THE SUSTAINABLE ENTREPRENEURSHIP
AND SOCIO-ECONOMIC COHESION IN POLAND

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Purpose: The basic research hypothesis is as follows "Socio-economic cohesion has a positive, statistically significant impact on the development of sustainable entrepreneurship in Poland from 2008 to 2022".

Design/methodology/approach: We normalize diagnostic variables into synthetic indicators to verify the hypothesis. We use the classical least squares method (OLS).

Findings: Sustainable entrepreneurship in Poland has a positive trend, although it should be pointed out that the ecological awareness of entrepreneurs should be significantly increased. The results of the study show that social and economic cohesion has a positive impact on sustainable entrepreneurship.

Research limitations/implications: The availability of data, the choice of normalization method and the estimation method for the model.

Social implications: Socio-economic development that considers protecting the natural environment is a source of new entrepreneurial opportunities, generating new profits and solving social and ecological problems. It is a challenge for the entrepreneur, an opportunity, and at the same time, requires a change in the perception and understanding of his role in developing modern economic systems.

Originality/value: The paper's novelty is an attempt to assess the impact of social and economic cohesion on sustainable entrepreneurship in Poland from 2008 to 2022.

Keywords: sustainable entrepreneurship, socio-economic cohesion.

Category of the paper: research paper.

1. Introduction

Sustainable entrepreneurship is entrepreneurship that implements the goals of sustainable development. Socio-economic development that considers protecting the natural environment is a source of new entrepreneurial opportunities, generating new profits and solving social and ecological problems. It is a challenge for the entrepreneur, an opportunity, and at the same time, requires a change in the perception and understanding of his role in developing modern economic systems.

Sustainable entrepreneurship takes place in strictly defined conditions, and its development depends on the social and economic conditions in the country, market conditions and conditions related to the entrepreneur.

The paper's novelty is an attempt to assess the impact of social and economic cohesion on sustainable entrepreneurship in Poland from 2008 to 2022. We want to analyse how cohesion, which aims to promote universal and harmonious development, influences decisions regarding establishing and running a business.

In the context of the objective, the study's main hypothesis is as follows: Socio-economic cohesion has a positive, statistically significant impact on the development of sustainable entrepreneurship in Poland from 2008 to 2022. We created synthetic indicators of sustainable entrepreneurship and socio-economic cohesion to verify the hypothesis. Then, we determined linear correlation indicators, built single-equation models (estimation using the Ordinary Least Square Method: OLS) and a multi-equation model (estimation using the Seemingly Unrelated Regression method: SUR).

The study includes an introduction, materials and methods, research methodology, results, discussion, and conclusion. The review of scientific publications was based on the Scopus and Web of Science lists. The data for the analysis come from Eurostat databases. For the calculations, we used Statistica and Gretl software.

The paper consists of an introduction, a review of the literature on the subject, research methodology, research results, discussion and conclusions.

2. Literature review

Socioeconomic cohesion refers to the degree of unity and interconnectedness within a society, particularly in terms of economic and social factors (Pullano et al., 2020). It encompasses the reduction of disparities between different groups, regions, or individuals in areas such as income, employment, education, and access to services (Nijman et al., 2020). A cohesive society is characterised by strong social bonds, mutual trust, and a sense of shared

purpose among its members. Achieving socioeconomic cohesion involves implementing policies and initiatives that promote equal opportunities, social inclusion, and balanced regional development (Martínez-Virto et al., 2021; Faura-Martínez et al., 2020). This may include measures such as progressive taxation, targeted investment in disadvantaged areas, and programmes to improve social mobility. By fostering socioeconomic cohesion, societies can potentially reduce social tensions, improve overall well-being, and create a more stable and prosperous environment for all citizens (Sánchez et al., 2023; Sielker et al., 2021).

The policy of socioeconomic cohesion is a multifaceted approach aimed at reducing disparities and promoting balanced development across regions and social groups. It is founded on the principle that by equalising opportunities and bolstering human and social capital, societies can achieve greater stability and sustainable economic growth (Davidescu et al., 2024; Sharma, 2023; Mbandlwa, 2023). This policy encompasses various aspects, including healthcare, employment, and infrastructure development. By investing in these areas, policy makers seek to create a more inclusive society where all individuals have access to essential resources and services (Suhaeb et al., 2024; Pavone et al., 2021). The underlying assumption is that a more equitable distribution of opportunities not only benefits disadvantaged groups, but also contributes to the overall prosperity of the entire society. Through targeted interventions and strategic investments, socioeconomic cohesion policies aim to foster social integration, improve economic competitiveness, and ultimately create a more resilient and prosperous society for all its members (Artelaris et al., 2020; Artelaris, 2021; Zhong et al., 2023).

We cannot talk about socioeconomic cohesion without forgetting about sustainable enterprise development, which is emphasised in the subject literature (Villalba-Eguiluz et al., 2020; Kostyukhin, 2019; Misztal, 2022; Mustapa et al., 2018). Corporate sustainability is an approach that integrates economic, social, and environmental goals, enabling companies to generate profits in a way that is responsible for people and the planet. In short, corporate sustainability is based on three pillars: economics, social responsibility, and environmental protection, which together are referred to as the triple bottom line (Misztal, 2023; Roztocki et al., 2020).

Corporate sustainability focusses on generating stable profits while minimising risk (Moore et al., 2009; Baumgartner, 2014). This includes investing in innovation, cost management, ensuring product quality, and customer satisfaction. A sustainable company aims to generate value not only for its owners but also for the local communities and the market in which it operates (Ortiz-de-Mandojana et al., 2016).

Social responsibility is about conducting business in an ethical manner, respecting the rights of employees, providing safe working conditions, and supporting the development of local communities. It can include investing in education, equal rights, equal pay, professional development, and cooperation with local suppliers. Companies that care about their employees,

customers, and society build trust and loyalty, which in the long term has a positive impact on their reputation and success (Tai et al., 2014; Valeri et al., 2019; Naqvi et al., 2021).

Environmental sustainability means that companies strive to minimise their negative impact on the natural environment. This includes effectively managing natural resources, reducing waste, saving energy, reducing CO_2 emissions, and supporting green initiatives such as recycling or renewable energy sources. Examples include investing in environmentally friendly production technology or reducing their carbon footprint. Companies that operate in an environmentally friendly manner often attract customers who care about the environment, which translates into their competitiveness (Uralovich et al., 2023; Jeswani et al., 2020). Corporate sustainability is not only good for companies and society, but is also necessary to address global challenges such as climate change, the depletion of natural resources, and growing social inequality (Oláh et al., 2020).

Socioeconomic cohesion has a significant impact on the sustainable development of enterprises in Poland, as it contributes to the creation of a stable, inclusive and developing market and to reducing social and economic inequalities. In the context of enterprises, this cohesion affects their ability to achieve long-term growth, innovation, and effective management of human and natural resources (Stiglitz, 2016).

Below are some key areas in which socioeconomic cohesion supports the sustainable development of enterprises in Poland (Del-Aguila-Arcentales et al., 2022; Misztal, 2023):

- Improving access to the labour market and increasing human capital.
- Development of infrastructure and equalisation of regional opportunities.
- Increase in Domestic Demand.
- Support for sustainable environmental practices.
- Strengthening public-private partnerships.
- Reducing Social Inequalities and limiting migration.

Activities for socioeconomic cohesion, such as investments in education, vocational training, and social integration, increase the qualifications of employees and their adaptation to the requirements of the labour market (Martínez-Virto et al., 2021). This results in better access to a qualified workforce, which strengthens the innovation and productivity of enterprises. Improving the quality of human capital promotes the growth of companies' competitiveness and allows them to better adapt to changing market conditions (Sánchez et al., 2023).

Investments in road, communication, and digital infrastructure, often supported by EU and state funds, make it easier for companies operating in less developed regions of Poland to access new markets, resources, and technologies. Better infrastructure reduces operating costs, increases efficiency, and attracts investors, which allows companies to operate on more equal terms regardless of location (V et al., 2023; Pavone et al., 2021).

Socioeconomic cohesion reduces income inequalities, which affects the growth of household purchasing power. As a result, the demand for goods and services on the domestic market increases, creating new development opportunities for companies operating locally. The financial stability of consumers facilitates long-term investment planning and increases revenues that can be allocated to innovation or expansion (Akinsulire et al., 2024).

Socioeconomic cohesion contributes to the development of companies based on the principles of sustainable development, especially in the context of responsible environmental management. Grants and relief for companies that implement ecological and energy-efficient solutions encourage sustainable development, which has a positive impact on the reputation of companies and reduces their impact on the environment (Appannan et al., 2023). Companies in Poland are increasingly motivated to invest in environmentally friendly technologies, which translates into savings and better management of natural resources (Tutko, 2023).

In Poland, socioeconomic cohesion also contributes to the development of partnerships between the public and private sectors, especially in areas related to infrastructure, education, and innovation. Such partnerships help companies obtain financing, technology, and know-how that support their sustainable development. Joint initiatives can also reduce investment risk and contribute to market stabilisation (Kuzior et al., 2020; Dubravská et al., 2020).

Socioeconomic cohesion reduces differences in the standard of living in different regions of the country, which reduces migration of people to large cities and abroad. Due to this, companies have access to a more stable labour market and do not struggle with the outflow of talent, which is especially beneficial for smaller companies operating in less urbanised regions (Giannakis et al., 2020).

In summary, socioeconomic cohesion in Poland is a key factor supporting the sustainable development of enterprises, contributing to the creation of equal opportunities and a stable business environment (Lewandowska et al., 2021; Oláh et al., 2020). The long-term effects of this cohesion can lead to an increase in the competitiveness of Polish companies on the international stage and to the strengthening of the national economy in a sustainable and responsible way.

3. Research methodology

We conducted the research for data on the Polish economy. The data for the study was taken from the Eurostat database, they are annual. The basic research hypothesis is as follows "Socio-economic cohesion has a positive, statistically significant impact on the development of sustainable entrepreneurship in Poland from 2008 to 2022". Our research has several steps:

- we created indicators of sustainable entrepreneurship and social and economic cohesion,
- we conducted correlation analysis,
- we built single- and multi-equation models.

We calculated the economic cohesion (EC) indicator based on analytical indicators divided into two groups:

- stimulants: gross domestic product at market prices [current prices, million euro], exports of goods and services [current prices, million euro], value of goods and materials sold [PLN thousand], R&D [PLN million], total industrial production sold,
- destimulants: Imports of goods and services [Current prices, million euro] Consumer price index, Total debt [PLN million].

We determined the social cohesion (SC) indicator based on the following:

- stimulants: employment level, average monthly gross wages [PLN] % of women sitting in the Sejm of the Republic of Poland [%], % of people over 25 years of age with primary education, % of people over 25 years of age with higher education, average life expectancy, population connected to public water supply [%];
- destimulants: Gini coefficient, unemployment rate [%], at risk of poverty rate (cut-off point: 60% of median equivalised income after social transfers) [%].

The sustainable entrepreneurship indicator (Sus_E) is divided into three pillars:

- economic pillar (E):
  o   stimulants distinguished: enterprises – number, turnover or gross premiums written, production value, value added at factor cost, gross operating surplus, total purchases of goods and services, gross investment in tangible goods, gross operating surplus/turnover (gross operating rate), share of gross operating surplus in value added, investment (investment/value added rate at factors cost),
  o destimulants: share of personnel costs in production, average personnel costs (personnel costs per employee);
- social pillar (S):
  o   stimulants: wages and salaries, social security costs, employees – number, turnover per person employed, apparent labor productivity, wage adjusted labor productivity, gross value added per employee, growth rate of employment, persons employed per enterprise, investment per person employed,
  o destimulants: personnel costs, share of personnel costs in total purchases of goods and services;
- environmental pillar (Env): environmental destimulants, carbon dioxide emission, methane emission, nitrous oxide emission, sulfur oxides emission, ammoinia emission, carbon monoxide emission, nitrogen oxides emission, generation of total waste.

Then, we transform the explanatory variables into integrated to create Sus_E, using the following formulas (Pieloch et al., 2020):

- for the stimulants:

$$Z_{ij} = \frac{x_{ij} - \min_i\{x_{ij}\}}{\max_i\{x_{ij}\} - \min_i\{x_{ij}\}}, Z_{ij} \in [0; 1] \tag{1}$$

- for the destimulants:

$$Z_{ij} = \frac{\max_i\{x_{ij}\} - x_{ij}}{\max_i\{x_{ij}\} - \min_i\{x_{ij}\}}, Z_{ij} \in [0; 1] \tag{2}$$

where:

Z_{ij} stands for the normalized value of the j-th variable in the i-th year;

x_{ij} is the diagnostic variable in i-year.

To calculate SC and EC, we assume the same impact of different indices on the aggregate measure. We use the following formula:

$$SC_i; \ EC_i \ = \frac{\sum_{j=1}^{n} IntVar_{ij}}{n} \ , (i = 1,2, \dots, n) \tag{3}$$

where $IntVar_i$ – integrated variable in i-year.

We use the following formula to create the Sus_E:

$$Sus_E = \frac{E+S+Env}{L} = \frac{\sum_{i=1}^{n}\frac{E_{ij}}{n}+\sum_{i=1}^{n}\frac{S_{ij}}{n}+\sum_{i=1}^{n}\frac{Env_{ij}}{n}}{L}; \ Sus_E \in [0;1] \tag{4}$$

where:

L is the working-age population;

zij is the normalized value of variable j in year i.

We use the OLS method to estimate models, which are given by the equations:

$$EE; SE; EnvE = \hat{\beta}_0 + \ \hat{\beta}_1 \cdot SC_i + \varepsilon_i \tag{5}$$

$$EE; SE; EnvE = \hat{\beta}_0 + \ \hat{\beta}_1 \cdot EC_i + \varepsilon_i \tag{6}$$

$$SusE = \hat{\beta}_0 + \ \hat{\beta}_1 \cdot EC_i + \hat{\beta}_2 \cdot SC_i + \varepsilon_i \tag{7}$$

where:

β_0 is the intercept,

$\beta_1; \beta_2; \beta_3$ is the slope,

εi denotes the i-th residual,

i is an observation index.

The regression is written with the formula:

$$s(\hat{\beta}_0, \ldots, \hat{\beta}_2) = \sum_{i=1}^{n} e_i^2 = \sum_{i=1}^{n} (I_i - \hat{I}_i)^2 \rightarrow min$$

(8)

$$s(\hat{\beta}_0, \ldots, \hat{\beta}_4) = \sum_{i=1}^{n} (Sus_E - \hat{\beta}_0 - \hat{\beta}_1 \cdot EC_i - \hat{\beta}_2 \cdot SC_i - \varepsilon_i)^2 \rightarrow min$$

We create the structural equation model and use the SUR method to estimate it:

$$EE = \propto_0 + \propto_1 \cdot SE + \propto_2 \cdot ENVE + \propto_3 \cdot SC + \propto_4 \cdot SC(t-1) + \propto_5 \cdot SC(t-2) + \propto_6 \cdot EC + \propto_7 \cdot EC(t-1) + \propto_8 \cdot EC(t-2) + \varepsilon_i$$

$$SE = \propto_0 + \propto_1 \cdot EE + \propto_2 \cdot ENVE + \propto_3 \cdot SC + \propto_4 \cdot SC(t-1) + \propto_5 \cdot SC(t-2) + \propto_6 \cdot EC + \propto_7 \cdot EC(t-1) + \propto_8 \cdot EC(t-2) + \varepsilon_i$$

(9)

$$ENVE = \propto_0 + \propto_1 \cdot EE + \propto_2 \cdot SE + \propto_3 \cdot SC + \propto_4 \cdot SC(t-1) + \propto_5 \cdot SC(t-2) + \propto_6 \cdot EC + \propto_7 \cdot EC(t-1) + \propto_8 \cdot EC(t-2) + \varepsilon_i$$

SUR method estimator:

$$\sqrt{R} \cdot (\hat{\beta} - \beta) \xrightarrow{d} N \left(0, \left(\frac{1}{R} X^T \cdot (\Sigma - 1 \otimes I_R) \cdot X\right)^{-1}\right)$$

(10)

where:

R – observation number,

Ω – covariance matrix,

X – equations,

IR – dimensional identity matrix,

$\otimes$ – denotes matrix Kronecker product,

$\hat{\Sigma}$ – matrix,

y – vector.

4. Research results

The social cohesion index in Poland in 2008-2022 has a positive trend (index increase). In the given period, its average value is 0,48 (standard deviation 0,24; median 0,48), while the maximum value is 0,87 (2022), and the minimum value is 0,14 (2008) (Table 1).

Table 1.
Index of social cohesion in Poland (2008-2022)

Poland		
Year	Index of social cohesion	Trend line
2008	0,14	
2009	0,16	
2010	0,18	
2011	0,26	
2012	0,29	
2013	0,30	
2014	0,43	SC= 0,0544time + 0,0467
2015	0,48	R^2 = 0,9695
2016	0,56	
2017	0,65	
2018	0,71	
2019	0,74	
2020	0,73	
2021	0,73	
2022	0,87	
Descriptive statistics		
Mean	0,48	
Standard deviation	0,24	
Median	0,48	
Min	0,14	
Max	0,87	

Source: own study on the basis of Eurostat https://ec.europ a.eu/Eurostat; https://stat.gov.pl/,
8.11.2024.

The index of economic cohesion in Poland from 2008 to 2022 shows a positive trend, which means its growth. In the period under review, its average value is 0,48 (standard deviation 0,08; median 0,48), while the maximum value is 0,62 (2021), and the minimum value is 0,33 (2009) (Table 2).

Table 2.
Index of economic cohesion in Poland (2008-2022)

Poland		
Year	Index of economic cohesion	Trend line
2008	0,40	
2009	0,33	
2010	0,44	
2011	0,42	
2012	0,40	
2013	0,43	
2014	0,47	
2015	0,50	EC = 0,016time + 0,3507
2016	0,48	R^2 = 0,8115
2017	0,51	
2018	0,54	
2019	0,57	
2020	0,48	
2021	0,62	
2022	0,59	

Cont. table 2.

Descriptive statistics	
Mean	0,48
Standard deviation	0,08
Median	0,48
Min	0,33
Max	0,62

Source: own study on the basis of Eurostat https://ec.europ a.eu/Eurostat; https://stat.gov.pl/, 8.11.2024.

The index of sustainable entrepreneurship in Poland from 2008 to 2022 consists of indicators of economic, social, and environmental entrepreneurship.

The first component, the economic entrepreneurship index in Poland in 2008-2022, has a positive trend. Its average value is 0.46 (standard deviation 0.19; median 0.37), and the maximum and minimum values, respectively, are 0.76 (2021) and 0.21 (2009).

Considering the second element, the social entrepreneurship index in Poland in 2008-2022 has a positive trend. The average value of this index is 0.48 (standard deviation 0.14; median 0.45), and the maximum and minimum values are 0.69 (2019) and 0.26 (2009).

The third pillar, the environmental entrepreneurship index in Poland in 2008-2022, has a negative trend. Its average value is 0.53 (standard deviation 0.10; median 0.53), and the maximum and minimum values are 0.67 (2009) and 0.37 (2021).

The index of sustainable entrepreneurship in Poland in 2008-2022 increased (positive trend). Its average value of this index is 0.49 (standard deviation 0.09; median 0.48), and the maximum and minimum values, respectively, are 0.64 (2019) and 0.37 (2008) (Table 3).

Table 3.
Index of sustainable entrepreneurship in Poland (with components, 2008-2022)

Poland															
Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Economic entrepreneurship	0,36	0,21	0,26	0,36	0,25	0,29	0,38	0,37	0,37	0,49	0,64	0,75	0,73	0,76	0,68
Descriptive statistics	Trend line														
Mean	0,46														
Standard deviation	0,19														
Median	0,37														
Min	0,21														
Max	0,76														
Social entrepreneurship	0,29	0,26	0,35	0,40	0,35	0,37	0,43	0,45	0,46	0,53	0,64	0,69	0,64	0,67	0,60
Descriptive statistics	Trend line														
Mean	0,48														
Standard deviation	0,14														
Median	0,45														
Min	0,26														
Max	0,69														

Economic entrepreneurship trend line:

$$E_E = 0{,}0392\,time + 0{,}146$$
$$R^2 = 0{,}7972$$

Social entrepreneurship trend line:

$$S_E = 0{,}0302\,time + 0{,}2337$$
$$R^2 = 0{,}8824$$

Cont. table 3.

Environmental entrepreneurship	0,46	0,67	0,53	0,57	0,61	0,62	0,65	0,63	0,55	0,41	0,38	0,48	0,51	0,37	0,49

Descriptive statistics		Trend line
Mean	0,53	
Standard deviation	0,10	
Median	0,53	
Min	0,37	
Max	0,67	

$ENV_E = -0,0119time + 0,6239$
$R^2 = 0,2897$

Sustainable entrepreneurship	0,37	0,38	0,38	0,44	0,40	0,43	0,49	0,48	0,46	0,48	0,55	0,64	0,63	0,60	0,59

Descriptive statistics		Trend line
Mean	0,49	
Standard deviation	0,09	
Median	0,48	
Min	0,37	
Max	0,64	

$SUS_E = 0,0192time + 0,3345$
$R^2 = 0,864$

Source: own study on the basis of Eurostat https://ec.europ a.eu/Eurostat, https://stat.gov.pl/, 8.11.2024.

The Pearson's R, Spearman-s Rho, Gamma and Kendall rank correlation coefficients between the sustainable entrepreneurship index and social and economic cohesion indexes in Poland in 2008-2022 are statistically significant ($p < 0,05$, bolded in Table 4). There is a positive relationship between these variables and different levels of correlation coefficients regarding the strength of impact (strong correlation). The highest level of the correlation coefficient is between the index of sustainable entrepreneurship and the index of social cohesion in Poland in 2008-2022 – 0.93 (Spearman's Rho) (Table 4).

Table 4.

Pearson's R, Spearman-s Rho, Gamma and Kendall rank correlation coefficients in the period from 2008 to 2022, $p < 0,05$ ($n = 15$)

Index	Correlation coefficient			
	Pearson's R	Spearman's Rho	Gamma	Kendall rank
SUS_E/SC	**0,92**	**0,93**	**0,79**	**0,79**
SUS_E/EC	**0,85**	**0,87**	**0,70**	**0,70**

Source: own study on the basis of Eurostat https://ec.europ a.eu/Eurostat, https://stat.gov.pl/, 8.11.2024.

The results of OLS regression between the components of the index of sustainable entrepreneurship (economic, social, and environmental entrepreneurship) and social and economic cohesion indexes in Poland in 2008-2022 indicate a statistically significant relationship. The relationship between the examined variables is positive or negative, with a different level of strength. The highest positive level of relationship is between the index of economic entrepreneurship and economic cohesion index in Poland in 2008-2022, 2.14,

and the lowest positive level of relationship is between the index of social entrepreneurship and social cohesion index in Poland in 2008-2022, 0.55. The highest negative level of relationship is between the index of environmental entrepreneurship and economic cohesion index in Poland in 2008-2022, -0.81, and the lowest negative level of relationship is between the index of environmental entrepreneurship and social cohesion index in Poland in 2008-2022, -0.23. The results meet the OLS estimation conditions, including no collinearity, homoscedasticity, normal distribution of variables, and no autocorrelation (Table 5).

Table 5.
Results of the OLS regressions in the period from 2008 to 2022 ($p < 0,05$)

$EE = \alpha_0 + \alpha_1 \cdot SC + \varepsilon_i$
$EE = \alpha_0 + \alpha_1 \cdot EC + \varepsilon_i$
$SE = \alpha_0 + \alpha_1 \cdot SC + \varepsilon_i$
$SE = \alpha_0 + \alpha_1 \cdot EC + \varepsilon_i$
$ENVE = \alpha_0 + \alpha_1 \cdot SC + \varepsilon_i$
$ENVE = \alpha_0 + \alpha_1 \cdot EC + \varepsilon_i$

Dependent variable	Independent variable	Coefficient	Std. error	P-value	R-squared
E_E	Const	0,12	0,05	0,0500	0,81
	SC	0,71	0,10	<0,0001	
E_E	Const	−0,56	0,17	0,0100	0,74
	EC	2,14	0,35	<0,0001	
S_E	Const	0,21	0,03	<0,0001	0,89
	SC	0,55	0,05	<0,0001	
S_E	Const	−0,31	0,10	0,0100	0,82
	EC	1,64	0,22	<0,0001	
ENV_E	Const	0,64	0,05	<0,0001	0,33
	SC	−0,23	0,09	0,0200	
ENV_E	Const	0,92	0,13	<0,0001	0,43
	EC	−0,81	0,26	0,0100	

Source: own study on the basis of Eurostat https://ec.europ a.eu/Eurostat, https://stat.gov.pl/, 8.11.2024.

The results of OLS regression between the index of sustainable entrepreneurship and social and economic cohesion indexes in Poland in 2008-2022 indicate a statistically significant relationship. The relationship between the examined variables is positive and has a different level of strength. The highest level of relationship is between the index of sustainable entrepreneurship and economic cohesion index in Poland in 2008-2022, 0.99, and the lowest level of relationship is between the index of sustainable entrepreneurship and social cohesion index in Poland in 2008-2022, 0.34. The results meet the OLS estimation conditions (Table 6).

Table 6.
Results of the OLS regressions in the period from 2008 to 2022 ($p < 0,05$)

$SUSE = \alpha_0 + \alpha_1 \cdot SC + \varepsilon_i$
$SUSE = \alpha_0 + \alpha_1 \cdot EC + \varepsilon_i$

Dependent variable	Independent variable	Coefficient	Std. error	P-value	R-squared
SUS_E	Const	0,32	0,02	<0,0001	0,85
	SC	0,34	0,04	<0,0001	
SUS_E	Const	0,02	0,08	0,8600	0,72
	EC	0,99	0,17	<0,0001	

Source: own study on the basis of Eurostat https://ec.europ a.eu/Eurostat, https://stat.gov.pl/, 8.11.2024.

The results of the SUR estimation indicate that the social and economic cohesion indexes in Poland in 2008-2022 (or the same indexes t-1, t-2) have a statistically significant, positive or negative influence on components of the index of sustainable entrepreneurship in Poland in 2008-2022 (economic, social, and environmental entrepreneurship).

Table 7.
Results of SUR regressions in the period from 2008 to 2022

$$EE = \propto_0 + \propto_1 \cdot SE + \propto_2 \cdot ENVE + \propto_3 \cdot SC + \propto_4 \cdot SC(t-1) + \propto_5 \cdot SC(t-2) + \propto_6 \cdot EC + \propto_7 \cdot EC(t-1) + \propto_8 \cdot EC(t-2) + \varepsilon_i$$
$$SE = \propto_0 + \propto_1 \cdot EE + \propto_2 \cdot ENVE + \propto_3 \cdot SC + \propto_4 \cdot SC(t-1) + \propto_5 \cdot SC(t-2) + \propto_6 \cdot EC + \propto_7 \cdot EC(t-1) + \propto_8 \cdot EC(t-2) + \varepsilon_i$$
$$ENVE = \propto_0 + \propto_1 \cdot EE + \propto_2 \cdot SE + \propto_3 \cdot SC + \propto_4 \cdot SC(t-1) + \propto_5 \cdot SC(t-2) + \propto_6 \cdot EC + \propto_7 \cdot EC(t-1) + \propto_8 \cdot EC(t-2) + \varepsilon_i$$

Country	Dependent variable	Independent variable	Coefficient	Std. error	p-value	R^2
Poland	E_E	Const	-0,38	0,07	0,0005	0,99
		S_E	1,62	0,12	6,41E-07	
		$SC_{(t-1)}$	-0,73	0,16	0,0017	
		$SC_{(t-2)}$	0,56	0,14	0,0036	
		$EC_{(t-2)}$	0,33	0,16	0,0490	
	S_E	Const	0,24	0,03	0,0001	0,99
		E_E	0,61	0,04	6,28E-07	
		$SC_{(t-1)}$	0,44	0,09	0,001	
		$SC_{(t-2)}$	-0,33	0,09	0,0063	
		$EC_{(t-1)}$	-0,20	0,09	0,0445	
	ENV_E	Const	0,37	0,16	0,0409	0,59
		$SC_{(t-2)}$	-0,53	0,14	0,0043	
		$EC_{(t-1)}$	0,81	0,43	0,0885	

Source: own study on the basis of Eurostat https://ec.europ a.eu/Eurostat, https://stat.gov.pl/, 8.11.2024.

The highest positive level of relationship is between the index of economic entrepreneurship and social cohesion index in Poland in 2008-2022, 1.62, and the lowest positive level of relationship is between the index of economic entrepreneurship and economic cohesion index in Poland in 2008-2022(t-2), 0.33. The highest negative level of relationship is between the index of economic entrepreneurship and social cohesion index in Poland in 2008-2022(t-1), -0.73, and the lowest negative level of relationship is between the index of social entrepreneurship and economic cohesion index in Poland in 2008-2022(t-1), -0.23 (Table 7).

5. Discussion

Sustainable entrepreneurship is important for sustainable development based on three economic, social and environmental goals. Sustainable entrepreneurship requires, on the one hand, a detailed business plan that will take into account the internal conditions of the enterprise, its skills and its attitude to social and environmental issues, but on the other hand, it is dependent on several external factors (Kostyukhin, 2019; Misztal, 2023).

Our research indicates that the increase in social and economic cohesion contributes to the sustainable development of entrepreneurship (Matera et al., 2023). Therefore, the main research hypothesis is true because the impact of cohesion on sustainable entrepreneurship is positive.

Like other researchers, we have noticed that sustainable entrepreneurship has a small positive trend in Poland, although its level still needs to be satisfactory (Kowalska et al., 2024).

Additionally, the level of economic and social cohesion is increasing in Poland, which should be interpreted as a positive phenomenon of improving the general macrosocial situation in Poland, associated with improving living conditions and quality of life.

Sustainable entrepreneurship is developing by a small positive trend, with its economic and social pillars having a positive trend and the environmental pillar having a negative one; this means that Polish entrepreneurs still need to fully exploit the opportunities offered by running a business through environmental protection.

The results of correlations and estimations of the OLS and SUR show that social and economic cohesion affects sustainable entrepreneurship and its pillars in various ways.

The research has limitations related to the selection of indicators for analysis, the choice of estimation methods and the construction of synthetic indicators.

Empirical implications concern the construction of indicators and the development of econometric models that allow for the assessment of the development of sustainable entrepreneurship in Poland. The contribution to the theory is developing a literature review and proposing our own research method.

6. Conclusion

Sustainable entrepreneurship is entrepreneurship that considers economic, social and environmental goals. It is extremely important for stable and lasting development that improves the quality of life.

Sustainable entrepreneurship in Poland has a positive trend, although it should be pointed out that the ecological awareness of entrepreneurs should be significantly increased. The results of the study show that social and economic cohesion has a positive impact on sustainable entrepreneurship. Therefore, macroeconomic conditions and social issues should be analyzed when dealing with economic activity.

We will devote further research to analyzing sustainable entrepreneurship in the European Union countries to compare the situation and indicate key factors for further development.

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