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Effect of the economic, social and technological factors on sustainable entrepreneurship over time

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ABSTRACT

Sustainable entrepreneurship (SE) has been researched in different areas but with little attention on sustainability. This study analyses the effects of economic, social, and technological factors on SE over time. It applies partial least squares structural equation modelling (PLS-SEM) to test three hypotheses. The results show that, while all three factor categories positively impact SE over time, the impact of technological factors is less significant.

1. Introduction

Research on sustainable entrepreneurship (SE) continues to grow (Moya-Clemente et al., 2021; Ribes-Giner et al., 2018; Terán-Yépez et al., 2020). This topic has been examined from the perspectives of the elements of the triple bottom line (TBL): environmental, social, and economic (Crals & Vereeck, 2005; Divito & Ingen-Housz, 2021; Gu et al., 2022; Hockerts & Wüstenhagen, 2010; Schaltegger & Wagner, 2011). The TBL perspective suggests that entrepreneurs can find sustainable economic opportunities in situations/market failures associated with environmental and social factors (Watson et al., 2023). Previous studies have focused on social entrepreneurship (Dacin et al., 2011; Sarango-Lalangui et al., 2018), environmental, ecological, or green entrepreneurship (Gast et al., 2017; York et al., 2016), and business entrepreneurship (Belz & Binder, 2017; Dean & McMullen, 2007).

Various definitions of SE have been proposed (Gu & Wang, 2022; Konys, 2019; Terán-Yépez et al., 2020). Schaltegger and Wagner define SE as 'the realization of sustainability innovations aimed at the mass market and benefiting most society' (2011, p. 225). Shepherd and Patzelt (2011, p. 156) define it as being 'focused on the preservation of nature, life and community sustenance in the pursuit of perceived opportunities to create future products, processes and services for profit, where profit is interpreted broadly to include economic and non-economic gains for individuals, the economy and society'. Pinkse and Groot define SE as 'the discovery, creation and exploitation of entrepreneurial opportunities that contribute to sustainability by generating social and environmental benefits for other members of society' (2015, p. 2).

The above definitions allow the identification of the relationship between sustainability and future generations. Indeed, SE should also be approached from the perspective of sustainability over time by considering the need for it to endure over time to generate a long-term impact. Entrepreneurships are sustainable when their objectives in economic, social, and environmental terms persist over time (Sarango-Lalangui et al., 2018). Therefore, entrepreneurs must be aware of both the current and future social and environmental impacts of their ventures. Sustainable development is the reason for generating new and lasting ventures, i.e. those that are maintained in the long term without affecting future generations. SE over time remains under-explored (Moya-Clemente et al., 2019). However, if SE is examined only from the TBL perspective, without considering the long term, the needs of future generations may be neglected.

In addition, technological capabilities lead to research and development (R&D) to produce long-term sustainable products or services and improve or optimise production processes, which not only leads to increased performance and competitiveness but also generates value; an

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example of this is the digitisation process, which entails using digital technologies to generate value for a company (Ribeiro-Navarrete et al., 2021, p. 320). This allows reductions in costs or improved quality (Gu & Wang, 2022), which generate positive impacts on enterprises' sustainable development (Zhang et al., 2020).

From a micro-viewpoint, technological capabilities are necessary to ensure the sustainability of ventures. However, another relationship at the macro-level of the technological aspect has been pointed out (Wade, 2020): the impact of digitisation on how humanity relates to the virtual world (Ribeiro-Navarrete et al., 2021); digitalisation is reshaping how talent is managed by companies (p. 320) and, in this sense, how companies can acquire practices and behaviours that allow data and digital technologies to be employed in a way that is socially, economically, technologically, and environmentally responsible. Therefore, the technological factor plays a vital role in SE over time.

This study first conceptualises economic, social, technological, and SE factors over time through partial least squares structural equation modelling (PLS-SEM). The indicators for the constructs are obtained from different databases. A discussion of the results is followed by the conclusion.

2. Theoretical background and hypothesis

First, the literature is reviewed for potential factors in SE over time. Subsequently, a relational model is designed to test the hypotheses.

2.1. Economic factor

The economic factor plays a vital role in the creation and development of ventures and can influence their sustainability. This factor is related to macroeconomic variables, such as gross domestic product (GDP), inflation, and foreign direct investment (FDI) (Chirinos Araque et al., 2018). A region's economic growth influences the sustainability of ventures over time because it can create a suitable environment for entrepreneurs (Maniyalath & Narendran, 2016) or affect the supply of and demand for goods or services, which can cause entrepreneurs to discontinue operations over time and prevent the establishment of new ones (Fertala, 2008).

Variables such as GDP per capita are related to the sustainability of ventures and number of new small firms. Spencer and Gómez (2004, p. 1105) observe that countries with a lower GDP per capita have higher self-employment rates and smaller businesses than richer countries. Meanwhile, Huang et al. (2023) find that a high GDP per capita provides better conditions for entrepreneurs to start and continue their businesses. Similarly, FDI impacts economic growth (Leiva et al., 2014) through technology absorption (Spencer & Gómez, 2004), which can improve the longevity of sustainable ventures. Other factors include income (Moya-Clemente et al., 2019; Wennekers et al., 2005), regulatory burden and policies (Spencer & Gómez, 2004), and economic policies (Valdez & Richardson, 2013).

Therefore, if ambiguous macroeconomic conditions exist, entrepreneurs will opt for survival rather than growth, and many ventures may not be sustained over time (Maniyalath & Narendran, 2016). Under such conditions, ventures will be created only as a result of the specific economic situation that arises, with no interest in their sustainability time. Therefore, we formulated the following proposition:

Proposition 1. *There is a positive relationship between the economic factor and SE over time.*

2.2. Social factor

Social conditions can affect the creation, initiation, or development of ventures (Lau & Busenitz, 2001). For example, a high unemployment rate may lead individuals to engage in basic forms of entrepreneurship such as self-employment because they perceive an entrepreneurship opportunity and cannot find employment (Spencer & Gómez, 2004). Additionally, access to finance is crucial for both starting and sustaining ventures (Könnölä et al., 2017).

Wennekers et al. (2005) observe that Internet use is related to entrepreneurship. Barnett et al. (2019) conclude that Internet use has a strong and positive effect on entrepreneurship as it has become a tool for people's lives and work and thus generates subjective well-being (Nie et al., 2021).

When studies examine the social factor and SE, they focus on social entrepreneurship, although there has also been an attempt to understand the relationships between social factors and SE. Accordingly, studies have considered human development, and it has been found that low human-development levels can lead to little interest or motivation in entrepreneurship (Maniyalath & Narendran, 2016). Therefore, we formulated the following proposition:

Proposition 2. *There is a positive relationship between the social factor and SE over time.*

2.3. Technological factor

Technology influences sustainable ventures (Gu & Wang, 2022). Innovation and R&D are related to ventures' sustainability over time (Schaltegger & Wagner, 2011) because they allow products or services to be created that generate cost reductions and improve quality to ensure that ventures are sustainable over time. Wennekers et al. (2005) find that innovation, the availability of computers, and Internet use impact entrepreneurship. Meanwhile, Botella-Carrubi et al. (2022) find that innovation is closely related to a company's competencies and that this leads to growth over time. One example is digitalisation, which has multiple benefits, such as process automation, general cost reductions, and the creation of long-term competitive advantages (Knudsen et al., 2021; Ribeiro-Navarrete et al., 2021).

Additionally, technology transfer promotes entrepreneurship (Lado & Vozikis, 1997). Technology transfer refers to 'the transmission of know-how to suit local conditions, with effective absorption and diffusion both within a country and from one country to another' (Lado & Vozikis, 1997, p. 56), and it impacts economic growth. However, this will depend on the context in which it is developed. Similarly, patents influence the start-up of ventures and economic growth rate (Ferreira et al., 2020), considering that patents represent the capacity to innovate and fulfilment of companies' objectives (Meyskens & Carsrud, 2013). Botella-Carrubi et al. (2022) find that innovation is a key element for business success, and thus for long-term sustainability. Therefore, we formulated the following proposition:

Proposition 3. *There is a positive relationship between the technological factor and SE over time.*

2.4. SE over time

SE has been examined in different disciplines, such as management, economics, the environment, and engineering, among others (Anand et al., 2021); thus, there is no single definition of SE (Gu & Wang, 2022; Konys, 2019; Mansouri & Momtaz, 2022; Terán-Yépez et al., 2020). Terán-Yépez suggests two ways of approaching SE: from a sustainable-management perspective and from a business-process perspective (Terán-Yépez et al., 2020). Shahid delineates three streams of SE research: studies involving the conceptualisation of SE, those on forms of entrepreneurship, and those focusing on the agents involved in SE (Shahid et al., 2023).

SE can be understood as 'an ongoing commitment by businesses to behave ethically and contribute to economic development, while improving the quality of life of the workforce, their families, local communities, society and the world in general, as well as future generations' (Muñoz & Cohen, 2018, p. 306). Therefore, SE relates to the pursuit of opportunities while preserving the environment and having

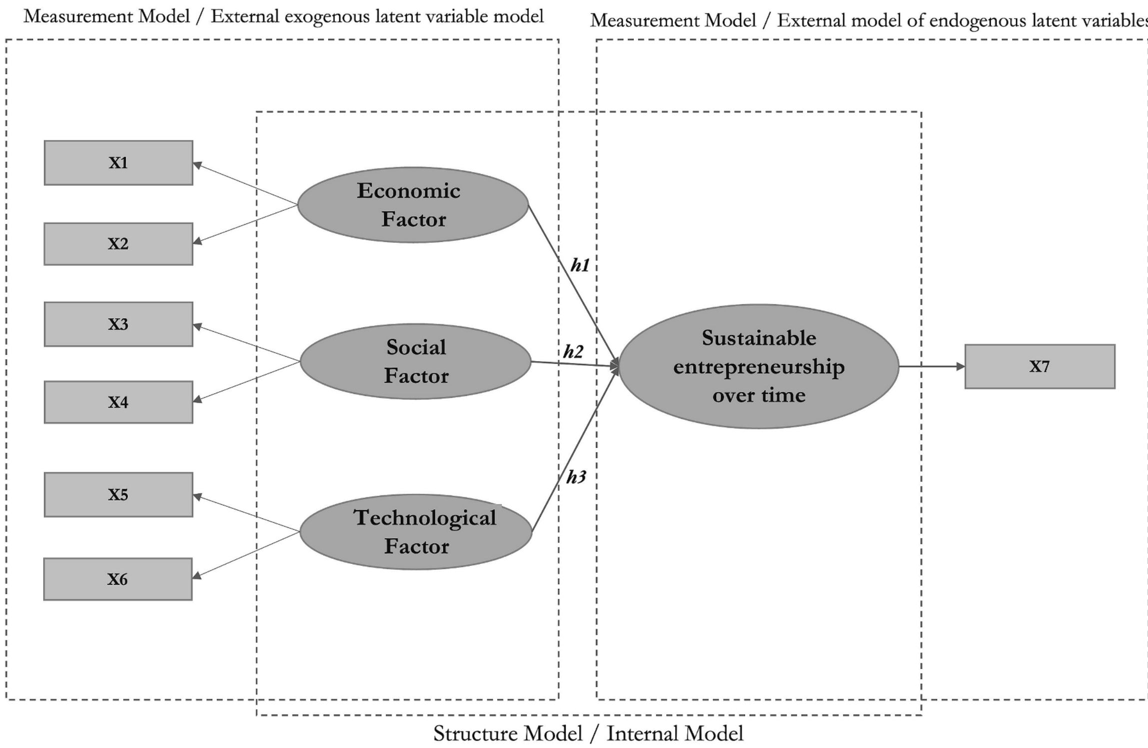

Fig. 1. Research model and hypotheses.

an impact on society (Pinkse & Groot, 2015; Shepherd & Patzelt, 2011). According to Mansouri and Momtaz (2022), 'SE encompasses all entrepreneurial activity that, in addition to positive financial returns, aims to generate non-negative non-financial returns related to environmental, social and governance aspects' (p.3).

Although there is concern about the present, sustainable entrepreneurs must project into the future and achieve sustainability over time. Thus, SE relates to the TBL, leading the sustainable entrepreneur to seek a balance between the TBL components: environmental care, social welfare, and desirable economic outcomes (Muñoz & Dimov, 2015; Terán-Yépez et al., 2020).

Indeed, governments will be keenly interested in sustainable ventures' sustainability over time because these ventures will contribute to the social and environmental solutions that form part of public policies (Pinkse & Groot, 2015) and help to correct market failures in these areas (Watson et al., 2023). Therefore, sustainable entrepreneurs will find long-term opportunities to achieve long-lasting business models (Sarango-Lalangui et al., 2018) by creating value in the short and long term and contributing to the advancement of future generations (Cordero López et al., 2011). Therefore, they must behave in a socially responsible manner and use resources appropriately (Moya-Clemente et al., 2019).

Based on the above hypotheses, the following constructs are defined in the proposed model, which are the variables that are not directly measured: social, economic, technological, and SE over time. These constructs represent the structural model. The measurement model, which is also called the external model of exogenous latent variables, will be reflective (the construct causes the measurement) (Hair et al., 2019) and comprises the environmental, social, economic, and technological constructs that help to explain the construct of SE over time. The external measurement model of the endogenous latent variables is represented by the explained construct in the model, i.e. SE over time. Fig. 1 depicts the proposed model, which aims to test the impacts of the social, economic, and technological factors on SE over time.

3. Method and statistical analysis

To conduct the research and design the model, data were collected on the economic, social, technological, and continuity factors of SE over time in different countries. The data were obtained from several databases, including the World Bank, Global Entrepreneurship Monitor (GEM), and Human Development Index (HDI). Fifty-one matching countries were obtained from all the databases. If a country had no information on an indicator, it was replaced in the database and assigned a value of −999. In the SmartPLS software (Ringle et al., 2015), the indicator was configured as missing data by always validating that it did not exceed 5 %, so that it could be replaced by the mean (Hair et al., 2019, p. 98). Table 2 shows the data for all the countries and factors, while Table 3 presents the descriptive statistics.

Given the absence of an indicator to measure SE over time, we used the business-continuity indicator proposed by Moya-Clemente et al. (2020). The indicator was obtained by using the business-discontinuity rate reported by GEM in 2017 and calculating the complement as follows: 100 - business-discontinuity indicator. The GEM business-discontinuity index is expressed as the percentage of 'people who have closed, sold or discontinued their business in the last 12 months', i.e. the continuity index shows the percentage of ventures that have been sustainable over time.

Two indicators for the economic factor were used: GDP per capita and FDI, as reported by the World Bank in 2017. The social factors were measured based on the indicator of people using the Internet and HDI. Finally, for the technological factor, indicators such as patent applications and high-tech exports were used. Table 1 presents the factors with their respective indicators, formal definitions, and databases from which information was obtained.

Of the 51 countries in the country database, 35 % are in Europe, 31 % in Asia, 25 % in the Americas, 6 % in Africa, and 2 % in Oceania. According to the World Bank classification, 57 % are high-income, 29 % upper/middle-income, 12 % lower/middle-income, and 2 % low-income.

Table 1
Description of the construct indicators.

Factor	Indicators	Description	Database
Economic	Gross Domestic Product (GDP) per capita growth (annual %)	GDP per capita is gross domestic product divided by the mid-year population. GDP at purchaser's prices is the sum of gross value added by all resident producers in an economy plus any product taxes minus any subsidies not included in the value of the products. It is calculated without accounting for the depreciation of fabricated assets or for the depletion and degradation of natural resources. (World Bank, 2017b)	World Bank https://data.worldbank.org/indicator/
	Foreign direct investment (FDI)	Foreign direct investment refers to direct investment-equity flows in a reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital. Direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy. Ownership of 10 % or more of the ordinary shares of voting stock is the criterion for determining the existence of a direct investment relationship. (World Bank, 2017a)	World Bank https://data.worldbank.org/indicator/
Social	Human Development Index (HDI)	The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and having a decent standard of living. The HDI is the geometric mean of the normalised indices for each of the three dimensions. (United Nations Development Programme, 2017)	United Nations Development Programme https://hdr.undp.org/en/data
	Individuals using the Internet (% of population)(INTERNET USE)	Internet users are individuals who have used the Internet (from any location) in the previous 3 months. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV, etc. (World Bank, 2017d)	World Bank https://data.worldbank.org/indicator/
Technological	Patents	Patent applications are worldwide patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office for exclusive rights for an invention–a product or process that provides a new way of doing something or offers a new technical solution to a problem. A patent provides protection for the invention to the owner of the patent for a limited period, generally 20 years. (World Bank, 2017e)	World Bank https://data.worldbank.org/indicator/
	High-technology exports (HTE)	High-technology exports are products with high R&D intensity. (World Bank, 2017c)	World Bank https://data.worldbank.org/indicator/
Sustainable entrepreneurship over time	Continuity index	The continuity index shows the percentage of entrepreneurships that have been sustainable over time (100-discontinuity index). (Moya-Clemente et al., 2019)	Global Entrepreneurship Monitor https://www.gemconsortium.org/

3.1. PLS-SEM

SEM was used to validate the model. This method allows the incorporation of unobservable variables that are directly measured using variables or indicators (Hair et al., 2019, p. 29). The employed SEM type is PLS-SEM. This technique is normally used to conduct exploratory research (Guenther et al., 2023). It simultaneously examines the relationships between the latent variables of several elements. The statistical objective is to maximise the variance explained in one multi-item dependent variable or more (Manley et al., 2021). One of the main PLS-SEM features is that it does not assume a specific data distribution and can estimate models with small samples (Hair et al., 2019).

It is worth highlighting that this method (PLS-SEM) has been used in research in different knowledge areas (Sarstedt et al., 2022), for example, entrepreneurship (Fichter & Tiemann, 2020; Moya-Clemente et al., 2019), tourism and hospitality (Hernández-Rojas & Huete Alcocer, 2021), knowledge management (Martínez Ávila & Fierro Moreno, 2018), human resources (Del-Castillo-Feito et al., 2022), and information security (Kante & Michel, 2023).

To conduct the PLS-SEM analysis, several steps have been proposed (Hair et al., 2019): 1) specification of the structural model; 2) specification of the measurement model; 3) data collection and examination; 4) estimation of nomograms (path models); 5) assessment of measurement models; 6) assessment of the PLS-SEM results; 7) advanced PLS-SEM analyses; and 8) interpreting the results and drawing conclusions.

The nomological network contains both the structural and the measurement models. Fig. 2 shows the nomological network of the model for the constructs, for which the SmartPLS software (Ringle et al., 2015) was used.

4. Results

The results are presented below. First, an assessment was performed of the overall model fit, as suggested by Dijkstra and Henseler (2015). The assessments of both the measurement and the structural models were then conducted. The SmartPLS software was used for the analysis (Ringle et al., 2015).

4.1. Assessment of the overall model fit

The proposed model fits the data well based on the parameters proposed by Henseler et al. (2016). Table 4 shows the results of the bootstrap-based fit test, which is a non-parametric resampling procedure that assesses the variability of a statistic by examining the variability of the sample data rather than using parametric assumptions to assess the precision of the estimates (Streukens & Leroi-Werelds, 2016, p. 619). The results meet the parameters set out by Benitez et al. (2020): the standardised root mean square residual (SRMR) ($0.146 \leq 0.156 \leq 0.198$); unweighted least squares discrepancy (d_ULS $0.594 \leq 0.684 \leq 1.102$); and geodesic discrepancy (d_G $0.194 < 0.314 < 0.546$).

4.2. Assessment of the measurement model

In the assessment of the measurement model for the model with the reflective constructs (Mode A), different criteria were applied, including an analysis of individual-item reliability, the internal consistency or reliability of a scale, and convergent and discriminant validity (Hair et al., 2019, p. 143; Manley et al., 2021). The results are shown in Table 5.

Individual-item reliability must be over 0.707 ($\lambda >= 0.707$) (Hair et al., 2019, p. 159). All the indicators are above 0.707. However, the FDI indicator yields a loading of $\lambda = 0.516$. Several researchers contend

Table 2
Information by country.

COUNTRY	GDP	INTERNET USE	HTE	PATENTS	CONTINUITY	HDI	FDI
Argentina	1.76	74.29	9.25	393	97	0.84	1.79
Australia	0.59	86.55	17.96	2503	96.2	0.94	3.56
Bosnia and Herzegovina	4.24	64.89	5.44	87	98.7	0.77	2.82
Brazil	0.51	67.47	13.86	5480	94.7	0.76	3.34
Bulgaria	4.26	63.41	9.65	202	98.7	0.81	3.43
Canada	1.95	92.7	14.7	4053	93.1	0.93	1.54
Chile	−0.24	82.33	6.98	425	92.9	0.85	2.21
China	6.35	54.3	30.91	1245709	97.2	0.75	1.35
Colombia	−0.16	62.26	8.99	595	93.5	0.76	4.44
Croatia	4.69	67.1	8.73	148	96	0.85	0.86
Cyprus	3.39	80.74	13.35	8	95.7	0.88	53.89
Ecuador	0.57	−999	8.05	16	91.2	0.76	0.6
Egypt, Arab Republic of	2.03	44.95	0.57	1025	89.8	0.7	3.14
Estonia	5.37	88.1	17.94	37	95.6	0.89	6.41
France	2.08	80.5	26.14	14415	96.7	0.9	1.38
Germany	2.22	84.39	15.85	47785	98.4	0.94	3.21
Greece	1.71	69.89	12.11	498	94.9	0.88	1.69
Guatemala	1.36	40.7	5.34	3	94	0.66	1.39
India	5.91	32	7.39	14961	96.8	0.64	1:51
Indonesia	3.84	32.34	8.46	2271	95.2	0.71	2.02
Iran, Islamic Republic of	2.33	64.04	1.36	15264	93.4	0.79	1.13
Ireland	6.97	84.11	29.2	62	96.7	0.95	17.37
Israel	1.55	81.58	21.07	1436	95.2	0.91	4.78
Italy	1.82	63.08	7.89	8643	97.9	0.89	0.57
Japan	2.34	91.73	17.6	260292	98.5	0.92	0.39
Kazakhstan	2.69	76.43	24.24	1055	92.5	0.82	2.83
Korea, Republic of	2.87	95.07	32.55	159084	97.3	0.91	1.1
Latvia	4.17	80.11	17.72	90	95.8	0.86	3.78
Lebanon	−0.64	78.18	7.61	−999	93.4	0.75	4.75
Luxembourg	−0.64	97.36	7.15	156	96.8	0.91	−10.62
Madagascar	1.19	−999	0.5	9	93.3	0.53	3.53
Malaysia	4.38	80.14	51.13	1166	91.7	0.81	2.94
Mexico	0.93	63.85	21.18	1334	96.5	0.77	2.85
Morocco	2.88	61.76	3.86	198	95.5	0.67	2.44
Netherlands	2.3	93.2	23.04	2241	96.9	0.94	26.77
Panama	3.81	59.95	13.71	33	97.3	0.81	6.39
Peru	0.83	50.45	5.14	100	93.8	0.77	3.25
Poland	4.82	75.99	10.91	3924	97.2	0.87	2.23
Puerto Rico	−0.51	68.74	−999	−999	97.3	−999	−999
Qatar	−4.04	97.39	0.01	19	94.2	0.85	0.61
Saudi Arabia	−2.71	94.18	0.73	909	91.2	0.85	0.21
Slovenia	4.73	78.89	6.51	−999	97.7	−999	2.46
Spain	2.73	84.6	7	2167	98.1	0.9	2.4
Sweden	1.2	93.01	15.4	1992	97.5	0.94	5.18
Switzerland	0.85	89.69	14.03	1337	98.9	0.95	21
Thailand	3:71	52:89	25.12	979	90.8	0.77	1.82
United Arab Emirates	1.01	94.82	2.72	52	90:8	0.88	2.69
United Kingdom	1.2	90.42	23.09	13301	97.4	0.93	4.7
United States of America	1.73	87.27	19.52	293904	96	0.92	1.88
Uruguay	2.22	70.32	8.49	23	95	0.81	4.46
Viet Nam	5.73	58.14	41.74	592	95.8	0.7	6.3

Table 3
Descriptive statistics.

CONSTRUCT	INDICATOR	MEAN	MEDIAN	MIN	MAX	STANDARD DEVIATION
ECONOMIC	GDP	2.252	2.077	−4.041	6.974	2.174
	FDI	4.615	2.818	−10.619	53.893	8.785
SOCIAL	INTERNET USE	74.006	78.181	32	97.389	16.736
	HDI	0.828	0.847	0.526	0.949	0.095
TECHNOLOGICAL	HTE	14.038	12.109	0.006	51.131	10.605
	PATENTS	43.978.67	1025	3	1245709	184937557
SUSTAINABLE ENTREPRENEURSHIP OVER TIME	CONTINUITY	95.425	95.8	89.8	98.9	2.334

that this rule of thumb ($\lambda >= 0.707$) should not be rigid in the initial scale-development stages (Chin, 1998), and loads between 0.40 and 0.70 can be accepted (Hair et al., 2019, p. 159). The indicator is not removed and continues to be used to verify the other criteria.

Construct reliability (internal consistency) was obtained using composite reliability, which must be greater than 0.7, which means that the construct indicators indicate the latent construct.

Convergent validity is measured using average variance extracted (AVE), which must equal or exceed 0.5 (Hair et al., 2019). The AVE values for all the constructs exceed this value, which indicates that, on average, each construct explains 50% of the variance of its indicators or more, i.e. each set of indicators represents a single construct. In other words, the constructs are adequately measured by their indicators.

In conclusion, the model meets the individual-item and composite

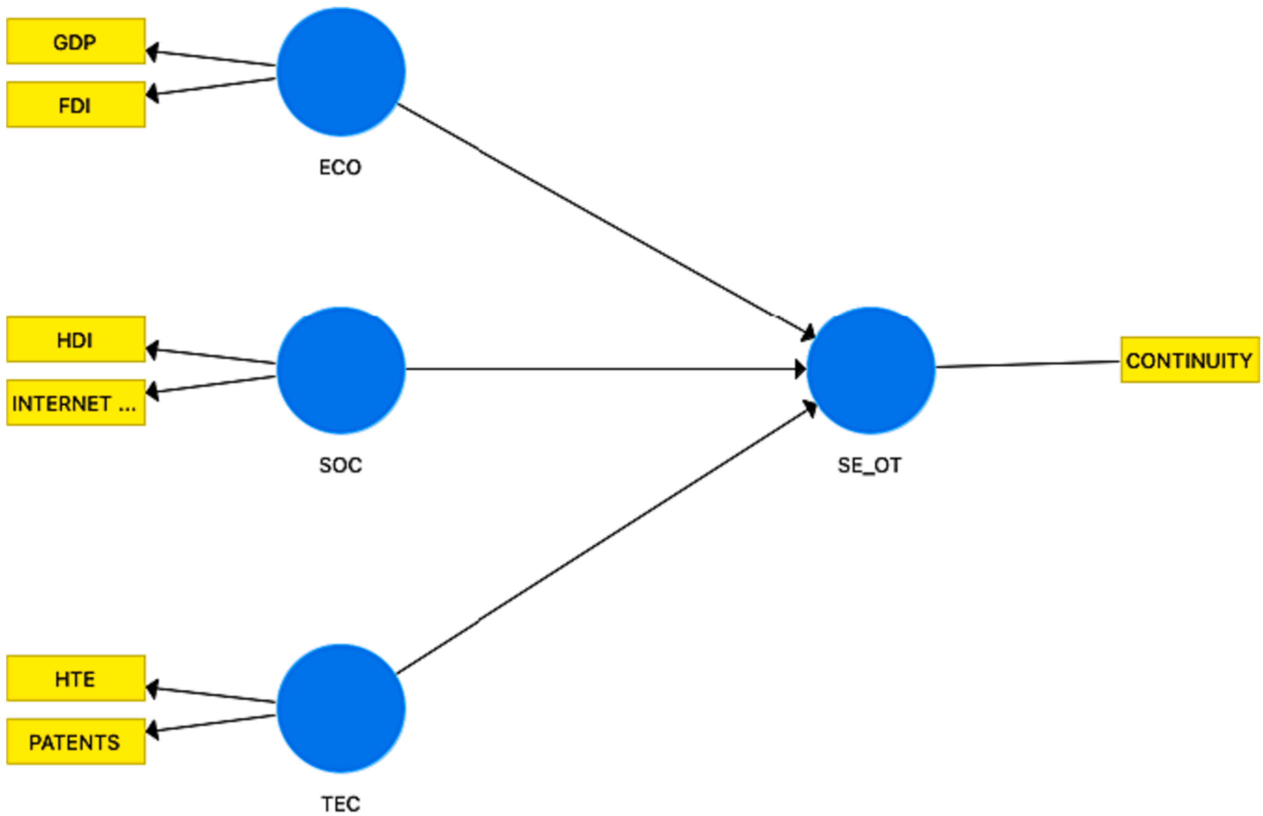

Fig. 2. Nomological network of the proposed model using the SmartPLS software.

Table 4
Results of the assessment of the overall model fit.

	Original sample	Sample mean	HI95	HI99
SRMR – estimated model	**0.146**	0.085	0.156	0.198
d_ULS – estimated model	**0.594**	0.226	0.684	1.102
d_G – Geodesic Distance – estimated model	**0.194**	0.169	0.314	0.546

reliabilities as well as the convergent-validity criteria.

Discriminant validity, which represents the extent to which one construct differs from the others, i.e. the extent to which the study assesses the different constructs, is verified based on the cross-loadings and Fornell and Larcker criterion.

a. **Cross-loadings:** It is evident from Table 6 that each indicator is more closely related to its own construct than to the others and is highly correlated with the indicators of its own construct. Although it is not widely used, it is evident that this is true (Hair et al., 2019).
b. **The Fornell and Larcker criterion.** The amount of variance that a construct captures from its indicators (AVE) should be larger than the variance that the construct shares with the other constructs in the model (Hair et al., 2019). The diagonal shows the square root of the AVE, and the off-diagonal elements are the correlations (see Table 7).

In conclusion, the proposed A-mode measurement model is validated because all the criteria and indicators are met.

Table 5
Rating measurement model. Reflective Construct.

	External Loads	Composite Reliability	AVE
CONTINUITY	**1**	**1**	**1**
ECONOMIC		**0.708**	**0.567**
GDP	**0.932**		
FDI	**0.516**		
SOCIAL		**0.917**	**0.848**
HDI	**0.984**		
INTERNET USE	**0.853**		
TECHNOLOGICAL		**0.775**	**0.633**
PATENTS	**0.844**		
HTE	**0.745**		

4.3. Assessment of the structural model.

The assessment of the structural model follows that of the measurement model. First, the presence/absence of collinearity between the variables must be established. For this, the construct that receives the most arrows is considered; that is, SE over time (SE_OT). The result rules out any collinearity problems because the values are below 3 (Hair et al., 2019) (see Table 9). Regarding the path coefficients (β), the signs and magnitudes were analysed. All the coefficients were positive, which is consistent with the proposed hypotheses.

Based on a bootstrapping method with 5,000 subsamples, the economic factor shows a positive relationship with SE over time ($\beta = 0.328$; $p < 0.05$). The social factor is also positively related to SE over time ($\beta = 0.354$; $p < 0.05$), whereas the technological factor is not positively related to SE over time ($\beta = 0.046$; $p > 0.05$) (see Table 8). For

Table 6
Discriminant validity of SE over time using the cross-loadings.

CROSS LOADINGS	ECO	SE_OT	SOC	TEC
CONTINUITY	0.315	**1**	0.33	0.2
GDP	**0.932**	0.307	−0.18	0.42
HTE	0.435	0.142	0.231	**0.75**
HDI	−0.02	0.377	**0.984**	0.11
FDI	**0.516**	0.13	0.183	0.02
PATENTS	0.185	0.176	−0.05	**0.84**
INTERNET USE	−0.26	0.128	**0.853**	0.22

Table 7
Discriminant validity of SE over time using the Fornell-Larcker criterion.

FORNELL-LARCKER	ECO	SE_OT	SOC	TEC
ECO	**0.753**			
SE_OT	0.315	**1**		
SOC	−0.085	0.33	**0.921**	
TEC	0.371	0.201	0.094	**0.796**

magnitude, the standardised path with the closest relationship is that of the social factor with SE over time, followed by that of the economic factor, while the technological factor yields a non-significant result with SE over time.

Subsequently, the within-sample predictive power was calculated using R^2 (Carrión et al., 2016) Fig. 3. The result is 0.230, which confirms the model's predictive relevance because it is higher than 0.1. Thus, the result means that the economic, social, and technological factors explain 23% of SE performance over time. The variance explained by each construct is identified. The social, economic, and technological factors explain 12%, 10%, and 1% of the SE construct over time, respectively (see Table 10).

Additionally, Hair et al. (2014) propose assessing effect size (f^2) and predictive relevance (Q2). Regarding effect size, obtained using f^2, the social factor has a moderate effect (0.158), the economic factor is weak (0.119), and the technological factor has an extremely small effect size (0.002). The predictive significance is determined using the Hensel test, and the value of the statistic must be positive. For the model, the predictive significance (Q^2) is 0.171.

5. Discussion

The main objective of this study is to explore the effects of selected factors on SE over time. Although consensus on a single definition of SE has yet to be reached (Gu & Wang, 2022; Terán-Yépez et al., 2020), several definitions focus on the relationship between sustainability and future generations (Sarango-Lalangui et al., 2018). This leads to an analysis of the longevity of SE; noteworthily, few studies have considered SE and its longevity (Moya-Clemente et al., 2019).

The results indicate a positive relationship between the economic factor and SE over time. This is consistent with Maniyalath and Narendran's (2016) findings that entrepreneurs' sustainability is influenced by a region's economic growth.

The results also show a positive relationship between the social factor and SE over time, which is consistent with Lau and Busenitz's (2001) finding that social conditions can affect enterprises' creation, start-up, or development. The results resonate with Huang et al.'s (2023) finding on the existence of social aspects that positively impact SE, such as education.

Table 9
Assessment of the collinearity of the antecedent variables.

VIF	SE_OT
ECO	**1.179**
SOC	**1.026**
TEC	**1.181**

Regarding the technological factor, the results do not support hypothesis 3 (*h3*); there is no positive relationship between the technological factor and SE over time. Although authors such as Wennekers et al. (2005) have found that innovations and the availability of computers impact entrepreneurship, this could not be evidenced in the results of the model. This may be because technology supports economic development (Lado & Vozikis, 1997) and may not be directly associated with SE over time.

Finally, regarding the research limitations, one finding is that not all the countries have information in the consulted databases, which limits the number of countries in the database. However, as evidenced, those countries are located in different regions and have distinct income classifications.

6. Conclusions

Although a considerable amount of research is related to SE, the concept of SE over time remains under-explored (Moya-Clemente et al., 2019). It is important to consider the time element when examining SE because an analysis of SE should not only be from the perspective of the TBL but should also include the factors that drive its durability. Therefore, this study contributes to the field because it explores the factors that influence SE over time and can serve as a starting point for further research.

The purpose of this study is to analyse the relationships among the economic, social, and technological factors and SE over time. A model was developed for the purpose and validated using the PLS-SEM method. The proposed model has a good fit and two of the hypotheses are supported. The results indicate that the social factor best explains SE over time, followed by the economic factor.

This study's findings contribute to the literature in two ways. First, it highlights the importance of examining SE from a time perspective and provides an empirical basis for the relevance of the social and economic factors in SE over time. While SE research has advanced, studies focusing on the time aspect remain limited. Second, through the proposed model, it was identified that social and economic factors influenced SE over time. However, technological factors were found to be unrelated to SE over time in this model.

According to the model's results, as the social factor has the strongest effect on SE over time, governments should focus on improving the aspects or variables related to this factor, such as the HDI. For example, policy makers can consider the HDI and all its dimensions: a long and healthy life, knowledge, and having a decent standard of living. An improvement in these dimensions leads to SE over time. Consistent with Garrigos-Simon et al. (2018), social and human capital should promote sustainable-government policies associated with the three axes of the

Table 8
Significance results for the path coefficients of the structural model.

	Path coefficient	t-values	p-values	95 % confidence intervals	Significance	f^2
ECO -> SE_OT	0.328	**3.094**	**0.001**	**[0.186–0.500]**	**SI**	0.119
SOC -> SE_OT	0.354	**2.81**	**0.002**	**[0.169–0.519]**	**SI**	0.158
TEC -> SE_OT	0.046	0.318	0.375	[-0.062–0.334]	No	0.002

Note: Critical t-values 1.96 (P < 0.05).

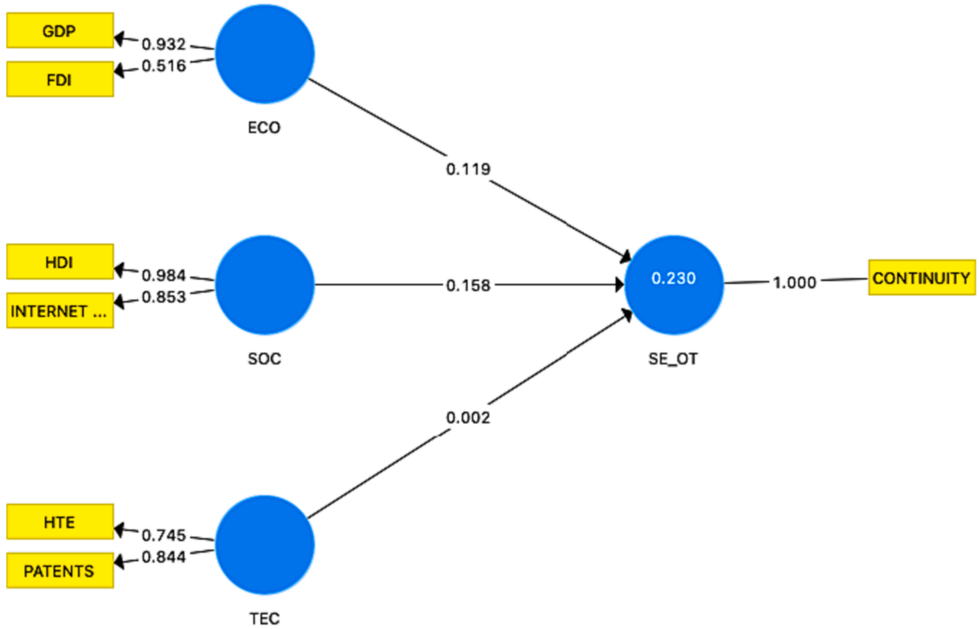

Fig. 3. Results of the model developed using the SmartPLS software.

Table 10
Amount of variance explained.

	path coefficient	Correlations	Amount of variance explained
ECO	0.328	0.315	**10 %**
SOC	0.354	0.33	**12 %**
TEC	0.046	0.201	**1 %**

TBL, which would lead to an impact on SE over time. Furthermore, Watson et al. (2023) propose that it is necessary to have a policy for SE to support entrepreneurs, market opportunities, and the entrepreneurial ecosystem in general.

Last, as the technological factor has less explanatory power for SE over time, it is possible to examine the possible role of technology as a mediator or moderator in the model as a future research avenue. However, it should be noted that public policies on entrepreneurship should be directed towards sustainability over time by considering the social, economic, and technological factors identified in this study.

CRediT authorship contribution statement

Chaves-Vargas Joana Carolina: Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Visualization, Investigation, Validation, Formal analysis, Methodology. **Ribes-Giner Gabriela:** Conceptualization, Data curation, Writing – review & editing, Visualization, Investigation, Validation, Formal analysis, Methodology. **Moya-Clemente Ismael:** Conceptualization, Data curation, Writing – review & editing, Visualization, Investigation, Validation, Formal analysis, Methodology.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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