599	0.801	0.698
Corp. EBIT (Albania)	-0.165	-0.098	0.140	0.131	0.240	0.135
Corp. EBIT (Bosnia & Herzegovina)	0.201	0.219	0.261	0.266	0.359	0.230
Corp. EBIT (North Macedonia)	0.190	0.199	0.210	0.197	0.261	0.214
Corp. EBIT (Montenegro).	0.209	0.190	0.261	0.234	0.389	0.223
Corp. EBIT (Serbia)	0.188	0.162	0.204	0.191	0.320	0.177

The same, like conventional company's case, normalized values were used as weighting factors.

Discussion. In the event that the weighting factors were not used, i.e. the influence of the energy, economic, and financial crises was not taken into account, the price for the (Bosnia & Herzegovina innovative companies case, 4th row in Table 6) sustainable entrepreneurship growth dynamics (metrics) will be 1.5360 instead of 1.5169; i.e. the influence of last decade energy, economic, and financial crises is estimated at -1.25% (negative) corporate sustainable growth potential.

N.B. It is noteworthy that the influence of last decade's crises is estimated to affect by -1.75% (negative) the corporate sustainable growth potential for conventional companies and only by -1.25% (negative) the innovative ones. That is the proposed model gives a 40% better outlook for innovative companies.

Hence, the introduced hypothesis «*Sustainable innovation increases corporate functionality when it is projected on sustainable growth potential operations*» was confirmed statistically and empirically.

5.3. Validation - Stability and sustainability testing

The baseline results were subjected to six (6) robustness checks (Karnitis et al., 2023; Moder and Bonifai, 2017). So, in the context of the Western Balkans case study and from the available 10-year period's data (Source: ECD and EDB indexes, World Bank,

EBRD, and BEEPS datasets) six tests were performed with a different 10-company sample each time, and the calculated ρ values were tabulated in 6 matrices for the conventional companies (like Table 5) and in another 6 matrices for the 10 innovative ones (like Table 6).

Table 7. Robustness checks - The *sustainable entrepreneurship growth dynamic* (mean metrics) for conventional companies.

	Six samples with conventional companies					
	Balanced (3 small, 4 medium, 3 large)	10 small Companies	10 medium- sized Enterprise	10 large firms	Random sample of small, medium, large	5 with foreign & 5 with state majority
EU	5.1060	5.1056	5.1059	5.1097	5.1071	5.1042
Greece	3.4258	3.4265	3.4266	3.4298	3.4255	3.4254
Albania	0.2490	0.2482	0.2499	0.2505	0.2492	0.2488
Bosnia & Herzegovina	1.3166	1.3171	1.3174	1.3190	1.3166	1.3160
North Macedonia	1.0752	1.0750	1.0755	1.0771	1.0756	1.0744
Montenegro	1.2765	1.2771	1.2780	1.2792	1.2766	1.2760
Serbia	0.9820	0.9884	0.9845	0.9890	0.9819	0.9817

Table 8. Robustness checks - The *sustainable entrepreneurship growth dynamic* (mean metrics) for innovative companies.

	Six samples with innovative companies					
	3 small, 4 medium, 3 large	10 small companies	10 medium- sized enterprises	10 large firms	Random (small, medium, large)	5 with foreign & 5 w/ state majority
EU	5.3580	5.3577	5.3582	5.3701	5.3579	5.3577
Greece	3.8781	3.8784	3.8780	3.8795	3.8788	3.8764
Albania	0.3329	0.3321	0.3327	0.3345	0.3330	0.3312
Bosnia & Herzegovina	1.5169	1.5174	1.5168	1.5179	1.5166	1.5160
North Macedonia	1.2658	1.2652	1.2659	1.2669	1.2657	1.2590
Montenegro	1.4858	1.4852	1.4860	1.4884	1.4863	1.4842
Serbia	1.2276	1.2271	1.2284	1.2295	1.2277	1.2255

Then, the *sustainable entrepreneurship growth dynamic* (mean metrics) was estimated per country / per sample as a metric indicating sustainable corporate EBIT

growth and outlook. The results are displayed in Table 7 for conventional companies and in Table 8 for innovative ones. The similarity in values from the six validation tests confirms the robustness of the proposed empirical model.

Discussion. Analyzing the values of Tables 7 and 8 it is noticed that:

- Small companies show a lower assessment of sustainable development dynamics and outlook.
- The three sample groups with medium-sized enterprises, balanced, and random ones, show almost identical results and this confirms, even more, the reliability of the proposed empirical model.
- Large firms show the best results.
- When the public or state body is involved in a company (management) the results show a relative drop (the lower detected prices).

Finally, comparing the values from the two Tables (balanced group of 10 companies) a superiority of innovative companies (Table 8) over conventional ones (Table 7) is detected in terms of sustainable development dynamics and outlook as follows:

- +5% for EU enterprises,
- +13% for Greek enterprises,
- +33% for Albania enterprises,
- +15% for Bosnia & Herzegovina enterprises,
- +18% for North Macedonia enterprises,
- +16% for Montenegro enterprises, and
- +25% for Serbia enterprises.

6. Conclusions and future work

In this paper, an empirical econometric model was proposed, tested on a Western Balkans case study, and validated. The model is based on Pearson's correlation coefficient (ρ) as a quality measure index (secondary data), while the correlation two datasets were the primitive data from (i) the corporate operating profit (EBIT values), and (ii) the estimated enterprise's performance in six selected KPI corporate factors with sustainable growth functionality (quality primitive data). The Pearson's ρ values reflect the relationship, strength, and direction of the linear correlation of corporate EBIT / corporate quality data and they were used, as weighted parameters in the empirical model, to assess the dynamics of the company's profit sustainable development with a positive outlook.

It is noteworthy that the influence of last decade's crises is estimated to affect by -1.75% (negative) the corporate sustainable growth potential for conventional companies and only by -1.25% (negative) the innovative ones. That is the proposed model gave a 40% better outlook for innovative companies. So, in the context of the econometric analysis, the raised hypothesis «*Sustainable innovation increases corporate's functionality when it is projected on sustainable growth potential operations*» was confirmed statistically and empirically. Hence, from the discussed case study, the superiority in sustainable profit growth and outlook has been recorded of those Eurozone

firms and Balkan companies concentrating their economic growth functionality on innovation initiatives. In addition, innovative enterprises demonstrate better resistance to (energy, economic, and financial) crises.

Potential applications include interventions (after formulating and estimating the corporate's weaknesses) in the company's management policy with the aim of sustainably increasing profitability with a social footprint.

As functional limitations of the proposed model could be considered (i) the relatively small number of quality KPI parameters involved (six); (ii) the relatively small number of companies in the sample (ten); (iii) the relatively short duration for the search period of the corporate results in the context of correlation matrix numbering (10 years); and (iv) the linear approximation of the hypothesis, because the proposed model estimates entrepreneurship's growth dynamics as a static value and not the acceleration speed of these dynamics (i.e. the slope of the representation line), nor many aspects of the non-linear relationship between the EBIT data and corporate factors with sustainable growth functionality.

As a future direction, the structure, spread, and functionalities of the *shadow economy* would be examined as a moral dilemma when dealing with an econometric analysis model for sustainable growth dynamics. Also, the non-parametric efficient frontier methods, such as data envelopment analysis, free disposal hull, order- α frontier analysis, etc., should be incorporated in an econometric analysis model for (frontier) productivity evaluation, particularly for companies trading in developing countries.

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Abbreviations

- BEEPS Business Environment & Enterprise Performance Survey.
- EBIT Earnings Before Interest and Tax (Corporate operating profit).
- EBRD European Bank for Reconstruction & Development.
- EBT Earnings Before Tax (Pre-tax profit).
- ECD European Central Bank.
- EDB Easy Doing Business Index.
- IMF International Monetary Fund.
- NPL Non-Performing Loan (NPL is a sum of borrowed money whose scheduled payments have not been made by the debtor for a period of time—usually 90 or 180 days).
- PBT Profit Before Tax (Corporate operating profit minus interest).

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