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Altruistic and egoistic motivations to engage with contact-tracing apps: Lessons learned from the Covid-19 pandemic

Motivaciones altruistas y egoístas para comprometerse con las apps de rastreo de contactos: Lecciones aprendidas de la pandemia por Covid-19

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ABSTRACT

During the Covid-19 pandemic, contact-tracing apps have offered effective help to bend the contagion curve. Thus, it is of critical importance to understand the factors that influence contact-tracing apps' adoption among citizens. In particular, the successful adoption and usage of contact-tracing apps strongly relies on individual motives. Therefore, this study draws on the theory of altruistic and egoistic motivation for prosocial behaviours to analyse the underlying motives through which citizens engage in voluntary behaviours aimed at using and promoting the use of contact-tracing apps. The study also examines the mediating role of users' trust in the app. Data from 221 users of Ireland's Covid Tracker app was analysed. Structural equation modelling with PLS was used to test the research model. Findings show differences between egoistic and altruistic motivation in promoting app use and sharing. Egoistic motivation significantly promotes voluntary behaviours among citizens and users' trust in the app mediates this influence. Yet, contrary to predictions, in the context of the pandemic, altruistic motivation does not play a significant role in engaging citizens in these voluntary behaviours, either directly or indirectly. The findings of this study are important for policy makers and may inform future policy decisions regarding the implementation of contact-tracing apps in the case of new pandemics or for other contexts requiring cooperative daily check-in.

Keywords: Contact-tracing, Covid-19, Altruistic motivation, Egoistic motivation, Prosocial behaviour.

RESUMEN

Durante la pandemia por Covid-19, las apps de rastreo de contactos han supuesto una ayuda efectiva para doblegar la curva de contagios. Por lo tanto, resulta de gran importancia entender los factores que influyen en la adopción de apps de rastreo de contactos entre los ciudadanos. En concreto, una adopción y uso exitosos de estas apps dependen fuertemente de los motivos individuales. Por ello, este estudio se basa en la teoría de motivaciones altruistas y egoístas para los comportamientos sociales para analizar los motivos por los cuales los ciudadanos llevan a cabo determinados comportamientos voluntarios dirigidos a usar y promocionar el uso de apps de rastreo de contactos. Este estudio también examina el papel mediador de la confianza de los usuarios en la app. Datos de 221 usuarios de la app de rastreo de contactos de Irlanda fueron analizados. El modelo se testó usando modelos de ecuaciones estructurales con PLS. Los resultados muestran diferencias entre las motivaciones egoístas y altruistas a la hora de promover el uso de la app. La motivación egoísta promueve significativamente comportamientos voluntarios entre los ciudadanos y la confianza de los usuarios en la app media esta influencia. Sin embargo, en el contexto de la pandemia, la motivación altruista no juega un papel significativo a la hora de animar a los ciudadanos a llevar a cabo estos comportamientos voluntarios, ni directa ni indirectamente. Los resultados de este estudio pueden ayudar a tomar futuras decisiones sobre la implantación de apps de rastreo de contactos en el caso de nuevas pandemias o de otros contextos que requieran un registro diario cooperativo.

Palabras clave: Rastreo de contactos, Covid-19, Motivación altruista, Motivación egoísta, Comportamiento social.

1. INTRODUCTION

The coronavirus (Covid-19) pandemic has been one of the world's major health crises during the past century. In an attempt to curb coronavirus outbreaks due to contact with asymptomatic patients, governments around the world established limitations on citizen mobility and implemented traditional contact-tracing programs (Trang *et al.*, 2020). However, due to the high risk of contagion and the rapid transmission of Covid-19, controlling the pandemic through traditional contact tracing was not feasible (Ferretti *et al.*, 2020).

One solution to this problem that caused great controversy was the implementation of contact-tracing apps (Trang *et al.*, 2020). These apps use big data and Bluetooth and GPS technologies to automatically register all app users with whom an individual has been in contact. Therefore, when a user is infected by the virus and notifies this to the app, other people who have been in contact receive a warning message on their mobile phones to stay in quarantine, thereby helping to prevent the spread of the virus.

Contact-tracing apps' effectiveness depends on a large percentage of the population downloading and using the app (Riemer *et al.*, 2020). This is why countries such as China made their use mandatory (Farronato *et al.*, 2020). In European countries, by contrast, their use was entirely voluntary. In most European countries, such as the United Kingdom (*NHS COVID-19* app), France (*Stop-COVID* app), Italy (*Immuni* app) and Spain (*Radar COVID* app), contact-tracing apps failed. However, there are some exceptions, such as in Germany and Ireland, where contact-tracing apps experienced unprecedented success; for instance, in Germany, the Corna-Warn-App reached 16 million downloads just in its first month, whereas Ireland's COVID Tracker app's downloads reached the equivalent of a third of smartphone users in the country in just its second week (BBC News, 2020). Apps with this level of adoption success provide a useful context for the study of contact-tracing apps.

As contact-tracing apps offer a possible solution to bend the contagion curve, it is of critical importance to understand the factors that influence contact-tracing apps' adoption among citizens. Recently, numerous studies have examined the effect of different factors on the adoption and use of contact-tracing apps worldwide, namely privacy concerns and cyber security risks (e.g., Altmann *et al.*, 2020; Horvath *et al.*, 2022), government-related factors such as trust on the government (e.g., Abeler *et al.*, 2020; Buder *et al.*, 2020) and individuals' political views (e.g., Lewandowsky *et al.*, 2021; Wnuk *et al.*, 2020), technology-related factors such as individuals' technical abilities (e.g., Albrecht *et al.*, 2021; Kostka & Habich-Sobiegalla, 2020), compatible equipment (e.g, Bachtiger *et al.*, 2020; Horstmann *et al.*, 2021), and app design and specifications (e.g., Wiertz *et al.*, 2020; Zhang *et al.*, 2020), and individuals' characteristics such as socio-demographic variables (e.g., Jansen-Kosterink *et al.*, 2021; Von Wyl *et al.*, 2021), health status (e.g., Blom *et al.*, 2021; O'Callaghan *et al.*, 2021), and personality traits (e.g., Guillon & Kergall, 2020; Walrave *et al.*, 2021).

Although these studies answer the question of *"what"* drives or impedes contact-tracing apps' adoption or use, they have not deepened into *"why"* citizens are willing to engage in prosocial behaviours related to the use and adoption of these apps. In the context of a collective action problem as the pandemic, achieving desirable collective outcomes depends partly on individuals' willingness to engage in actions that can have personal costs but benefit the group as a whole (Fang *et al.*, 2022; Syropoulos and Markowitz, 2021). While extant literature has explored psychological underpinnings of prosociality concerning shopping for others or doing telework to support the COVID response overseas (Politi *et al.*, 2021), it is also important to explore *"why"* citizens perform behaviours that benefit the community and its members, but go beyond requirements and are not directly or formally rewarded, such as using a contact-tracing app, recommending it to other potential users and assisting other users downloading and using the app. Therefore, this study seeks to answer the following question: what motivates citizens to perform these behaviours for themselves and others?

As Roberts *et al.* (2014) stated, *"motivation explains why people behave in certain ways, what energises their behaviour and what directs their subsequent voluntary action(s)"* (p. 150). Indeed, motivational factors have successfully been used to explain why users engage in voluntary behaviours towards information systems and online communities (Kim *et al.*, 2018). Yet despite their importance, scant research has been conducted in the context of contact-tracing apps. To address this gap, this study draws on the theory of altruistic and egoistic motivation for prosocial behaviours (Batson & Shaw, 1991) to analyse the underlying motives through which citizens engage in voluntary behaviours aimed at using and promoting contact-tracing apps among others. The study also examines the mediating role of users' trust in the app.

This research contributes to the literature in several ways. First, this research provides empirical insights into the impact of citizens' motivations —ignored to date in the literature— on contact-tracing apps. Additionally, most existing studies investigating contact-tracing apps' adoption were carried out at the beginning of the pandemic (e.g., Abeler *et al.*, 2020; Altmann *et al.*, 2020; Guillon & Kergall, 2020; Kaspar, 2020; Lewandowsky *et al.*, 2021; Li *et al.*, 2020; Trang *et al.*, 2020; Wnuk *et al.*, 2020; Zhang *et al.*, 2020). At that time, there was a great lack of knowledge and confusion around contact-tracing apps. This study conducted several months after the start of the pandemic, when the app was "up and running", can help us better understand the motivations to use and promote the use of contact-tracing apps. Third, whereas previous research has investigated fictitious apps or the determinants of users' intention to adopt contact-tracing apps (e.g., Buder *et al.*, 2020; Horvath *et al.*, 2022; Li *et al.*, 2020, 2021; Naous *et al.*, 2020; Utz *et al.*, 2021; Wiertz *et al.*, 2020), this study analyses the use of a real application among real users. Finally, given that the Covid-19 pandemic may not be the last pandemic that the world will see, the results of the study may inform future policy decisions regarding the implementation of contact-tracing apps in the case of new pandemics, or in other contexts requiring cooperative daily check-in and/or tracing or in fostering adoption of other prosocial initiatives.

2. PRIOR RESEARCH ON CONTACT-TRACING APPS

Since the beginning of the pandemic, research on Covid-19 has grown exponentially, with a great number of studies investigating the factors that influence the adoption and usage of contact-tracing apps. Most previous research has primarily relied on privacy issues, government-related factors, technology-related aspects and individuals' characteristics to explain contact-tracing apps adoption and usage (Table 1).

Table 1
Prior research on factors influencing contact-tracing apps adoption and use

Factors	Variables	Sample of studies analysing the variables	Main findings
Privacy and security	Privacy concerns	Abuhammad *et al.* (2020), Altmann *et al.* (2020), Bachtiger *et al.* (2020), Chan and Saquib (2021), Cocosila *et al.* (2022), Jansen-Kosterink *et al.* (2021), Kostka and Habich-Sobiegalla (2020), Horstmann *et al.* (2021), Horvath *et al.* (2022), Li *et al.* (2021), Utz *et al.* (2021), Walrave *et al.* (2021), Zimmermann *et al.* (2021)	Overall, privacy concerns as well as security and surveillance perceived risks decrease the acceptance and use of contact tracing
	Security/ surveillance risk	Abeler *et al.* (2020), Albrecht *et al.* (2021), Lewandowsky *et al.* (2021)	
Government	Trust in the government	Abeler *et al.* (2020), Altmann *et al.* (2020), Buder *et al.* (2020), Guillon and Kergall (2020), Kostka and Habich-Sobiegalla (2020), Lewandowsky *et al.* (2021)	Overall, acceptance and use of contact tracing are higher for people who trust governments and support their measures. However, the effect of ideological views on the acceptance of contact tracing is inconclusive.
	Satisfaction with the government	Horvath *et al.* (2022)	
	Ideological views	Lewandowsky *et al.* (2021), Wnuk *et al.* (2020)	
	Supporting government measures	Albrecht *et al.* (2021), Saw *et al.* (2021), Von Wyl *et al.* (2021)	
Technology	Technical abilities	Albrecht *et al.* (2021), Blom *et al.* (2021), Kostka and Habich-Sobiegalla (2020)	Overall, individuals' lack of compatible equipment and technical abilities to install, understand and use apps are barriers to contact-tracing apps. Voluntary use, anonymous data and limited data storage are preferable.
	Attitude towards technology	Jansen-Kosterink *et al.* (2021)	
	Technical equipment	Bachtiger *et al.* (2020), Blom *et al.* (2021), Horstmann *et al.* (2021)	
	App characteristics and specifications	Altmann *et al.* (2020), Buder *et al.* (2020), Horvath *et al.* (2022), Kaspar (2020), Lewandowsky *et al.* (2021), Li *et al.* (2020), Li *et al.* (2021), Trang *et al.* (2020), Wiertz *et al.* (2020), Zhang *et al.* (2020), Zimmermann *et al.* (2021)	
Individual's characteristics	Gender	Bachtiger *et al.* (2020), Guillon and Kergall (2020), Horstmann *et al.* (2021), Kaspar (2020), Kostka and Habich-Sobiegalla (2020), Lewandowsky *et al.* (2021), Wnuk *et al.* (2020)	Overall, acceptance of contact tracing is positively correlated with individuals' youth, monthly income, innovativeness and prosocialness, and negatively correlated with individuals' impulsivity. The effects of gender and health status are inconclusive.
	Age	Bachtiger *et al.* (2020), Buder *et al.* (2020), Guillon and Kergall (2020), Horstmann *et al.* (2021), Jansen-Kosterink *et al.* (2021), Kaspar (2020), Kostka and Habich-Sobiegalla (2020), Lewandowsky *et al.* (2021), Von Wyl *et al.* (2021)	
	Financial situation	Abuhammad *et al.* (2020), Kostka and Habich-Sobiegalla (2020), Von Wyl *et al.* (2021)	
	Area of living	Abuhammad *et al.* (2020), Utz *et al.* (2021)	
	Education	Guillon and Kergall (2020)	
	Health status	Bachtiger *et al.* (2020), Blom *et al.* (2021), Buder *et al.* (2020), Horstmann *et al.* (2021), Kostka and Habich-Sobiegalla (2020), O'Callaghan *et al.* (2021)	
	Personality traits	Cocosila *et al.* (2022), Clark *et al.* (2020), Guillon and Kergall (2020), Li *et al.* (2021), Walrave *et al.* (2021)	

Source: Authors.

First, one of the factors that has received great attention among researchers is related to privacy and security. Despite their potential, the use of contact-tracing apps to fight the pandemic has generated great debate. Rowe (2020) discusses the dilemma that citizens face about choosing between safety and privacy. Indeed, several studies have found that citizens across different

countries expressed concerns about privacy as one of the main reasons for not using contact-tracing apps (Abuhammad *et al.*, 2020; Altmann *et al.*, 2020; Bachtiger *et al.*, 2020; Cocosila *et al.*, 2022; Horstmann *et al.*, 2021; Utz *et al.*, 2021). The risk of surveillance after the pandemic and having their phone hacked were also important reasons against app installation (Abeler *et al.*, 2020).

Early studies focused also on government-related factors. Zimmermann *et al.* (2021) found that participants perceived contact-tracing apps as governmental surveillance tools. This is why one of the most important predictors of app uptake was trust in the government (Buder *et al.*, 2020; Guillon & Kergall, 2020; Kostka & Habich-Sobiegalla, 2020). Additionally, Wnuk *et al.* (2020) found that ideological views of individuals were stronger predictors for supporting surveillance than variables related to the pandemic, such as personal threat. Finally, supporting government measures, such as adherence to mask-wearing, were also correlated to the acceptance of contact-tracing apps (Albrecht *et al.*, 2021).

Another factor that has attracted the interest of researchers is related to technology. Individual's technical abilities (Albrecht *et al.*, 2021; Kostka & Habich-Sobiegalla, 2020) were associated with increased contact-tracing app uptake, whereas lack of technical equipment, such as a compatible smartphone, was identified as one of the frequent reasons against app installation (Bachtiger *et al.*, 2020; Blom *et al.*, 2021; Horstmann *et al.*, 2021). App characteristics and specifications were also influential, such as the kind of data storage (Zhang *et al.*, 2020) and the type of installation (Altmann *et al.*, 2020).

Finally, researchers have also focused on how individuals' characteristics, such as gender (Lewandowsky *et al.*, 2021; Wnuk *et al.*, 2020) or age (Jansen-Kosterink *et al.*, 2021; Kostka & Habich-Sobiegalla, 2020), influence contact-tracing apps' adoption. Individuals' health status and the potential to infect or get infected also played an important role (Horstmann *et al.*, 2021; O'Callaghan *et al.*, 2021). Furthermore, individuals' personality traits (Clark *et al.*, 2020) were found to correlate with app uptake too.

While these aspects answer the question of *"what"* drives or impedes citizens from engaging in voluntary behaviours towards these apps, they do not deep into *"why"* citizens are willing to engage in these citizenship behaviours. To address this gap, previous research must be extended to investigate more intangible aspects, such as individual motives, which have successfully explained engagement in voluntary behaviours towards information systems in previous literature (Kim *et al.*, 2018), and which are discussed further below.

3. RESEARCH MODEL AND HYPOTHESES

Prosocial behaviours (or citizenship behaviours) can be defined as behaviours that benefit any community and its members, but go beyond requirements and are not directly or formally rewarded (Lemmon & Wayne, 2015). About contact-tracing apps, these behaviours refer mainly to downloading and using the app (e.g., sharing location information, informing if getting infected, etc.) to create a base of users so that the app is effective, but also to other voluntary behaviours that have been stated to add value to firms and organisations, such as advocacy and helping (Yi & Gong, 2013). On the one hand, advocacy through positive word-of-mouth refers to recommending the app to other potential users, such as work colleagues, family and friends. This behaviour is valuable as it contributes to enhancing the reputation of the object (e.g., firm, organisation, app, etc.) that is being recommended, as well as to promote it among other potential users and increase the base size (Groth *et al.*, 2004; Yi & Gong, 2013). On the other hand, helping refers to users' behaviour aimed at assisting other users in downloading and using the app (Yi & Gong, 2013). This behaviour has also been observed within firms, where customers direct helping behaviour at other customers because the latter may need help behaving in ways consistent with their expected roles (Groth *et al.*, 2004; Yi & Gong, 2013). So, a question arises: what motivates citizens to perform these behaviours for themselves and others?

Batson and Shaw (1991) proposed two types of motivation depending on the ultimate goal that drives prosocial behaviours: altruistic motivation and egoistic motivation.

Altruistic motivation *"is a motivational state with the ultimate goal of increasing another's welfare"* (Batson & Shaw, 1991, p. 108). The primary form of altruistic motivation is altruism, which has been defined as *"behaviour that promotes the welfare of others without conscious regard for one's own self-interests"* (Hoffman, 1978, p. 326). In other words, altruism involves benefiting others without expecting something in return. Piliavin and Charng (1990) conducted a comprehensive review of altruism research and concluded that altruism is a part of human nature. Although there may be very few instances of absolute altruism, where individuals show an absolute lack of self-concern in the motivation for an act, relative altruism, where self-concern plays a subtle role in motivating an act, is more prevalent (Smith, 1981). According to this, in the context of the pandemic, some citizens might become users of a contact-tracing app to help others without expecting anything in return for their help.

Besides altruism, altruistic forms of motivation also include supporting the service provider (Choi & Lotz, 2016). A close relationship between customers and their service providers can increase customers' empathy towards their service providers and their desire to improve the service provider's welfare, resulting in prosocial behaviours (Bove *et al.*, 2009). As Hennig-Thurau *et al.* (2004) suggested, supporting the service provider is related to altruism and draws on the same psychological background, which is a concern for others. In the pandemic context, the service provider is embodied by the central government and/or the national health system in charge of the contact-tracing app. Thus, some citizens might become users of a contact-tracing app to contribute to their communities' fight against the virus and to help others (e.g., governments, health systems, etc.) manage the pandemic.

Extant literature has largely analysed whether altruistic forms of motivation promote prosocial behaviours in a variety of contexts. For instance, individuals motivated by altruism and

the enjoyment of helping others have shown greater willingness to engage in behaviours that would benefit a specific community (Choi & Lotz, 2016), such as using e-participation (Naranjo-Zolotov *et al.*, 2019), tweeting (Lee *et al.*, 2015), using electronic knowledge repositories (Kankanhalli *et al.*, 2005), purchasing local food (Birch *et al.*, 2018), contributing to electronic networks of practice (Wasko & Faraj, 2005) and sharing opinions with others (Reimer & Benkenstein, 2016). Altruistic motivation has also been associated with innovation through co-creation activities (Roberts *et al.*, 2014). Likewise, Lemmon and Wayne (2015) confirmed that altruistic concern for organisations promotes organizational citizenship behaviour toward the organization. Finally, in the context of the Covid-19 pandemic, Apuke and Omar (2021) found that altruistic individuals were more motivated to share information and news about the virus to inform others. Based on the arguments above, the following hypothesis is proposed:

H1: Altruistic motivation has a positive effect on a) intention to continue using the app, b) advocacy, and c) helping.

By contrast, egoistic motivation is *"a motivational state with the ultimate goal of increasing one's own welfare"* (Batson & Shaw, 1991, p. 108). Egoistic forms of motivation include a feeling of duty or felt obligation, reciprocal arrangements which are in the self-interest of all the parties, and pure egoism devoted to increasing one's own good (Schokkaert, 2006). According to this motivation, some citizens might engage with contact-tracing apps due to felt obligation; that is, the inner obligation to care about one's community or organisation's welfare, not to relieve other's suffering, but to receive self-benefits, such as avoiding guilt due to a lack of fulfilment of one's perceived duties (Gebauer *et al.*, 2008). In addition to felt obligation, other citizens might engage with contact-tracing apps due to reciprocity, which involves making contributions for a common goal, based on a perception of supportiveness among the members of a community (Naranjo-Zolotov *et al.*, 2019). Contact-tracing apps' effectiveness depends on a large number of citizens being users; so, although using the app could involve some cost (e.g., battery consumption, concerns about lack of privacy when sharing location information, etc.), citizens might become users with the thought that, if everyone does the same, at the end everyone will benefit from each other. Finally, the ultimate goal of certain citizens to become users of contact-tracing apps might be their own good and benefit, which is inner to human nature, such as receiving valuable information about infections, etc.

Extant literature has also analysed whether egoistic forms of motivation promote prosocial behaviours. For instance, previous research has found that feelings of self-satisfaction, social guilt and perceiving a win-win situation, all of which are egoistic motives, motivate mainstream ethical consumption among individuals (Davies & Gutsche, 2016). Similarly, various studies have found that egoistic forms of motivation promote citizenship behaviours (Choi & Lotz, 2016), such as the purchase of local food (Birch *et al.*, 2018), individuals' contributions to electronic networks of practice (Wasko & Faraj, 2005), innovation through co-creation activities (Roberts *et al.*, 2014) and sharing opinions with others (Reimer and Benkenstein, 2016). Also, Lemmon and Wayne (2015) confirmed that felt obligation towards the supervisor promotes organizational citizenship behaviour toward the supervisor. Based on this, we propose the following hypothesis:

H2: Egoistic motivation has a positive effect on a) intention to continue using the app, b) advocacy, and c) helping.

Previous research has pointed out trust as a critical factor that influences smartphone apps adoption (e.g., Choi *et al.*, 2019; Gu *et al.*, 2017), as trust has largely played a key role in helping users overcome perceptions of risks and uncertainty when using new technology (Gefen *et al.*, 2003; Pavlou & Gefen, 2004). Conceived as *"a glue that holds the relationship together"* (Singh & Sirdeshmukh, 2000, p. 156), trust may be central to the viability of contact-tracing apps because some citizens see these apps as surveillance tools (Zimmermann *et al.*, 2021).

Existing research has demonstrated that, when using a new technology, trust positively predicts behavioural intention (Lee & Song, 2013). For instance, Shiau and Chau (2015) found that trust in online group buying promotes online group buying intention, whereas Chao (2019) demonstrated that trust has a significant influence on students' intention to use m-learning. Similarly, previous studies in a variety of contexts have proven that trust also has a direct effect on the intention to engage in voluntary behaviours (Kim *et al.*, 2018). Indeed, Kim *et al.* (2018) found that feelings of trust predict voluntary behaviours that benefit a community, such as sharing accommodation, even more than altruistic and egoistic forms of motivation; so users who have strong feelings of trust tend to share their rooms, whether or not they enjoy helping others or feel reciprocity towards other members. Additionally, in an organizational context, Lu (2014) found that trust in supervisors promotes organizational citizenship behaviours, whereas Dang *et al.* (2020) found that consumer trust also promotes consumer citizenship behaviours.

Besides promoting voluntary behaviours among individuals, Shiau and Chau (2015) found that trust mediates the relationship between both altruistic and egoistic motivation and prosocial behaviours, such as online group buying intention. In particular, they found that people trust more observable information, so the results of helping others without expecting returns always increase the degree of trust in online group buying activities. Likewise, individuals share information and experiences of online group buying to enhance their image and gain recognition, thus winning the trustworthiness of other members. Based on these studies, we propose that trust in the contact-tracing app mediates the relationship between motivation to use contact-tracing apps and users' voluntary behaviours. Therefore, the following hypotheses are proposed:

H3: Trust mediates the relationship between altruistic motivation and a) intention to continue using the app, b) advocacy, and c) helping.

H4: Trust mediates the relationship between egoistic motivation and a) intention to continue using the app, b) advocacy, and c) helping.

Figure 1 shows the proposed model underlying this research.

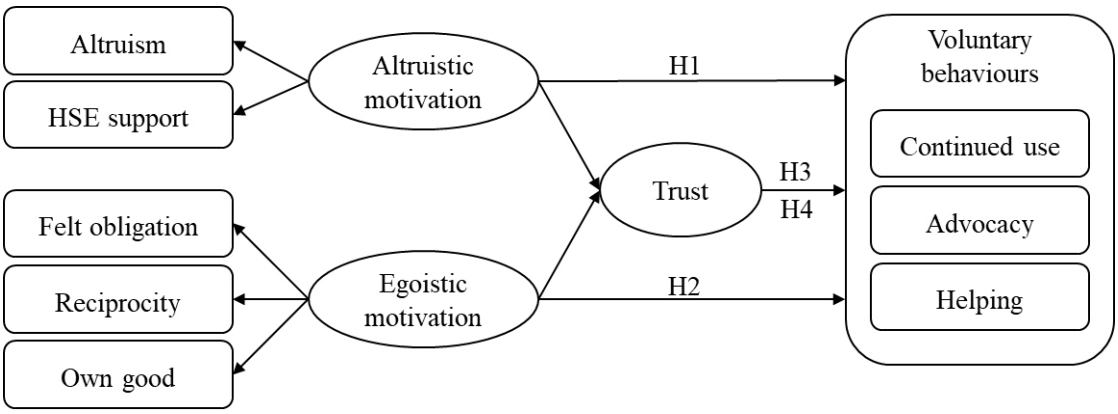

Figure 1
Proposed model
Source: Authors.

4. METHODOLOGY

4.1. Data collection and participants

To test the proposed hypotheses, a study was developed in the context of Ireland's contact-tracing app, called Covid Tracker Ireland. The app was released by the Irish Government and the Health Service Executive, which is the publicly funded healthcare system in Ireland, on 7th July 2020. The app was provided to the public for free for downloading to mobile phones.

Table 2
Sample characteristics

Variable	Category	%
Age	18-25	47.6
	26-45	15.8
	46-65	17.6
	66-80	5.0
	Prefer not to say	14.0
Gender	Male	31.2
	Female	67.8
	Other	0.5
	Prefer not to say	0.5
Education	Primary	0.5
	Secondary	16.7
	Tertiary/University	82.8
Working status	Working full-time	36.2
	Working part-time	11.8
	Studying	44.8
	Unemployed/ Receiving Pandemic Unemployment Payment	2.2
	Stay-at-home Mum/Dad	0.5
	Prefer not to say	4.5

Source: Authors.

Following approval from the University's Research Ethics Committee, an online survey designed using Qualtrics was circulated to students and staff of one of the largest Universities in Ireland. This country commenced a strict lockdown in March 2020, and University education was mainly provided online during the academic year 2020-21. Therefore, data collection took place during the first term of the academic year 2021-22, coinciding with Ireland's plans for a safe return to University campuses. As a screening question, participants were required to have already downloaded the Covid Tracker app. After removing incomplete and non-valid questionnaires, a final sample of 221 respondents was obtained. Table 2 provides an overview of sample characteristics.

The appropriateness of the sample was assessed through the software G*Power v3.1.9.7. Using the effect size at 0.15, the alpha error probability at 0.05, and the statistical power of 95%, a total sample size of 119 would be required. The number of valid responses in this study is 221, which exceeds the minimum requirement, confirming the appropriateness of the sample size.

4.2. Measurement instrument

To measure all the constructs included in the online survey, well-established scales taken from previous literature were adapted to ensure that the items fit the context (Table 3). In all cases, 7-point Likert-type scale items were used, ranging from 1 (strongly disagree) to 7 (strongly agree).

4.3. Common method bias assessment

As the data were based on self-reported measures and collected through a one-time survey, common method bias was evaluated by both procedural and statistical methods (Podsakoff *et al*., 2003). First, participation in the study was voluntary and the responses were anonymous. Furthermore, the dependent and independent variables were included on different pages of the online survey, thus preventing the respondents from identifying cause-effect relationships among the constructs. In addition, the variance inflation factor (VIF) values were assessed. The results suggest there is no common method bias in the study, as all values were between 1.510 and 3.167, lower than the 3.3 threshold (Kock, 2015). Additionally, Harman's single-factor test (Podsakoff *et al.*, 2003) was applied. The first factor explained 45.1% of the covariance among the constructs. As this value is less than the recommended 50% threshold, it can be concluded that common-method bias did not affect the data.

Table 3
Scales, descriptive statistics and measurement model results

Constructs, items and sources	Mean	SD	FL	CR	AVE
Altruistic motivations				0.952	0.768
Altruism (*Reimer & Benkenstein, 2016*)					
ALT1. I want to help others with this	5.43	1.70	0.961		
ALT2. I care about benefiting others	5.48	1.64	0.977		
ALT3. It is important to me to do good for others	5.39	1.71	0.966		
HSE support (*Choi & Lotz, 2016*)					
HSE1. It helps the HSE to manage the pandemic if I use the app	5.10	1.74	0.944		
HSE2. It makes HSE task easier if I use it	5.09	1.68	0.960		
HSE3. It provides HSE with opportunities for improving the current situation if I use it	5.10	1.68	0.964		
Egoistic motivations				0.914	0.545
Felt obligation (*Eisenberger et al., 2001*)					
OBL1. I feel a personal obligation to do whatever I can do to fight the pandemic	5.73	1.57	0.813		
OBL2. I feel a personal obligation to use the app	4.79	1.90	0.916		
OBL3. I would feel guilty if I did not use the app	3.46	2.02	0.798		
Reciprocity (*Wasko & Faraj, 2005*; *Hsu & Lin, 2008*)					
REC1. Other people are helping me by using it, so it's only fair to help them by using it	4.07	2.02	0.861		
REC2. It is advantageous to me and other people to use the app	5.00	1.82	0.926		
REC3. It is mutually beneficial when I use the app	4.81	1.88	0.925		
Own good (*Reimer & Benkenstein, 2016*)					
OWN1. The information in the app is advantageous for me	4.60	1.71	0.813		
OWN2. It is for my own good	4.89	1.76	0.897		
OWN3. I expect to receive something in return (e.g., information about contacts who tested positive)	4.76	1.96	0.701		
Trust *(Slade et al., 2015)*				0.970	0.914
TRU1. I trust the app to be reliable	5.43	1.80	0.938		
TRU2. I trust the app to be secure	5.46	1.82	0.965		
TRU3. I believe the app is trustworthy	5.48	1.80	0.964		
Behavioural intention *(Venkatesh et al., 2012)*				0.941	0.842
INT1. I intend to continue using the app	5.63	1.60	0.916		
INT2. I plan to continue using the app for the duration of the pandemic	5.79	1.54	0.941		
INT3. I will continue using the app even if a covid-19 vaccine becomes widely available	5.31	1.85	0.896		
Advocacy *(Yi & Gong, 2013)*				0.968	0.910
ADV1. I say positive things about the app to others	4.67	1.90	0.952		
ADV2. I recommend the use of the app to others	4.71	1.96	0.967		
ADV3. I encourage friends/relatives/work colleagues to use the app	4.58	2.02	0.943		
Helping *(Yi & Gong, 2013)*				0.961	0.892
HEL1. I help people (e.g., friends, family) when they seem to have problems with the app	3.99	2.20	0.942		
HEL2. I teach other people to use the app correctly	3.67	2.21	0.955		
HEL3. I give advice to other people about the app	3.81	2.19	0.936		

Note: SD: standard deviation; FL: factor loading; CR: composite reliability; AVE: average variance extracted. HSE = Health Service Executive.
Source: Authors.

5. ANALYSES AND RESULTS

The research model was tested using Partial Least Squares (PLS) Structural Equation Modelling (SEM), with the software Smart PLS 3.0. This methodology is the most appropriate method to follow in this study for three reasons: the purpose of the PLS approach is prediction, suitable for the proposed model; the PLS technique does not require a normal distribution; and PLS is indicated for the analysis of models when the sample size is lower than 250, as in our case (Hair *et al.*, 2017; Reinartz *et al.*, 2009). PLS simultaneously assesses the reliability and validity of the measurement model and the estimation of the structural model. These two steps are described next.

5.1. Measurement model

First, the reliability and validity of the research constructs were assessed (Table 3). Altruistic motivation to use the Covid Tracker app was conceptualised as a second-order construct composed by a sense of altruism and the wish to support the Health Service Executive (HSE). Similarly, egoistic motivation to use the Covid Tracker app was operationalised as a second-order construct composed by a sense of felt obligation, feelings of reciprocity, and looking for one's own good. The results showed that all standardised factor loadings were above 0.7 and statistically significant at 0.01 (Carmines & Zeller, 1979), which suggests that the individual item reliability was adequate. In addition, all the constructs were internally consistent, as their composite reliabilities were greater than 0.7 (Nunnally & Bernstein, 1994). The constructs also met the convergent validity criteria, as the average variance extracted (AVE) values were above 0.5 (Fornell & Larcker, 1981). Finally, the discriminant validity was also supported (Table 4) as the square root of the AVE for any two constructs was greater than the correlation estimate among the constructs (Fornell & Larcker, 1981).

Table 4
Discriminant validity

	1	2	3	4	5	6
1. Altruistic motivation	0.876					
2. Egoistic motivation	0.814	0.738				
3. Trust	0.540	0.564	0.956			
4. Continued use	0.319	0.386	0.368	0.918		
5. Advocacy	0.568	0.599	0.543	0.432	0.954	
6. Helping	0.398	0.465	0.287	0.326	0.679	0.945

Note: Values on the diagonal are the square roots of the AVEs. Values below the diagonal are construct correlations.

Source: Authors.

5.2. Structural model

To test hypotheses, a bootstrapping procedure with 5,000 iterations of resampling was used (Chin, 1998). The model accounted for 17.1% of the variation in the intention to continue using the app, 42.2% of the variation in advocacy, and 20.7% of the variation in helping behaviours. The Stone–Geisser test criterion (Q^2) exceeded the threshold of 0 for all dependent variables, thereby supporting the predictive relevance of the model. Finally, as the SRMR (standardised root mean square residual) showed a value of 0.07, lower than the threshold of 0.08 (Hu and Bentler, 1998), it can be concluded that the model has a good fit.

The results (Table 5) indicated that, among the two types of motivation, egoistic motivation is the only one showing significant effects on users' voluntary behaviours. In particular, users' egoistic motivation to use the app is positively associated with their intention to continue using the app (β = 0.291; *p-value* = 0.016), advocacy (β = 0.300; *p-value* = 0.002), and helping behaviours (β = 0.406; *p-value* = 0.000), which supports H2. On the contrary, altruistic motivation to use the app has no significant effect on users' intention to continue using the app (β = -0.040; *p-value* = 0.718), advocacy (β = 0.172; *p-value* = 0.107), or helping (β = 0.050; *p-value* = 0.653), which leads H1 to be rejected. Regarding the mediating role of users' trust in the app on the relationship between motivations and prosocial behaviours, the findings show that trust partially mediates the role of egoistic motivation on intention to continue using the app (β = 0.083; *p-value* = 0.025) and advocacy (β = 0.103; *p-value* = 0.007), which supports H4a and H4b respectively. However, no mediating role has been found for trust neither among the influence of egoistic motivation on helping (β = 0.011; *p-value* = 0.687), nor among the influence of altruistic motivation on intention to continue using the app (β = 0.054; *p-value* = 0.108), advocacy (β = 0.068; *p-value* = 0.060), or helping (β = 0.007; *p-value* = 0.711), leading H3 and H4c to be rejected.

Table 5
Structural model results

Hypotheses	β	*t*	*p*-value	Supported
H1a: Altruistic motivation → Behavioural intention	–0.040	0.362	0.718	No
H1b: Altruistic motivation → Advocacy	0.172	1.614	0.107	No
H1c: Altruistic motivation → Helping	0.050	0.450	0.653	No
H2a: Egoistic motivation → Behavioural intention	0.291	2.410	0.016	Yes
H2b: Egoistic motivation → Advocacy	0.300	3.130	0.002	Yes
H2c: Egoistic motivation → Helping	0.406	3.786	0.000	Yes
H3a: Altruistic motivation → Trust → Behavioural intention	0.054	1.607	0.108	No
H3b: Altruistic motivation → Trust → Advocacy	0.068	1.885	0.060	No
H3c: Altruistic motivation → Trust → Helping	0.007	0.370	0.711	No
H4a: Egoistic motivation → Trust → Behavioural intention	0.083	2.242	0.025	Yes
H4b: Egoistic motivation → Trust → Advocacy	0.103	2.702	0.007	Yes
H4c: Egoistic motivation → Trust → Helping	0.011	0.403	0.687	No

Source: Authors.

6. DISCUSSION

Based on the theory of altruistic and egoistic motivation for prosocial behaviours (Batson & Shaw, 1991), one could expect that users of a contact-tracing app might engage with it to help others (namely altruistic motivation) and to receive self-benefits (namely egoistic motivation). However, contrary to our predictions, this research has shown that, in the context of contact-tracing apps, altruistic motivation does not predict users' voluntary behaviours either directly (rejecting H1) or indirectly (rejecting H3), and that continuance use intention, advocacy and helping are only motivated by individuals' egoistic motivation (supporting H2). These findings are novel and contradict previous literature somewhat. While it is true that the positive effect of egoistic motivation on prosocial behaviours has been well documented in previous research in other contexts (e.g., Birch *et al.*, 2018; Choi & Lotz, 2016; Davies & Gutsche, 2016; Lemmon & Wayne, 2015; Reimer & Benkenstein, 2016; Roberts *et al.*, 2014; Wasko & Faraj, 2005), most existing knowledge has usually supported the predominance of altruistic motivation over egoistic motivation. For instance, Kankanhalli *et al.* (2005) found that enjoyment in helping others (altruistic motivation) promotes electronic knowledge repository usage, while reputation and reciprocity (egoistic motivation) don't. Similarly, Lee *et al.* (2015) found that altruistic motivation promotes intention to tweet, while egoistic motivation doesn't. Likewise, Naranjo-Zolotov *et al.* (2019) showed that altruism promotes the intention to use e-participation, while reputation and reciprocity (egoistic motivation) don't. A possible explanation for the predominance of egoistic motivation in the specific context of contact-tracing apps can be found in Schechter and Yuskavage (2012), who determined that relationships that are not directly reciprocated might not be based on altruism. This idea is also in line with the work of Maner and Gailliot (2007), who stated that motivations for prosocial behaviours depend on the relationship context, with altruistic motivation being more prominent in the context of close relationships than among strangers. Similarly, Piatak and Holt (2020) stated that in formal contexts, motivations related to public service might be more consistent predictors of prosocial behaviours than altruism. Considering these arguments, as in the Covid-19 pandemic context there is a common benefit but an individual threat, and there is no direct reciprocation between well-known individuals, it is plausible that receiving self-benefits is more important to individuals than helping other strangers when considering the use of contact-tracing apps.

Finally, in the specific context of contact-tracing apps, the findings have confirmed the importance of trust in the success of the app. In line with previous research in varied contexts which predicted the effect of trust on voluntary behaviours (e.g., Chao, 2019; Dang *et al.*, 2020; Kim *et al.*, 2018; Lee & Song, 2013; Lu, 2014; Shiau & Chau, 2015), the findings of this study have demonstrated that trusting the contact-tracing app plays a mediating role between egoistic motivation to use the app and users' intention to continue using the app and to be advocates of the app (supporting H4a and H4b). As trusting the app involves perceiving it as reliable and secure, it somehow also translates into whether users trust the organisation that controls the app, such as the government, the healthcare system, or the app developer. Therefore, these findings are in line with other studies who found that acceptance and use of contact-tracing apps are higher for individuals who trust the organisation in charge of it, which is usually the government (e.g., Abeler *et al.*, 2020; Altmann *et al.*, 2020; Buder *et al.*, 2020; Guillon & Kergall, 2020; Kostka & Habich-Sobiegalla, 2020; Lewandowsky *et al.*, 2021).

6.1. Theoretical implications

This study makes several theoretical contributions. First, as stated before, most existing research analysing the adoption and use of contact-tracing apps worldwide has limited the scope of those studies to variables related mainly to privacy and security concerns and cyber security risks, government-related factors, individuals' characteristics, and technology-related factors. From a theoretical point of view, prior research has drawn on theoretical paradigms such as the technology acceptance model, the theory of goal-directed behaviour, the theory of privacy (Shahidi *et al.*, 2022), the unified theory of acceptance and use of technology (van der Waal *et al.*, 2022) or the theory of planned behaviour (e.g., Kwarteng *et al.*, 2023), to analyse the determinants of contact-tracing apps adoption and the acceptance or resistance to use them. These studies have found that factors such as a positive attitude towards these apps (Kwarteng *et al.*, 2023) or social norms regarding the use (van der Waal *et al.*, 2022) are stronger predictors of adoption and use. However, scant research has focused on individuals' motivations, leaving the question of *"why"* citizens are willing to engage in prosocial behaviours related to the adoption and use of contact-tracing apps unanswered. Drawing on the theory of altruistic and egoistic motivation for prosocial behaviours (Batson & Shaw, 1991), this study contributes to the existing body of knowledge by showing that the motives through which citizens engage in voluntary behaviours aimed at using and promoting the use of contact-tracing apps are mainly egoistic. As noted by Maner and Gailliot (2007), motivations for prosocial behaviours depend on the relationship context. Therefore, this study provides the first empirical evidence of the predominance of egoism over altruism in the context of contact-tracing apps, which has not received attention previously.

This study also contributes to bridging existing knowledge gaps in terms of the methodology and research context. First, most data collection of empirical studies analysing contact-tracing apps during the Covid-19 pandemic were carried out during the first six months after the launch of the first contact-tracing app worldwide (e.g., Abeler *et al.*, 2020; Altmann *et al.*, 2020; Guillon & Kergall, 2020; Kaspar, 2020; Li *et al.*, 2020; Trang *et al.*, 2020; Wnuk *et al.*, 2020; Zhang *et al.*, 2020). During these first months, many countries were experiencing lockdowns or other public-health interventions related to minimising contacts, and therefore citizens' perceptions of risk from interacting with or near others may have been lowered. Consequently, apps may have been perceived as a less necessary intervention until a return to "normality" and greater socialising was imminent. Secondly, as during those first months of the pandemic in which most studies were carried out, many countries had not even launched their own contact-tracing apps, most empirical studies did not survey real users of any app but analysed situations with

hypothetical apps or just focused on analysing citizens' general opinions about contact-tracing (e.g., Buder *et al.*, 2020; Li *et al.*, 2020, 2021; Naous *et al.*, 2020; Utz *et al.*, 2021; Wiertz *et al.*, 2020) as well as their intention to use these apps in the future (see Von Wyl *et al.* (2021) and Joo and Shin (2020) as exceptions). Therefore, this study contributes to the existing literature by analysing contact-tracing apps' use among citizens at a critical time of the pandemic, when the country was returning to "normal" opening, and by providing empirical evidence on the use of contact-tracing apps based on a sample of real users of a real and in-use app. Finally, previous studies on this phenomenon have focused on a limited number of European countries, mainly Germany (e.g., Blom *et al.*, 2020; Buder *et al.*, 2020; Kaspar, 2020), the United Kingdom (e.g., Abeler *et al.* 2020; Bachtiger *et al.*, 2020; Lewandowsky *et al.*, 2020) and France (e.g., Guillon & Kergall, 2020). Therefore, this study contributes to the current literature by analysing Ireland's contact-tracing app, Covid Tracker, which is worthy of study, as it represents a case of success in terms of downloads, compared to other European countries.

6.2. Practical implications

The Covid-19 pandemic has not been the only viral health crisis in recent decades (Pamplona da Costa *et al.*, 2021); for instance, the Ebola virus in Western Africa, the Zika virus in Latin America, or the Influenza A (H1N1) virus in the USA, had already assaulted health systems before. Furthermore, it does not seem that Covid-19 is going to be the last viral pandemic. Indeed, Microsoft co-founder Bill Gates, who predicted the Covid-19 outbreak in 2015, has warned about the emergence of more pandemics in the future. Having learnt from the Covid-19 pandemic, the use of contact-tracing apps might be a powerful tool to fight future viral pandemics. However, as it happened with the Covid-19 pandemic, for the success of these apps, it is vital to gain a significant base of users. In this sense, the findings derived from this study might help to understand the factors that influence contact-tracing apps' voluntary adoption among the population, to develop future apps and campaigns that would be persuasive for citizens in the event of emerging pandemics.

As this study has demonstrated, instead of emphasizing altruistic benefits derived from using these apps, governments, national health systems, and other responsible third parties are recommended to emphasize the benefits for the individual. To do that efficiently, the first step to follow would be to identify, through research, the form of egoistic motivation (i.e., sense of felt obligation, reciprocity, or own good) that is most salient among citizens of a city or country.

The second step would be to design and deliver powerful communication campaigns in line with the most salient forms of egoistic motivations identified in the previous step. As Laor and Lissitsa (2022) suggested, mainstream media has been the primary source of pandemic information, and thus, should also be the primary source of contact-tracing apps' promotion.

For those places with a high sense of felt obligation or duty, policy makers should use powerful messages to encourage individuals to use contact-tracing apps by appealing to citizens' pride and shame, following the example of the British government, who launched the campaign *"Can you look them in the eyes?"* to encourage the public to follow restrictions. This campaign consisted of pictures showing close-up facial shots of Covid-19 patients and NHS workers wearing oxygen masks and asked people whether they could look them in the eyes and tell them they were doing everything they could to stop the spread of the virus.

For places ranking high on reciprocity, policy makers should create communication campaigns that promote feelings of community and reciprocal effort among users, following the example of Germany, which launched the campaign *"Ich schütze Dich!" (I protect you!)* to express the idea that if other citizens are following the rules to protect you, it is only fair that you do the same to protect them. Similarly, the Irish government launched the campaign *"#InThisTogether"* for people to stay connected, active and mentally well. In this campaign, they promoted the idea of unity in the country and group effort. It included statements such as *"Some of us are anxious"*, *"Some of us are learning to video call our grandchildren for the first time"*, and *"Some of us are working on the front line"*, among others, ending up with *"We'll make it through, together"*. Other countries have also emphasized the idea of unity in their campaigns during the Covid-19 pandemic. For instance, the Northern Ireland Executive released a campaign with the slogan *"We all must do it to get through it"*. Similarly, the Spanish Government used the message *"Este virus lo paramos unidos" (We will stop this virus together)* to reinforce the idea of common effort.

For places where people are motivated mainly by the benefits that contact-tracing apps can have for themselves, policy makers should create campaigns that increase one's perception of self-benefits by showing people how using these apps can considerably improve their lives (e.g., meeting socially with others, travelling, etc.), countering concerns over adverse side-effects, such as battery consuming or surveillance. This would follow the example of the French Government, which also appealed to this egoistic form of motivation and launched the campaign *"Oui, le vaccine peut avoir des effecs désirables" (Yes, the vaccine can have desirable effects)* to persuade young people to have the Covid-19 vaccine, focusing on the desirable effects of getting vaccinated, such as kissing, hugging, or travelling.

Finally, once the campaign is launched, the last step would be to measure its effectiveness in promoting the acceptance and use of contact-tracing apps by identifying key performance indicators (KPIs). Some of these contact-tracing app KPIs are based on mobile app KPIs proposed by Kurzweg (2023), while others correspond to metrics followed during the Covid-19 pandemic (Resolve To Save Lives, 2021). The indicators include: *(1) App Downloads:* the number of times the contact-tracing app gets downloaded to a smartphone device; *(2) App Installs*: actual installations completed on the devices, as not all app downloads might complete the setup process; *(3) App Uninstalls:* when uninstallations occur, to see if it corresponds to any change in the app (e.g., an update) or to changes in other policies and/or restrictions regarding the pandemic; *(4) Registrations*: if users are failing to register after downloading the contact-tracing app, the onboarding flow should be reviewed; *(5) Permissions Granted*: the number of permissions (e.g., location, agenda, alerts) that users allow the contact-tracing app; *(6) Daily Active users*: the number of active users who check in on the contact-tracing app daily; *(7) New Cases Reported per day*: the number of positive cases reported to the app daily; *(8) Contacts Notified*

per day: the number of close contacts of a positive case identified and notified to stay in quarantine through the contact-tracing app. *(9) User Growth Rate*: since contact-tracing apps rely on a consistent base of users to work effectively, it is important to ensure that the user base is growing and to understand how it grows. This can be obtained with the following formula: ((Present User Amount – Past User Amount)/ Past User Amount) * 100; *(10) Social Shares*: the number of times the contact-tracing app is recommended or shared on social media.

6.3. Limitations and future research lines

As with any research, this study has limitations, which offer avenues for future research. First, due to privacy restrictions during data collection (i.e., we could not ask participants for contact. details to contact them in the future), the data were collected using a one-time, self-administered questionnaire; therefore, we cannot analyse the continuance of voluntary behaviours over time. Future studies could use longitudinal data to analyse behaviours related to contact-tracing apps in the long term. Second, the sample is limited to one segment of citizens: students and staff from an Irish University. It would be interesting to include other citizens segments, such as primary and secondary schools, families, employees, etc. Third, the sampling procedure has limitations, such as self-selection bias and the lack of information about non-respondents who use the app. Therefore, future research should use random sampling procedures. Additionally, the data were collected based on one specific contact-tracing app from one specific country: Covid Tracker Ireland. While this app has been successful, which provides great learnings for other apps, future research should replicate this model using other apps in different countries, and in other contexts. Finally, future research should also consider the perspective of the government and/or public institution in charge of the contact-tracing app to provide a wider view of the acceptance and use of these apps.

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Confluence of Factors that Influence Business Model by Digitalisation and Industry 4.0 Technologies

Confluencia de Factores que Influyen en El Modelo de Negocio por la Digitalisación y las Tecnologías de la Industria 4.0

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ABSTRACT

The emergence of digital technologies and the expansion of their use has significantly transformed organisations and their Business Models (BM), modifying their traditional structures, redefining the client's meaning and positioning, as well as retally adjusting the way individuals live and interact with each other in the Fourth Industrial Revolution, also known as Industry 4.0 (I4.0). This research aims to reflect on the confluence of factors influencing BM through digitalisation and I4.0 disruptive technologies. Firstly, a Systematic Literature Review was conducted to map the top articles and most persuasive authors in the area, journals, institutions, and countries with the most publications within this theme. Secondly, five thematic clusters were pointed out and analysed through the co-occurrence of keywords. Finally, an in-depth analysis was run to identify influencing aspects of BM in the digitalisation era, relating them to specific I4.0 technologies. The research revealed that digital technologies enable improvements in distribution strategy and traceability, facilitate the relationship between buyers and suppliers, improve customer segmentation and product demand forecasting, enable cost reduction, and assist in implementing circular economy practices. In the context of the pandemic/COVID-19, BM has changed significantly, making it necessary to deepen knowledge about digitalisation and adopt I4.0 technologies.

Keywords: Industry 4.0, Digitalisation, Business Models, Factors, Technologies, Innovation.

R E S U M E N

El surgimiento de las tecnologías digitales y la expansión de su uso ha transformado significativamente las organizaciones y sus Modelos de Negocio (MN), modificando sus estructuras tradicionales, redefiniendo el significado del cliente y su posicionamiento, así como ajustando la forma como los individuos viven e interactúan con ellos en la Cuarta Revolución Industrial, también conocida como Industria 4.0 (I4.0). Esta investigación tiene como objetivo reflexionar sobre la confluencia de factores que influyen en los MN por la digitalización y las tecnologías disruptivas de la I4.0. Primer, se realizó una Revisión Sistemática de la Literatura para mapear los artículos más destacados y los autores más persuasivos en el área, así como las revistas, instituciones y países con mayor número de publicaciones dentro de esta temática. Después, mediante la coexistencia de palabras clave, se señalaron y analizaron cinco grupos temáticos. Finalmente, se realizó análisis en profundidad para identificar aspectos influyentes del MN en la era de la digitalización relacionándolos con tecnologías específicas de la I4.0. La investigación reveló que las tecnologías digitales permiten mejoras en la estrategia de distribución y la trazabilidad, pueden facilitar la relación entre compradores y proveedores, permitir una mejor segmentación de clientes y previsión de la demanda de productos, además de permitir la reducción de costes y ayudar en la implementación de prácticas de la economía circular. En el contexto de la pandemia/COVID-19, los MN ha cambiado significativamente, siendo necesario profundizar en el conocimiento de la digitalización y la adopción de tecnologías de la I4.0.

Palabras clave: Industria 4.0, Digitalización, Modelos de Negocio, Factores, Tecnologías, Innovación.

1. INTRODUCTION

The emergence of digital technologies has significantly transformed organisations by forcing them to adapt their Business Models (BM), management strategies and practices (Fernandez-Vidal *et al.*, 2022), modifying traditional business structures as well as redefining the client's meaning and how people live and interact with each other in the Fourth Industrial Revolution, also known as Industry 4.0 (I4.0) (Berman *et al.*, 2016).

This research aims to reflect on the confluence of factors influencing BM through digitalisation and I4.0 disruptive technologies. It is impressive how I4.0 technologies (e.g., Internet of Things (IoT), Industrial Internet of Things (IIoT), Cyber-Physical Systems (CPS), Smart Manufacture, Smart Factories, Cloud Computing, Cognitive Computing, Artificial Intelligence) have significantly affected production processes and how companies, independently of their type, create value through their BM (Paiola *et al.*, 2021). For, the underlying characteristic of I4.0 is the connectivity between machines, supply chain, procurement and stakeholders, enabling the intelligent manufacturing process, providing high performance associated with product design, production and logistics systems through communication between machines and digital devices (Alkaraan *et al.*, 2022). In order to succeed in the digital economy, businesses need to be both digitalised and digital. Despite the similarity of the words, there are differences in their meanings. For Ross *et al.* (2022) digitalisation is an operational necessity involving the standardisation of business processes, i.e., it consists of using digital technologies to transform production, product development and/or BM processes, aiming at process optimisation and efficiency. It is also considered an internal process executed by companies to transform the existing BM into a digital-based BM, where information and communication technologies are located at the centre of daily operational life, involving customers and suppliers for business activity (Gartner, 2020). For a company to become digital (digitalisation), leaders must articulate a visionary digital value proposition for customers and deliver it in digital offerings. It can be considered the procurement process through which companies acquire new equipment that converts part of the analog process into a digital one (Gartner, 2020).

The result is more efficient companies, which includes optimised costs and time processes and reduced waste and errors. Notably, technological adaptation is not a choice for businesses, being nearly standard, especially in today's world. Companies must innovate technologically to enable better stakeholder engagement, leverage their competitive advantage, and remain customer-centric (Faridi & Malik, 2019). Rosa *et al.* (2020) stated that I4.0 mechanisms enable significant business improvements, increasing customer experience and optimising operations or even creating BM. However, many factors influence companies' results in changing BM in the context of I4.0 technologies. Therefore, BM can be described as a simplified representation of the elements of the business system and its interrelations, aiming to reveal the business strategy through the creation, delivery and capture of value (Richardson, 2008). Nevertheless, transforming from a traditional BM to a digital BM is accelerating to deliver new values to all stakeholders and compete more effectively in a digital economy.

In the face of a particularly new scenario, it becomes necessary to investigate the confluence of factors that influence BM through digitalisation and I4.0 disruptive technologies. It is observed that there is a research gap in the importance of interconnecting themes in this study. No comprehensive studies discuss and present a bibliographic review on this specific theme, except for the systematic literature review by Caputo *et al.* (2021), which addresses the relationship between digitalisation and innovation of BM and the progress that occurred during the last decade. Despite increasing research on I4.0, digitalisation and BM, the investigations are distinct. In recent decades, scientific literature has paid increasing attention to digitalisation and its effects on organisations, economies, and societies. While some are focused on debating the impacts that I4.0 and digitalisation can have on BM, others address the effects of digitalisation on BM of SMEs and/or large companies and analyse Circular Economy BM. Several studies present concepts and frameworks to help companies achieve market leadership, implement technology solutions, and give guidance on and during the decision-making process.

This research addresses the lack of understanding about the growing research field of factors that influence BM through digitalisation and I4.0 disruptive technologies and conducts a systematic literature review and bibliometric analysis to contribute to the field. Moreover, through the co-occurrence of keywords, five thematic clusters were pointed out and analysed, namely: (1) Technology Innovation, (2) Innovation in Business Models, (3) Digital Transformation, (4) Digital Technologies and (5) Circular Economy & Sustainability.

Motivated by digitalisation, this research explores the existing state of the art on the theme and the dimensions that organisations adopt I4.O technologies. Firstly, the theoretical reference framework is presented, followed by the research method and the results of the bibliometric analysis. Afterwards, there is a discussion about clusters and factors found, as well as suggestions for future research and main conclusions.

2. INDUSTRY 4.0 AND BUSINESS MODEL: AN OVERVIEW

In this section, the main concepts found in the researched literature on I4.0 and BM are presented to allow a theoretical basis to support the objective of this investigation, seeking a better understanding of the phenomenon to be explored.

2.1. Industry 4.0

In recent decades, the scientific literature has paid increasing attention to digitalisation and its effects on organisations, economies, and societies. Nonetheless, the industry has been renewing itself over the last centuries, bringing technological innovations with an ever-increasing speed. The First Industrial Revolution used water and steam power to mechanise production. The second industrial revolution used electricity to create mass production. The third Industrial Revolution used electronics and computer technology to automate production. Currently, the Fourth Industrial Revolution is growing on the foundation of the third revolution, the digital revolution that has been taking place since the middle of the last century and is characterised by the merging of technologies that draw their lines between the physical, digital and biological worlds. According to Halvorsen *et al.* (2017),

I4.0 is a new term for combining industry and the Internet of Things (IoT).

The concept of I4.0 represents the current production paradigm being driven by the advancement of some base technologies (e.g., The internet of things (IoT), The industrial internet of things (IIoT), Cyber-physical systems (CPS), Smart manufacture, Smart factories, Cloud computing, Cognitive computing, Artificial intelligence, Big Data (BD)) that enable companies to renew their BM by integrating digital technologies into business processes (Trivelli *et al.*, 2019). I4.0 disruptive technologies have transformed the traditional systems of many companies, offering new strategic opportunities to increase competitiveness by optimising costs and improving quality, service levels, and flexibility (Ferdows, 2018).

The underlying characteristic of I4.0 is connectivity between machines, purchasing and logistics sectors, employees, suppliers, and customers. I4.0 technologies enable smart manufacturing by providing high performance associated with product design, production, and logistics systems through communication between machines and digital devices (Alkaraan *et al.*, 2022). The result is more efficient companies with optimised processes in both cost and time and reduced waste and errors. However, according to Rahman *et al.* (2019), the business organisation is moving towards Industry 5.0 (Internet of Thought) along with the GIG economy (a labour market characterised by flexible, temporary or freelance jobs, as opposed to permanent, full-time work) where the traditional way of entirely relying on full-time workers is no longer as relevant (Silva & Moreira, 2022). From an organisational perspective, the leap in strategy with technological advancement is significant in achieving a competitive advantage to ensure business continuity.

2.2. Business Model

In general, the BM concept can be described as a complex system that allows the core value proposition to be transferred to the customer as a benefit (Seelos & Mair, 2007) as well as the application of digital technologies in BM can also help create value, generate revenue, and reduce costs (Alkaraan *et al.*, 2022). According to Rosa *et al.* (2020), I4.0 mechanisms enable significant business improvements, enhancing customer experience and optimising operations or even creating BM. However, many factors influence companies outcomes in ways that change BM, such as customers and the market, competitors and suppliers, employees and location, costs and prices, products and services offered and similar and/or substitute products, government, and the economy, as well as when a company decides to adopt one or more I4.0 technologies.

Although conceptualisations about BM differ in the number and specification of components, in general, four main areas are highlighted: (1) target customers, (2) the value proposition offered by an organisation to its customers, (3) value creation and delivery, through where the value proposition is produced and brought to the customer, and (4) value capture activities related to revenues and costs to create and deliver a value proposition (e.g., Dentchev *et al.*, 2018). While the "value creation" component of BM is used in the context of the products and/or services offered to customers, the "value delivery" component of BM aims to implement activities and processes capable of delivering the promised value and the "value capture" component concerns to company revenue issues and cost structure. The case study by Chen *et al.* (2021) argues that digital technologies are crucial to making viable changes between expanding the value proposition into personalised and intelligent solutions, opening up the value delivery system to the supply chain beside the ecosystem, and introducing various value capture mechanisms. The interaction between BM change and digital technology adoption occurs within and across these three distinct phases.

3. METHOD: SYSTEMATIC LITERATURE REVIEW

3.1. Research Protocol

The research was conducted in the Scopus database on March 2, 2022, using the following pre-established research protocol (Liberati *et al.*, 2009) to conduct the Systematic Literature Review: (a) Only articles in the area of Business, Management and Accounting were included; (b) English language articles only; and although no filter was established per year of publication (c) the whole period (2003-2021) covered by the database was contemplated; (d) using the topics: title, abstract, author keywords, and keywords plus, with the following terms: "business model" AND "industry 4.0" OR "digitalisation". The research results, shown in Figure 1, resulted in 1,535 documents. However, 859 documents were excluded based on the publication criteria, as they were not classified as articles (a), 330 articles were not from Business, Management and Accounting, according to publishing area criteria (b), and 18 articles were not published in English (c), remaining 328 articles. After an objective screening, with the reading of the titles and abstracts, to evaluate whether the results addressed the theme of interest, it was removed more than 6 articles that were outside of this research scope, such as articles focused on academics and not companies. Therefore, 322 articles were analysed for this research.

3.2. Bibliometric Analysis

To map the articles that address topics related to I4.0 and digitalisation in the BM, a bibliometric analysis was made in a comprehensive way using the software VOSviewer version 1.6.18 (Van Eck & Waltman, 2010) to understand the scientific activity related to this theme.

Five indicators (articles, authors, journals, countries, and academia), the software citation (Cit), the co-citation, and the bibliographic coupling analysis (Total Link Strength/TLS) were presented. To complement, a co-occurrence analysis of all keywords was performed to group the results by theme. Hence, the evaluation combines (i) scientific mapping: the relationship between scientific elements, and (ii) performance: citations, keywords frequency, and publication (Caputo *et al.*, 2021; Ferreira, 2018). The number of citations is a measure of influence, and documents must reach a minimum inclusion limit. The co-citation evaluates the documents cited in the results, and the bibliographic coupling assesses how much a particular document is connected to the rest of the included documents; that is, if the coupling force is too low, the document is disconnected from the rest of the investigation and is not part of a large flow of research. Keywords co-occurrence analysis provides a thematic cluster, a set of items included in a map that guides the discussion. This comparative analysis overcomes the biased restrictions of using only one, offering a comprehensive examination of the scientific domain (Ferreira, 2018) and increasing the veracity of the data.

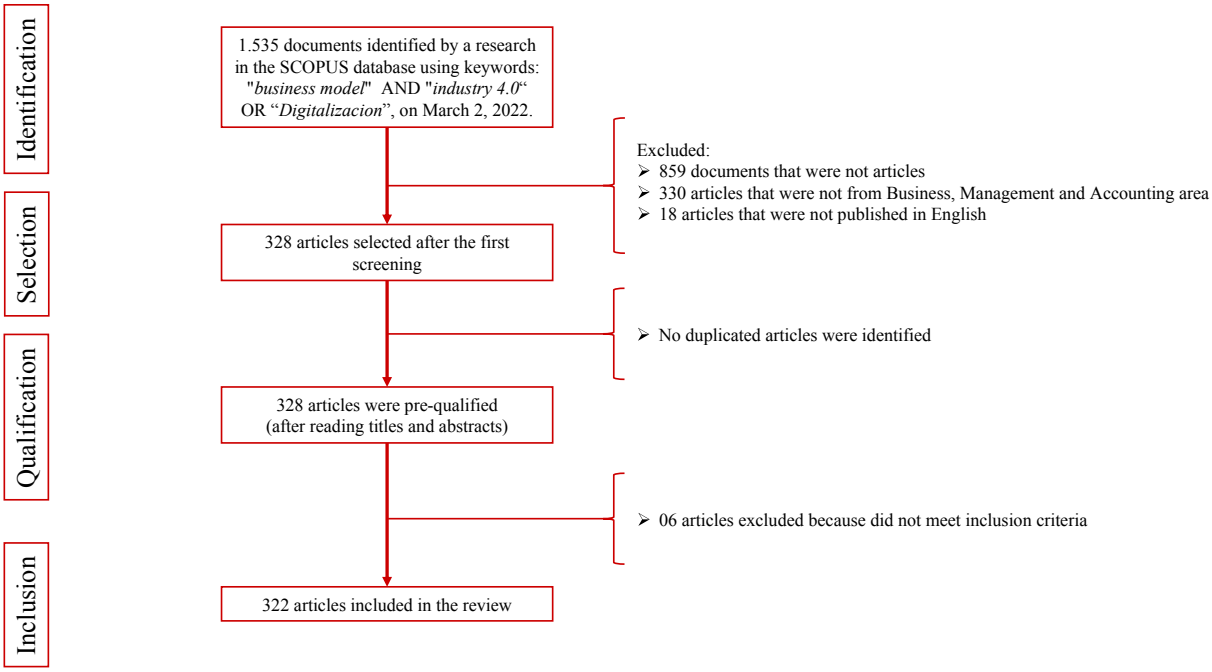

Figure 1
Research Protocol
Source: Own elaboration.

4. RESULTS OF DATA ANALYSIS

Before doing the comparative analysis, it was written a *thesaurus file* (Van Eck & Waltman, 2010) to unite the names of authors, Journals, and Institutions, written in a different format but which are the same and to unite words that were synonymous and/or abbreviated (e.g., authors: "Baines, t." was replaced by "Baines, t.s." / Journals: "acad. manag. j." was replaced by "Academy of Management Journal' / institutions: "Free University of Bozen-Bolzano" was replaced by "Free University of Bolzano-Bozen" / words: 'business model" was replaced by "business models").

4.1. Analysis Of Authors

A comparison of authors' citations, co-citation, and bibliographic coupling was run to analyse the most cited authors in the area. Co-citation analyses were performed using *fractional counting,* maintaining the VOSviewer analysis pattern. Of the 23,450 authors, they meet a minimum of 20 citations threshold. Concerning citations and bibliographic coupling, the features were a minimum of 4 articles per author, without minimum citations; of 889 authors, 11 meet the threshold. Table 1 provides the list of the key authors in this area. The author Vanit Parida appears at the top of the three analyses, as shown in Table 1.

Table 1
Author impact. Comparison of authors citations, co-citation, and bibliographic coupling

Citation				Co-Citation			Bibliographic Coupling	
Author	**Doc**	**Cit**	**TLS**	**Author**	**Cit**	**TLS**	**Author**	**TLS**
Parida V.	15	406	28	Parida, V.	190	174.96	Parida V.	2.763
Kraus S.	6	261	0	Zott, C.	175	162.80	Kraus S.	306
Gebauer H.	5	289	16	Amit, R.	171	160.67	Gebauer H.	1.356
Sjödin D.	5	75	24	Teece, D.J.	137	129.94	Sjödin D.	1.100
Elidjen	4	23	0	Gebauer, H.	131	123.80	Elidjen	543
Kohtamäki M.	4	296	14	Kohtamäki, M.	121	112.90	Kohtamäki M.	1.260
Mihardjo L.W.W.	4	36	0	Sjödin, D.	111	104.24	Mihardjo L.W.W.	388
Müller J.M.	4	486	1	Porter, M.E.	109	103.73	Müller J.M.	637
Sasmoko, Alamsjah F.	4	23	0	Kowalkowski, C.	98	93.82	Sasmoko, Alamsjah F.	543
Voigt K.-I.	4	413	1	Baines, T.S.	93	89.96	Voigt k.-I.	637
Wincent J.	4	57	10	Eisenhardt, K.M.	93	90.34	Wincent J.	1.079

Note: Doc – documents; Cit – citation; TLS –Total Link Strength.
Source: Own elaboration.

4.2. Analysis of Articles

Regardless of whether there is much research in the digitalisation and I4.0 area, which is still a relatively recent topic, the number of investigations on BM associated with I4.0 has increased significantly, especially after the onset of the COVID-19 pandemic. Of the 322 articles, 213 were published between 2020 and 2022, i.e., 66% were published from 2020 to the time of this research, 79 in 2020, 111 in 2021 and 23 in 2022.

Regarding the analysis of the articles (Tables 2, 3 and 4), in terms of citation and bibliographic coupling, a minimum of 20 citations was established for the 322 documents; 72 meet the threshold. On the co-citation analysis, with a minimum of 10 citations, of the 18,628 cited references, 13 meet the threshold.

Table 2
Analysis of Articles: Top three articles

Rank	Authors	Year	Title	Main Contributions
1	Moeuf, A., Pellerin, R., Lamouri, S., Tamayo-Giraldo, S., & Barbaray, R.	2018	The industrial management of SMEs in the era of Industry 4.0	— New changes brought to the production planning and control functions in SMEs in the era of I4.0; — Describes technologies under-exploited or ignored by SMEs as well as the most exploited; — Presents a framework for analysing papers associated with the I4.0 concept.
2	Müller, J. M., Buliga, O., & Voigt, K. I.	2018	Fortune favours the prepared: How SMEs approach business model innovations in Industry 4.0	— How I4.0 impacts manufacturing SMEs' business models; — Implementation motives and implications are shown for I4.0 users and providers; — Presents four implementation stages of I4.0 within SMEs.
3	Warner, K. S., & Wäger, M.	2019	Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal	— What digital transformation means for incumbent firms; — Analysis of the ongoing digital transformation; — Provides a perspective where digitalisation drives changes to digitally transform an incumbent's BM, organisational structures, and processes.

Source: Own elaboration.

Table 3
Analysis of Articles: three most impacting articles in terms of Total Link Strength (TLS)

Rank	Authors	Year	Title	Main Contribution
1	Müller, J. M., Buliga, O., & Voigt, K. I.	2018	Fortune favours the prepared: How SMEs approach business model innovations in Industry 4.0	Refer to table 2
2	Warner, K. S., & Wäger, M.	2019	Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal	Refer to table 2
3	Kamalaldin, A., Linde, L., Sjödin, D., & Parida, V.	2020	Transforming provider-customer relationships in digital servitisation: A relational view on digitalisation	— Guides on how companies can facilitate both customisation and operational efficiency by leveraging the value of digital technologies; — Development of a relational transformation framework for digital servitisation to guide B2B relations.

Source: Own elaboration.

Table 4
Comparison of articles citations, co-citation, and bibliographic coupling

Citation			Co-Citation			Bibliographic Coupling	
Author	Cit	links	Author	Cit	TLS	Author	TLS
Moeuf *et al.* (2018)	385	1	Zott C. (2011)	23	58	Müller *et al.* (2018)	195
Müller *et al.* (2018)	365	0	Teece D. (2010)	20	62	Warner & Wäger (2019)	188
Warner & Wäger (2019)	247	2	Porter & Heppelmann (2014)	16	28	Kamalaldin *et al.* (2020)	149
Frank *et al.* (2019)	224	2	Eisenhardt K. (1989)	15	52	Zhao Y. (2020)	144
Verhoef *et al.* (2021)	212	0	Eisenhardt & Graebner (2007)	15	43	Verhoef *et al.* (2021)	136
Sung T. (2018)	203	1	Foss & Saebi (2017)	15	42	Kohtamäki *et al.* (2019)	129
Ślusarczyk B. (2018)	169	0	Amit & Zott (2001)	14	44	Frank *et al.* (2019)	129
Kraus *et al.* (2020)	166	1	Chesbrough H. (2010)	12	31	Moeuf *et al.* (2018)	114
Rachinger *et al.* (2019)	158	0	Gioia *et al.* (2013)	12	37	Kohtamäki *et al.* (2020)	113
Kohtamäki *et al.* (2019)	151	1	Vandermerwe & Rada (1988)	11	26	Parida & Wincent (2019)	108

Note: Doc – documents; Cit – citation; TLS –Total Link Strength.

Source: Own elaboration.

4.3. Analysis of Journals

The Journal with the highest number of publications in the I4.0 and digitalisation area associated with BM is Technological Forecasting and Social Change, with 17 publications and the highest number of citations (1,041). The Journal of Cleaner Production has the highest number of co-citations (405), with 10 articles published. Concerning the citation and bibliographic coupling, with a minimum of 4 articles per Journal of 183 Journals, 14 meet the thresholds.

Regarding the co-citation, the default features specify 20 citations; only 96 of the 7,560 Journals meet the selection criteria. Table 5 displays the top ten Journals that contributed more with publications about the theme I4.0 and digitalisation associated with BM.

Table 5
Comparison of journals' citations, co-citation, and bibliographic coupling

Citation				Co-Citation			Bibliographic Coupling	
Journal	Article	Cit	TLS	Journal	Cit	TLS	Journal	TLS
Technological Forecasting and Social Change	17	1041	10	Journal of Cleaner Production	405	12994	Journal of Business Research	948
Journal of Business Research	12	510	11	Industrial Marketing Management	376	15851	Technological Forecasting and Social Change	839
International Journal of Production Research	4	500	2	Long Range Planning	364	14151	Industrial Marketing Management	667
Journal of Manufacturing Technology Management	5	278	4	Strategic Management Journal	333	12800	Journal of Manufacturing Technology Management	340
Industrial Marketing Management	8	224	7	Journal of Business Research	286	12726	Review of Managerial Science	335
Journal of Cleaner Production	10	159	2	Technological Forecasting and Social Change	273	9328	Journal of Cleaner Production	287
Business Horizons	4	84	3	Harvard Business Review	264	9570	Technology Innovation Management Review	219
Review of Managerial Science	5	79	0	International Journal of Production Research	210	7653	Business Horizons	204
Production Planning and Control	4	47	3	International Journal of Production Economics	195	7882	Production Planning and Control	184
Technology Innovation Management Review	5	28	3	Mis Quarterly	185	7948	International Journal of Innovation and Technology Management	151

Note: Doc – documents; Cit – citation; TLS –Total Link Strength.

Source: Own elaboration.

Table 6
Comparison of countries citations, co-citation, and bibliographic coupling

Country	Article	Cit	TLS
Germany	66	1607	90
Finland	35	1083	103
Italy	35	953	80
Sweden	35	827	109
United Kingdom	34	1177	63
United States of America	25	583	44
France	23	1183	60
Spain	21	378	21
Russian Federation	16	40	5
Brazil	14	385	45

Note: Doc – documents; Cit – citation; TLS –Total Link Strength.

Source: Own elaboration.

4.4. Analysis of Country Collaboration

Germany was the country that contributed most to the research agenda, with 66 articles published, followed by Finland (35), Italy (35), Sweden (35), and the United Kingdom (34). Brazil (14) and Portugal (09) are in 10th and 19th place respectively. Table 6 displays the top ten countries with the highest number of articles published, their citation and TLS of the 100 countries analysed; only 24 published more than five articles.

4.5. Analysis of Institutional Collaboration

Regarding collaboration of institutions, approximately 554 institutions, at least 17 published 4 articles or more. The two universities with the most publications were: Luleå University of Technology (Sweden) and the University of Vassa (Finland), with 15 articles each. Table 7 displays the list of the 13 universities that have published four or more articles related to the theme of this research. In addition to a comparison between the num-

ber of citations and TLS, it was observed that the author Vanit Parida, who has the highest number of citations, co-citation and TLS in the bibliographic calculation, is a chair professor of Entrepreneurship and Innovation at one of the universities with the largest number of published articles at Luleå University of Technology, during the period of this research.

Table 7
Comparison of institutions' citations, co-citation, and bibliographic coupling

Institution	Country	Article	Cit	TLS
Luleå University of Technology	Sweden	15	425	36
University of Vaasa	Finland	15	467	38
Bina Nusantara University	Finland	7	40	0
Linkoping University	Sweden	7	464	23
University of Bayreuth	Germany	7	96	6
Friedrich-Alexander University Erlangen-Nürnberg (FAU)	Germany	6	423	3
Hanken School of Economic	Finland	6	132	18
University of St. Gallen	Switzerland	6	96	22
Free University of Bolzano-Bozen	Italia	5	83	2
University of Lincoln	United Kingdom	5	102	4
University of South Eastern Norway	Norway	5	179	30
Durham University	United Kingdom	4	252	6

Note: Doc – documents; Cit – citation; TLS –Total Link Strength.
Source: Own elaboration.

4.6. Analysis of Keywords

A full counting method was used to identify and group the clusters with at least five occurrences; of 1,607 keywords, 71 met the threshold. As the three keywords, part of the research themes, were influencing the results, these were excluded: "industry 4.0", "digitalisation" and "business model". Using a three-item minimum cluster size, the analysis by association provided five clusters with 805 links and 1,194 total link strength (TLS). Table 8 presents the complete list of keywords and their clusters, and this number of links demonstrates that there are topic overlaps between the clusters (Figure 2).

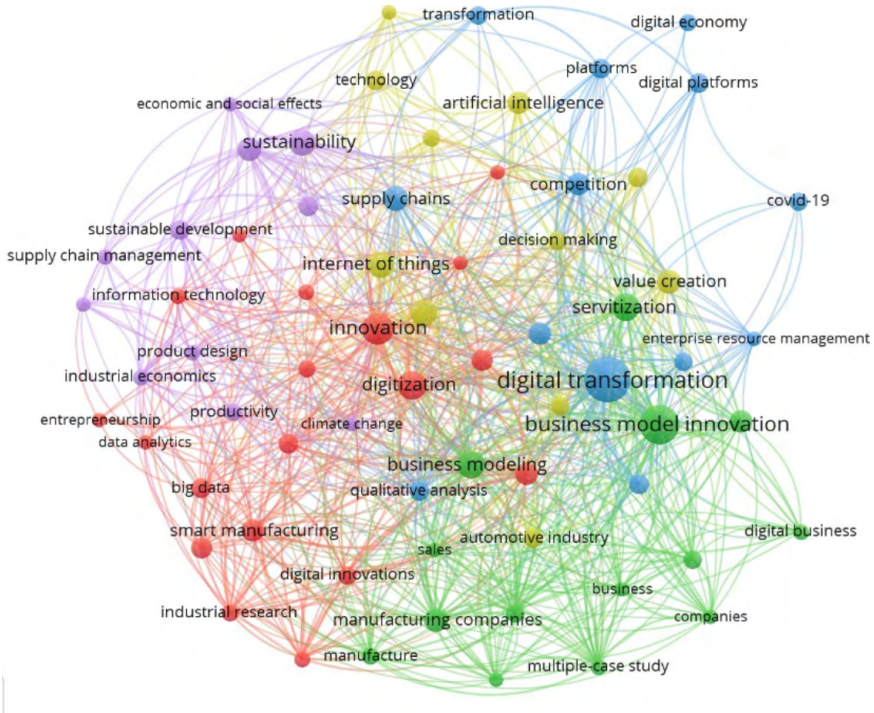

Figure 2
Network Visualisation by VOSviewer 1.6.18
Source: Own elaboration.

Table 8
All keywords co-occurrence analysis by VOSviewer 1.6.18

	Keyword	Occurrence	TLS Cluster
Cluster 1: Technology Innovation	Innovation	23	80
	digitalisation	20	67
	smart manufacturing	12	39
	sme	12	39
	business development	11	51
	new business models	11	30
	design/methodology/approach	10	39
	Big Data	9	25
	digital innovations	8	26
	industrial performance	7	39
	industrial research	7	39
	information technology	6	17
	small and medium-sized enterprise	6	35
	technological change	6	20
	data analytics	5	18
	entrepreneurship	5	9
	industrial development	5	18
	networks	5	11
	strategic approach	5	26
Cluster 2: Business Model Innovation	business model innovation	36	106
	servitisation	19	51
	business modelling	18	82
	manufacturing companies	13	62
	digital servitisation	12	39
	manufacturing	8	52
	technological innovation	8	38
	manufacture	7	47
	digital business	6	20
	multiple-case study	6	48
	business	5	32
	companies	5	34
	sales	5	31
	service industry	5	35
Cluster 3: Digital Transformation	digital transformation	50	132
	supply chains	15	31
	ecosystems	12	35
	competition	12	46
	platforms	10	21
	qualitative analysis	10	53
	digital platforms	9	13
	digital business models	9	26
	covid-19	8	6
	transformation	8	16
	competitive advantages	8	24
	digital economy	7	4
	enterprise resource management	5	25
Cluster 4: Digital Technologies	digital technology	16	65
	internet of things	16	54
	value creation	13	31
	artificial intelligence	12	28
	strategy	10	16
	automotive industry	9	30
	technology	9	17
	decision making	8	31
	dynamic capabilities	8	43
	product-service system	7	23
	blockchain	5	16
Cluster 5: Circular Economy and Sustainability	sustainability	17	41
	circular economy	13	51
	sustainable development	10	33
	systematic literature review	9	23
	productivity	7	21
	industrial economics	6	37
	product design	6	23
	supply chain management	6	12
	economic and social effects	5	21
	climate change	5	20
	3d printing	5	15

Note: Doc – documents; Cit – citation; TLS –Total Link Strength.
Source: Own elaboration.

Along with the clusters (Table 8), the co-occurrence analysis offers network (Figure 2), overlay (Figure 3) and density visualisation (Figure 4). The links present the articles' stronger and more prominent words (Figure 4). The five colours in Figure 2 represent each of the 5 clusters (Table 9) and the network to which they belong. The link strength is visible in the size of the word. In this way, the clusters were named using the themes with the highest total strength of the link (see Table 9).

In addition to this generic analysis, the clusters will be addressed individually in Section 5 - Discussion of clusters results.

Visualising the overlay of words (Figure 3) presents the temporal distribution of keywords and thematic evolution over the years using non-normalised scores; this means that researchers currently focus on digital technology analysis, digital transformation, technology innovation, digital platforms, and innovation in digital BM. Previous studies have focused on I4.0 manufacturing, smart manufacturing, and technologies like Big Data. These less dense themes indicate themes for future research. At the same time, the denser themes point to themes that may be saturated in research.

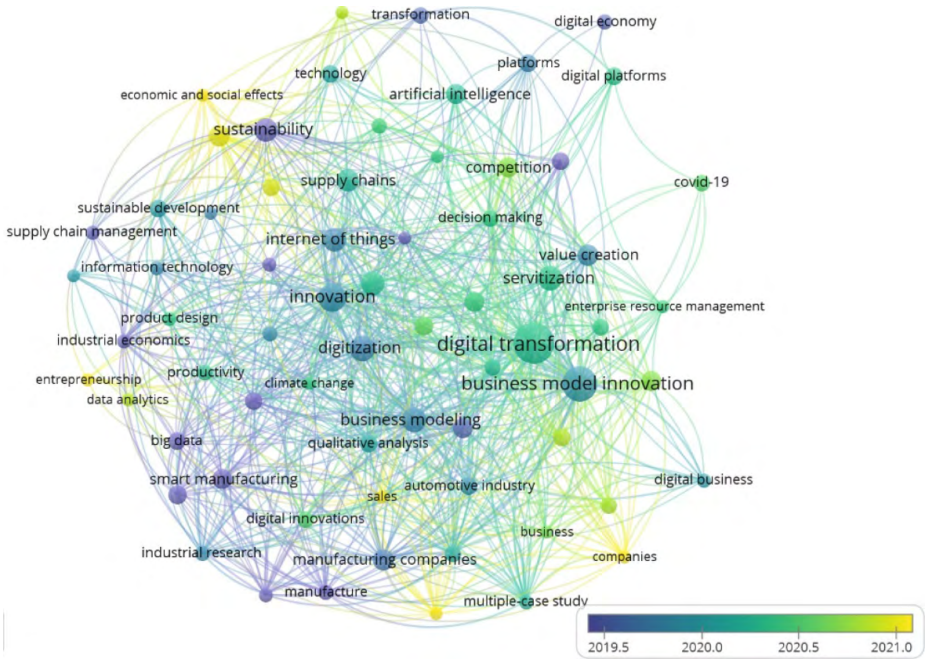

Figure 3
Overlay Preview through by VOSviewer 1.6.18
Source: Own elaboration.

The word density visualisation (Figure 4) continues, showing the connections between keywords. The colours yellow and red and the size of the word indicate a more robust presence and the strength of the link between them, while light blue indicates the opposite. For example, digital transformation and innovation in BM are denser than digital economy and digital business. These less dense themes indicate topics for future research. In comparison, denser themes point to themes that may be saturated in research.

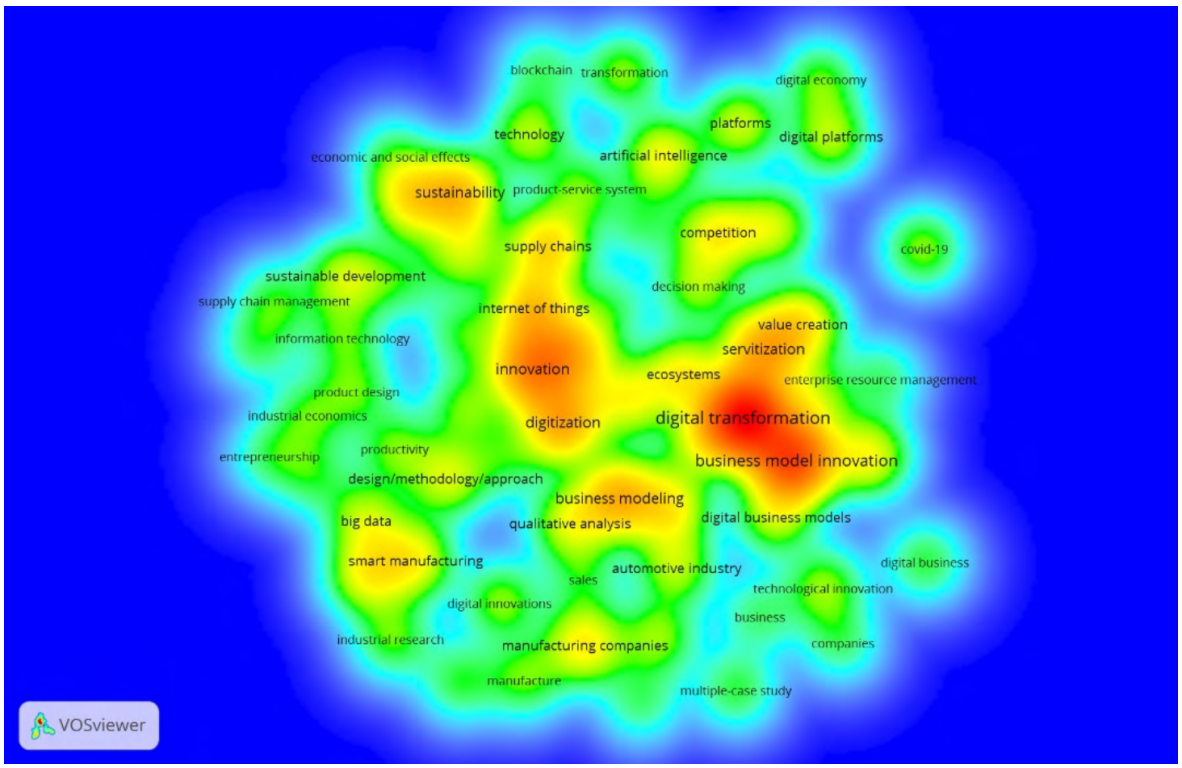

Figure 4
Density Display by VOSviewer 1.6.18
Source: Own elaboration.

5. DISCUSSION

Firstly, as mentioned previously, the clusters were grouped through the VOSviewer software that analysed the keywords and the links' total strength; nevertheless, it was necessary to read the articles to identify which cluster each article belonged. Table 9 displays the number of articles grouped in each cluster and their colours. Although the first cluster (Technology Innovation) has the largest number of keywords (n = 19), it does not include the largest number of articles, which may have occurred because the second (Innovation in business models) and third (Digital Transformation) clusters have the most powerful keywords in the link: "business model innovation" (TLS = 106) and "digital transformation" (TLS 132) respectively.

Table 9
Number of articles per cluster and their respective colours

No.	Cluster	No. of Articles	Figure Color
1	Technology Innovation	68	red
2	Innovation in Business Models	103	green
3	Digital Transformation	84	blue
4	Digital Technologies	43	yellow
5	Circular Economy and Sustainability	24	violet

Source: Own elaboration.

5.1. Technology Innovation

The first cluster was named Technology Innovation, as this tends to offer opportunities to develop innovative BM. Research has been into the effectiveness of transformative BM and disruptive I4.0 technologies (Kovaitė & Stankevičienė, 2021) that are revolutionising the market for products and services, disrupting global markets (Hannibal, 2020). Among several factors, it was observed that I4.0 technologies could support open innovation initiatives (Strazzullo *et al.*, 2022), promising a future of discontinuities and disruptive innovations, replacing the deployment of digital technologies initially enabled by Industry 3.0 (Wofford *et al.*, 2020), with for example, industrial robots can help improve product quality and offer better working conditions to limit the use of resources, resulting in cost savings (Vido *et al.*, 2020); Information and Communication Technologies and BM innovation can enhance the traditional advantages of physical markets by transforming and upgrading the traditional system into an enterprise ecosystem (Song *et al.*, 2022). Therefore, the digital revolution has substantially changed the business environment, transforming various sectors, such as the banking sector, which has recognised the importance of investing in innovative technologies due to analytical capabilities to attain competition and sustainability (Gul & Ellahi, 2021) as well as improve the performance and satisfaction of its customers.

5.2. Cluster 2 - Innovation in Business Models

Since "Business Model" is one of the research keywords, it was challenging to classify the articles of this cluster, as it was identified through the perception of the difference in the focus of each article when relating to BM, I4.0, and digitalisation. Thus, the Innovation cluster in the BM grouped the themes related to business management, people, and how a company's previous knowledge affects its strategies in implementing digital services. Publications in this cluster also discuss the barriers to digitalisation, decision-making guidance, strategies for implementing digital technologies, and innovation in BM to deliver digital products and services through technology innovation and intelligent solutions. For Bouncken & Kraus (2022), organisations must not only compete among themselves through well-developed autonomous strategies to gain advantages over their competitors, solely relying on their resources and capabilities, but also base their BM on shared resources, knowledge dissemination, local resources, and government support. For Müller *et al.* (2021), firms that acquire, assimilate, transform and exploit external knowledge are better prepared to engage in exploratory and experimental innovation strategies, allowing such firms to redesign their BM towards efficiency and novelty. According to Paiola *et al.* (2021), prior knowledge has been considered crucial to properly conceptualise and classify the digital service models and designs to be adopted before even beginning the digitalising services. Companies without sufficient prior knowledge are forced to close their knowledge gaps by learning to manage various new and specific aspects of digital technologies. Support from external sources and knowledge is also crucial to upgrading the internal capabilities of family businesses to adopt I4.0 disruptive technologies (Cucculelli *et al.*, 2022).

In addition to these factors, people management practices are strongly correlated with the productivity and innovation of the BM (Llinas & Abad, 2019). Top management and leadership guidelines, employee motivation, collective wisdom, creativity, and innovations are critical factors influencing BM in a smart factory (Jerman *et al.*, 2019), as well as the continuous and orderly management of organisational leadership is also considered to be one of the critical success factors of I4.0 implementations (Pozzi *et al.*, 2021). Digital technologies have had a tremendous impact on the world and have forced companies to adapt their BM, their strategies and, especially, their management practices (Fernandez-Vidal *et al.*, 2022). Suppliers and customers move from the product-centric transactional model to service-oriented relational engagement to profit from digitalisation. The interaction between digitalisation and high-service delivery has become positive and significant, which can improve company's financial performance (Kohtamäki *et al.*, 2020).

5.3. Cluster 3 - Digital Transformation

Publications in the digital transformation cluster focus on the development of the BM of digital platforms, the transition of traditional BM to digital BM influenced by digitalisation, the challenges and stages of digital transformation and the digital transformation caused by the COVID-19 pandemic. Digital platforms are influencing BM in a diverse of organisations as well as business relations (Veile *et al.*, 2022), apart from activities not related to the products and equipment manufacturing or even supply chain, such as the insurance sector, travel sector, media/newspaper sector, among others, which has had their business and services completely affected by digital transformation. For Mariani and Nambisan (2021), digital platforms can deliver value by analysing innovation and serve as a powerful tool for experimenting with digital innovation, enabling companies to innovate more effectively and transform their BM to adapt to rapidly changing market conditions. One of the biggest revolu-

tions in modern business is the shift from traditional to digital BM to achieve a higher level of competitiveness (Jovanović *et al.*, 2018); consequently, digital transformation has been one of the main challenges faced by contemporary businesses (Saarikko *et al.*, 2020). The case study carried out by Rubio *et al.* (2021), which presents a new algorithm to maximise the use of AGVs (Autonomous Guided Vehicles) efficiently and reliably, presents evidence of increased productivity, reduction in energy consumption, improvement in production time and decrease in labour costs, which has an impact on the factory's revenue and consequently on the decision-making process and BM.

Regarding the adoption of I4.0 technologies, inter- and intra-organizational factors that influence BM were also identified. For Zeng *et al.* (2021), inter-organisational factors such as regulatory pressure, pressure from business stakeholders, and the influence of large organisations and market leaders influence adoption decisions to different degrees. The intra-organizational factors are related to top management support, which directly influences the organisation's adoption decisions and the technology compatibility within each organisation. For Menchini *et al.* (2021), enterprise architecture can be useful in the digitalisation of BM; however, for this to happen, support from top management is essential, especially since it requires much work in the transition to a digital BM, where collaborations with external partners could be beneficial (Palmié *et al.*, 2022). Finally, the COVID-19 pandemic has led to a shift in BM towards socially responsible business and adherence to sustainable development goals. According to Miethlich *et al.* (2021), digital transformation is a necessary and important process for developing a company in COVID-19, aiming to maintain its integrity and survival, driving the extensive use of digital technologies in everyday life. In pandemic scenarios, digital enterprise management is focused on survival, self-learning and cooperation without intermediaries through innovation and transformation of business processes.

5.4. Cluster 4 - Digital Technologies

Publications in the digital technology cluster share a common denominator: value creation influenced by digitalisation. Digital technologies influence organisations' creation, proposition, and capture of value and how they deal with the challenges of increased digitalisation (Acciarini *et al.*, 2021; Rachinger *et al.*, 2018). Other investigations seek to clarify the impacts of one of the specific digital technologies in BM, e.g., Cyber-Physical Systems, IoT, Blockchain, cloud computing, Big Data, and Artificial Intelligence, among others. Dynamic capacity is another theme that has caught the attention of researchers, whether in building dynamic management capabilities to drive digital transformation (Warner & Wäger, 2019), using new digital technologies, or using them to generate changes in operational capabilities and business activities (Oyebanjo & Tengeh, 2021). In terms of digital technologies, IoT has created many kinds of extraordinary business opportunities for e-commerce, and with the use of the internet on mobile devices, new forms of BM have emerged (Bhullar & Gill, 2018). IoT can change not only BM but also how individuals and organisations create value (Langley *et al.*, 2021), as its use can aid in real-time data capture and, when integrated with Blockchain, allows business intelligence to improve resource management agility (Rane & Narvel, 2021). Another factor that influences BM is the development of new biclustering algorithms that can help designers, managers, innovators, and others to identify who the customers are in general, their desirable and undesirable characteristics or combinations through IoT devices, and thus corroborate the process of developing new products (Garbuio & Gheno, 2021). According to Srivastava *et al.* (2019), Blockchain helps manage the integrity of finished products, the collection of medicines, safety announcements, traceability, and security of your supply chain from raw material to manufacturing and final distribution to customers. Augmented Reality (AR) can also be a potential solution for improving business processes, operational efficiency, and overall competitiveness (Rejeb *et al.*, 2021).

5.5. Cluster 5 - Circular Economy and Sustainability

In the last cluster, the articles have their roots in the circular economy and sustainability. Publications in the fifth cluster contribute to understanding how I4.0 and digitalisation associated with BM innovation are related to practices, principles and objectives, strategies, and the transformation of the circular economy. There is much research on circular BM, whether BM innovation or BM related to sustainability. According to Beier *et al.* (2020), I4.0 technologies offer a greater chance of aligning sustainability goals with digital transformation in the context of current industrial development, which can also become a threat if sustainability goals are not considered in implementing I4.0 technologies. According to Alkaraan *et al.* (2022), the circular economy is an industrial system that uses renewable energy to help eliminate waste through materials, products, systems, and BM. Digital transformation, defined through new digital technologies, enables significant business improvements, enhances the customer experience, streamlines operations and supports the creation of BM. The consolidation of I4.0 as a new innovative ecosystem has generated great expectations about its economic and environmental effects (Díaz-Chao *et al.*, 2021). For example, lean design combined with eco-design and I4.0 represents an innovative model that includes sustainability throughout the product life cycle (Dahmani *et al.*, 2021). Using I4.0 technologies, such as in green energy platforms, can contribute significantly to the energy sectors' decarbonisation, digitalisation and decentralisation and, consequently, to the slowdown of climate change (Menzel & Teubner, 2020). Implementing technologies such as Blockchain can help improve circular economy practices and companies' environmental and financial performance (Khan *et al.*, 2021). In conclusion, these digital technologies influence BM innovation, being considered to provide solutions to numerous problems in the world, including those related to the transformation of the circular economy.

6. CONCLUSIONS, FUTURE RESEARCH AGENDA AND LIMITATIONS

This paper investigates the confluence of factors influencing BM by digitalisation and I4.0 disruptive technologies. Firstly, bibliometric analysis was conducted to detect the most cited authors and the most impactful articles, Journals with the highest number of publications within this theme, and institutional and country collaboration. Through the co-occurrence of keywords, five clusters were pointed out and analysed: (1) Technology Innovation, (2) Innovation in BM, (3) Digital Transformation, (4) Digital

Technologies, and (5) Circular Economy and Sustainability. In addition to clusters, other key themes have also been identified that complement this analysis, such as (a) SMEs in the context of digitalisation, (b) the impacts that digital technologies have caused on BM, (c) servitisation and digitalisation, which is present in an expressive number of articles, and (d) the digitalisation and adoption of technologies in the context of the COVID-19 pandemic, that has changed BM significantly. After that, an in-depth analysis was conducted to investigate explicitly the factors that influence BM through digitalisation and I4.0 disruptive technologies.

The research revealed that some technologies, such as BD & BD Analytics, IoT, and AI, have been explored more than others. Nevertheless, all technologies have several factors, some of which are similar; for example, these three mentioned technologies can be useful in developing concepts and/or products and/or services and can help the process of customer segmentation and top management orientation. IoT and Blockchain can be valuable in implementing a circular economy, while cloud computing and AI are very effective for data collection, analysis, and sharing. However, technological innovation can impact the BM positively and/or negatively (Patrucco *et al.*, 2021). While digitalisation can bring new opportunities, the process conveys risks that may be difficult to mitigate or for which it is difficult to prepare (Amankwah-Amoah *et al.*, 2021). In the case of SMEs, which need to rely on the support of universities, government, and/or advanced technology centres, the adoption of some advanced technologies may be in short supply due to the low scale of operation, which makes such technologies inaccessible to SMEs (Benitez *et al.*, 2020).

Another example is the case of augmented reality, where despite helping improve training and working conditions, there are some challenges to implementation as employees may have restrictions on the training type (Dalmarco *et al.*, 2019). Furthermore, before adopting any technology, it is necessary to carefully analyse the internal and external consequences, seeking to understand what creates, delivers and captures value within BM according to each organisation's profile. These and other factors directly influence the BM of organisations in the digitalisation era.

The results of this study offer valuable contributions regarding knowledge about dimensions that influence BM in the digitalisation and I4.0 era, where the main findings and contributions concern the identification of themes and factors that have been further explored to drive future research to other areas less studied. It also offers a new approach to scientific mapping in digitalisation and BM. The analyses carried out in Journals, authors, and articles provide comprehensive and vital knowledge that systematises the body of knowledge and is based on the research of the academic panorama (Caputo *et al.*, 2021).

Despite the well-established research methodology, which is capable of ensuring the clarity and reproduction of the study, the limitations related to systematic literature reviews shall be underlined. These derive from the research keywords and the chosen database, which affect and characterise the results obtained: using another set of keywords (and their appropriate combinations) and other databases (such as Google Scholar or ISI Web of Science) could have led to a different analysis sample. To comply with the standards, we present only the main bibliographic references.

The findings of this study provide suggestions for policymakers, academics, and researchers to understand better the factors that influence BM through digitalisation and I4.0 disruptive technologies and can guide future research in this field (see Table 10).

Table 10
Proposal of a Research Agenda

Theme	Future Research Proposed
Technology Innovation	— Technologies implemented in the specific phase of the open innovation process and the intensity of the adoption of I4.0 technologies; — Effects of digitalisation-driven innovation connected to the BM reshaping; — Digitalisation activities of SMEs and family businesses during their business successions; — Strategies to implement I4.0 technologies identifying new opportunities in BM.
Innovation in Business Models	— Innovation in BM resulting from different levels of servitisation and the digitalisation process; — Innovative BM that are more appropriate to capacities, internal resources and the external environment; — Differences and/or similarities between countries in the digital BM innovation procedure.
Digital Transformation	— Connection between BM settings and the revenue/profit model through digital transformation — Relationship of strategic competencies that contribute to the transformation of digital BM; — Effects of digital transformation that can lead to business failure when the transformation process occurs slowly.
Digital Technologies	— Benefits versus costs for the adoption of digital technologies; — Study whether management, for BM innovation, differs between industries by adopting digital technologies; — What partnerships between companies and other organisational actors, such as startups which develop digital solutions, universities, and public and private R&D centres, could contribute to implementing digital technologies; — Better understanding of the relationship between sustainability and the adoption of digital technologies, focusing on sustainable entrepreneurship and BM.
Circular Economy and Sustainability	— New strategies and address the adverse effects of unemployment caused by innovation and technological progress; — Which sectors and/or companies have had an advantage through digitalisation and Circular Economy; — How circular BM affect the delivery of value during the adoption of various digital technologies; — Influence of digitalisation on various product and/or service sustainability aspects.

It was carefully identified and revealed the most relevant areas in terms of research, journals, and authors and, in doing so, it highlighted significant issues that offer future research directions. Policymakers aiming to increase the implementation of digitalisation and I4.0 disruptive technologies can provide training programs or tax incentives to incite firms to invest in developing new business models. Focusing on adopting new business models in companies will promote implementing practices aligned with sustainability goals and a circular economy.

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Profitability of microfinance institutions and borrowers: a systematic literature review

Rentabilidad de las instituciones de microfinanciación y de los prestatarios: una revisión sistemática de la literatura

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ABSTRACT

Using the SCOPUS database, this paper conducts a systematic literature review to identify the drivers of financial profitability for both microfinance institutions (MFIs) and borrowers. Among the 174 papers reviewed, 39 addressed the profitability drivers of MFIs and borrowers. For, MFIs several factors stand out: financing for women and group credit, portfolio quality; client monitoring; appropriate active and passive interest rates; and control of operating costs. For borrowers, training in small business management; the generation of innovative and well-structured business ideas, access to microcredit and adequate passive interest rate, monitoring by MFIs and investment-focused credit, are found to drive profitability without jeopardizing their scope and depth of their operations. In this way the MFIs can grow and expand their services in a financially sustainable way, and better serve excluded individuals. These results may provide a valuable framework to MFIs and borrowers to consider in their activities. Additionally, the findings are valuable also to policymakers when designing microfinance policies aimed at poverty reduction. A possible conjecture resulting from this study is that the financial sustainability of microfinance does not lie in subsidization, but in the application of market rules. By identifying two sets of factors that drive profitability, for MFIs and for borrowers, this paper provides an interface that incorporates measurement indicators.

Keywords: Profit, Financial Performance, Microfinance Institutions, Microcredit, Borrower, Systematic Review.

RESUMEN

Utilizando la base de datos SCOPUS, este documento lleva a cabo una revisión sistemática de la literatura (RSL) para identificar los factores que impulsan la rentabilidad financiera tanto de las instituciones de microfinanciación (IMFs) como de sus beneficiarios. De los 174 documentos revisados, 39 abordaban los determinantes de la rentabilidad de las IMFs y los beneficiarios. Para las IMFs, se destacan varios factores: financiación para mujeres y créditos colectivos, calidad de la cartera; supervisión de los clientes; tasas adecuadas de interés activas y pasivas; y control de costes operativos. Para los beneficiarios, la formación en gestión de pequeñas empresas; la generación de ideas de negocio innovadoras y bien estructuradas, el acceso al microcrédito y a un tipo de interés pasivo adecuado, la supervisión por parte de las IMFs y el crédito centrado en la inversión, se considera que impulsan la rentabilidad sin poner en peligro el alcance y la profundidad de sus operaciones. De este modo, las IMFs pueden crecer y ampliar sus servicios de forma financieramente sostenible, y atender mejor a las personas excluidas. Estos resultados proporcionan un marco valioso a los responsables políticos a la hora de diseñar políticas de microfinanciación dirigidas a la reducción de la pobreza. Una posible conjetura resultante de este estudio es que la sostenibilidad financiera de las microfinanzas no reside en los subsidios, sino en la aplicación de las reglas del mercado. Al identificar dos conjuntos de factores que impulsan la rentabilidad, para las IMFs y para los beneficiarios, este trabajo proporciona una interfaz que incorpora indicadores de medición.

Palabras clave: Beneficio, Rendimiento Financiero, Instituciones de Microfinanciación, Prestatario, Revisión Sistemática.

1. INTRODUCTION

Microfinance institutions (MFIs) have a dual mission – social and financial: without financial sustainability, their ability to fulfill their social mission would be compromised. Therefore, it is crucial for MFIs to ensure their long-term financial sustainability and growth. This is achieved by applying interest rates that can sustainably remunerate capital, enabling the extension of microfinancial services to a larger number of borrowers, particularly through microcredit (Mota *et al.*, 2018). By doing so, MFIs can effectively promote their social mission.

The microfinance industry has experienced significant growth, supporting over 205.3 million customers (Wondirad, 2022). However, the interest rates applied by MFIs are often higher than those charged by commercial banks. This is because the costs associated with lending and collecting numerous small loans are higher than handling a few larger loans with a greater capital volume (Bennouna & Tkiouat, 2016). Therefore, higher interest rates are necessary to cover these operating costs.

To understand the concept of profitability, or financial sustainability, in the context of MFIs, it is essential to examine the framework within the scope of microfinance. Profitability can be viewed as a mechanism through which microfinance services are provided to clients in a profitable manner, allowing MFIs to sustain and expand their operations without relying on subsidies (Fadikpe *et al.*, 2022; Hemtanon & Gan, 2020). For Bhanot and Bapat (2015), profitability means fully recovering costs or generating profits to ensure the future growth and operation of MFIs, serving more impoverished individuals without continuously depending on government subsidies or donor funds. In the context of microfinance, sustainability refers to the continuous provision of financial services to the poor through the ongoing operation of MFIs (Navajas *et al.*, 2000). Financially sustainable MFIs generate enough revenue to cover all their costs without depending on subsidies (Fadikpe *et al.*, 2022).

The profitability of MFIs' clients is determined by their ability to meet their credit obligations using the revenue generated from their activities, thereby freeing up financial resources for their households and sustaining their businesses over time (Brau *et al.*, 2009).

According to Hemtanon and Gan (2020), financial performance contributes to the financial sustainability of MFIs, as measured by three indices: return on assets (ROA), return on equity (ROE), and operational self-sufficiency (OSS). Positive ROA and ROE, along with an OSS value above 100%, indicate that MFIs are profitable and sustainable. The OSS index measures whether operating income is sufficient to cover all operating costs, including salaries, loan losses, and administrative expenses. An OSS index above 100% indicates that MFIs can operate without external funding or grants. If MFIs strive for financial sustainability and provide microcredits on favorable terms to borrowers, they can contribute to poverty alleviation by improving economic conditions at local and national levels. Ultimately, this economic growth benefits the poor and overcomes any concerns about repayment by impoverished individuals (Kumar & Sensarma, 2017).

If microfinance and microcredit has been analyzed from the point of view of the borrowers, namely their personal characteristics, their business projects and their loan characteristics (Mota *et al.*, 2018), the profitability of MFIs and their borrowers is a critically important topic that requires further study to understand and identify the main factors driving this profitability. It is crucial to enable MFIs to operate in a self-sufficient manner, without relying on public subsidies, in order to grow and expand their activities. This enables them to reach a wider population and promote financial inclusion for the poorest individuals, leading to an improvement in their living conditions. Sustainable and autonomous operations are key to achieving this extended reach and depth. The more financially profitable and self-reliant MFIs are, the greater their capacity to serve the poor population and reduce poverty. This is achieved through mechanisms that empower individuals to develop their own businesses, supported by microfinance as needed.

Although this topic has been analyzed from other perspectives, e. g. from the point of view of Non-Profit Organizations (NPOs) (Urquía-Grande *et al.*, 2022), the object of this study is on MFIs, specifically. The objective of this study is to conduct a systematic literature review (SLR) to identify the main drivers of financial profitability for MFIs and their borrowers. The research questions that will be addressed are: What are the primary drivers of profitability for MFIs and borrowers? How do these elements contribute to achieving profitability? The SLR was based on studies published in the SCOPUS database until January 2023.

The main results and novelty of this research include: Firstly, identifying the key drivers of profitability and financial sustainability for MFIs and borrowers, Secondly, presenting a comprehensive framework that combines these drivers and corresponding measurement indicators, and providing a unique perspective on the profitability process within the microfinance system.

This study contributes to the existing literature in several ways: Firstly, by presenting a holistic view of the profitability process for both upstream and downstream actors, which is distinct from previous studies such as those by Kumar and Sensarma (2017), Bradley *et al.* (2012), Mota *et al.* (2018) and Crombrugghe *et al.* (2008), as they only look at one side of the problem. Second, additionally, the study establishes an intertwined relationship between profitability drivers and indicators for both MFIs and borrowers, clarifying where the process begins and ends (Bennouna & Tkiouat, 2016; Bos & Millone, 2015). Finally, the study presents a framework encompassing the driving factors and profitability indicators for both MFIs and borrowers, building upon the works of Baklouti (2013), Caserta *et al.* (2018), and Hermes *et al.* (2011).

The practical implications of this study lie in recognizing the driving factors and profitability indicators that can support MFIs and borrowers in their daily activities, as well as aiding decision-makers in formulating effective public policies that promote true profitability for these entities. Ultimately, the aim is to enhance the well-being of the poorest individuals. In turn, as one of the implications of the results of this study, it is advisable MFIs conduct their lending activities according to market principles and avoid dependence on government subsidies or other entities if they wish to maintain economic and financial sustainability in the long run.

The structure of this paper is organized as follows: after this introduction, section 2 provides a description of the research methodology. Section 3 presents the investigation's results, while section 4 discusses these findings. Section 5 concludes with implications, limitations, and suggestions for future research.

2. RESEARCH METHODOLOGY

2.1 Systematic Literature Review

A systematic literature review (SLR) involves the identification, selection, analysis, and synthesis of existing research on a specific topic to keep knowledge on the subject up to date (Denyer & Tranfield, 2009; Mota *et al.*, 2020). SLRs are advantageous because they adhere to principles of rigor, transparency, and replicability, thereby expanding the breadth of knowledge and emphasizing the importance of empirical evidence over preconceived notions of a given topic.

SLRs aim to identify, synthesize, and evaluate all available evidence to provide a robust, empirically derived answer to a focused research question. Additionally, SLRs help identify knowledge gaps, inconsistencies, and methodological weaknesses (Gil-Lamata & Latorre-Martínez, 2022; Mota *et al.*, 2020; Petticrew & Roberts, 2006).

Regarding the choice of database, Scopus was selected because its curated and citation database, mandatory for a credible outcome using scholarly peer-reviewed published journal articles, with an extensive collection of scientific high-quality, relevant research journals (Baas *et al.*, 2020; Zhu & Liu, 2020). It provides large search options with a good degree of customization offering researchers several essential tools that enable them to analyze and compare documents by the exclusion and inclusion search criteria (Mota *et al.*, 2020).

Although Web of Science (WoS) records peer-reviewed journals in the social sciences and is one of the most comprehensive databases, Scopus has been used because of its broader coverage of relevant and quality publications (Arroyo Esteban *et al.*, 2022; Rasel & Win, 2020). Although Scopus, WoS and Google Scholar are the three main databases for academic literature and citation indexes, this study chooses the Scopus database due to its largest citation and abstract database covering a wide range of subjects. We did not conducted the formal search in the Google Scholar because it does not have a strong quality control process (Ali *et al.*, 2022).

This SLR specifically aims to select articles that discuss the drivers of profitability or financial sustainability in the field of microfinance. The proposed structure for this SLR follows the following phases (Denyer & Tranfield, 2009; Gil-Lamata & Latorre-Martínez, 2022; Mota *et al.*, 2020): planning, realization, reporting, and dissemination of results.

The planning phase includes defining the objective and research questions, as outlined in the introduction chapter, along with a review of the literature on financial profitability/sustainability. The realization phase involves creating a table of the main analyzed articles selected based on inclusion criteria, while the third phase focuses on describing and disseminating the obtained results.

The searches were conducted using the following keywords: profit, revenue, income, financial performance, earning, microfinance institution, borrower, microcredit client, microcredit customer, microfinance client, microcredit client, micro-finance client, micro-finance customer. The search covered the period up to January 2023 to gather as much information as possible on the subject.

In the planning phase of this SLR, the search words and the corresponding research equation were defined as integral elements of the research, as shown in Table 1.

Table 1
Research method implemented in the SCOPUS database

Elements of the research	**SCOPUS database** /*Search documents*
Keywords/*search words*	*Profit, revenue, income, financial performance, earning, microfinance institution, borrower, microcredit client, microcredit customer, microfinance client, micro-credit client micro-finance client, micro-finance customer*
Search Equation/*Query*/Search Key/search syntax	Search within Paper title, Abstract, Keywords (Profit* OR revenue* OR income* OR "financial performance" OR earning* AND "microfinance institution*" AND borrower* OR "microcredit* client*" OR "microcredit customer*" OR "microfinance client" OR "micro-finance client" OR "micro-finance customer*")
Inclusion/limitation criteria	Research area: *Economics, Econometrics and Finance; Business, Management and Accounting*; Document years 1951-January 2023; Languages: English; Document type: *Article and Review*, Source: *Journal.*
Quality criteria	Searches conducted and repeated on different dates, having obtained the same results. The paths taken were access to SCOPUS, keywords, inclusion criteria and saving in the SCOPUS list.
Results before inclusion criteria	174
Results after inclusion criteria	94
Selection of documents tuned to the content of mutual profitability	39

Source: Own elaboration.

The inclusion criteria presented in Table 1 aimed to identify articles that specifically address the business, management, economic, and financial facets of microfinance, while excluding social aspects unrelated to the core of this research. Additionally, conference papers, book chapters, and books were also excluded, as they do not typically undergo the rigorous double-blind review process and often serve different objectives compared to scientific articles.

After applying the inclusion criteria, a total of 94 documents were considered for the analysis phase. Table 1 provides an overview of the search terms used in the SCOPUS database. The quality criterion used in this SLR involved repeating the entire process a few days later, which yielded the same results of 174 documents.

A total of 94 documents were initially considered, and the subsequent selection process resulted in 39 articles eligible for this work. The 94 articles underwent analysis based on exclusion criteria applied to titles, abstracts, keywords, introductions, and conclusions, with a focus on identifying factors driving profitability or financial sustainability relevant to the SLR's objective. Articles not addressing microfinance or its broad concepts, as well as those lacking discussions on factors influencing profitability or financial sustainability factors and their corresponding measures/indicators, were excluded. Consequently, 55 articles were excluded, leaving 39 articles for further analysis.

The 39 final articles underwent thorough examination, considering various aspects such as authors, article types, objectives, geographic scope of the studies, factors influencing profitability or financial sustainability, and their corresponding indicators, as well as the main conclusions. This comprehensive analysis identified the state of the art regarding the main factors or drivers of financial profitability/sustainability in the context of microfinance.

2.2. *Bibliometric analysis*

Bibliometric analysis was conducted to enhance the analysis of the articles included in this (SLR) and to identify key issues related to mutual profitability within the context of microfinance. This involved employing the VOSviewer software version 1.6.19 as analytical tool for the analysis of keywords co-occurrence and bibliometric coupling as detailed by Rios-Romero *et al.* (2023).

2.2.1. Co-occurrence of all keywords

In this section, all keywords utilized in the publications were subject to analysis. The frequency with which a keyword appeared alongside another is termed co-occurrence. Based on the link strength of co-occurrence, these keywords were categorized into clusters, each distinguished by color, as outlined by Yihua *et al.* (2023).

For the co-occurrence analysis of Keywords, we considered those used by multiple authors and occurring at least twice. Out of a total of 183 Keywords, 35 met these criteria. As depicted in Figure 1, "Microfinance" and "Lending Behavior" were the most frequently occurring keywords, appearing 23 and 8 times, respectively, with a total link strength of 84 and 40 each, and they were grouped into five clusters related to one another:

- **Cluster 1 (red)** comprises 9 items: article, financial management, financial support, government, human, income, India, investment, profit.
- **Cluster 2 (green)** includes 8 items: credit provision, interest rate, lending behavior, numerical model, poverty, regression analysis, sustainability, trade-off.
- **Cluster 3 (blue)** consists of 7 keywords: banking, efficiency, financial system, mission drift, outreach, panel data, profitability.
- **Cluster 4 (gold)** encompasses 6 items: Bangladesh, financial performance, microcredit, microfinance institutions, social capital, social performance.
- **Cluster 5 (purple)** involves 5 keywords: institutional framework, low-income population, microfinance, poverty alleviation, saving.

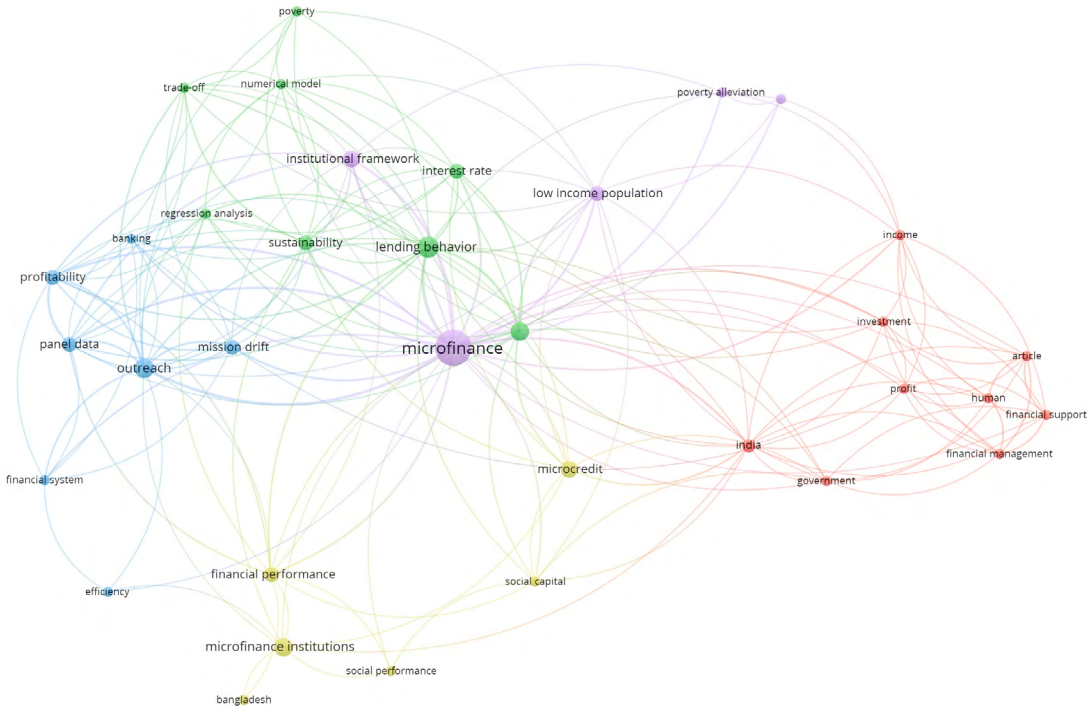

Figure 1
Co-occurrence of all keywords
Source: Own elaboration from SCOPUS using VOSviewer.

2.2.2. Bibliographic coupling with document as unit of analysis

In our Bibliographic Coupling analysis, we considered documents with a minimum of two citations to ensure a degree of similarity among the research items. Out of the 39 documents, 35 meet this criterion, and 32 are interconnected, forming five distinct clusters as illustrated in Figure 2.

The two most extensive clusters are Cluster 1, comprising 12 documents, and Cluster 2, consisting of nine documents, with a notable connection between them. Three additional clusters follow, also interconnected: Cluster 3 (blue) including seven documents, Cluster 4 (gold color) consisting of two documents, and Cluster 5 (purple) also involving two documents.

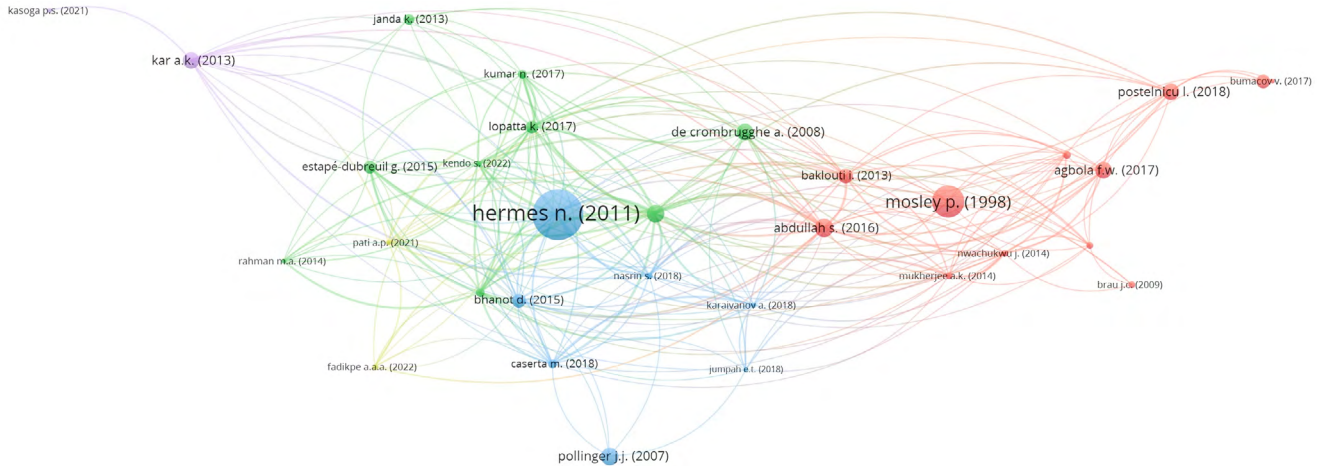

Figure 2
VOSviewer bibliographic coupling
Source: Own elaboration from SCOPUS using VOSviewer.

After analyzing the results of figures 1 and 2, we can see that the bibliographic coupling is in line with the co-occurrence of Keywords even in number of clusters, five for each, maintaining the coherence of the minimum threshold of two.

3. RESULTS

Out of the 94 articles analyzed, only 39 met the inclusion criteria that had been established previously. These articles were focused on the topics of profitability or financial sustainability of MFIs and their borrowers, as well as the factors and variables used to measure financial performance. Moreover, these chosen articles also demonstrated a connection to both the social and financial dimensions of MFIs' performances.

Of the 39 selected documents, approximately 77% of them employed a quantitative approach, utilizing various econometric models. The remaining articles employed a qualitative approach, relying on case studies and research based on secondary data.

3.1. Evolution and sources of publication

2018 is the year with the highest number of articles published and analyzed in this SLR. There is also a high concentration of articles in the years 2020, 2018, 2017, and 2013. As such, 77% of the articles were published between 2012 and 2022. This indicates that there is a significant interest among scholars in studying the profitability of MFIs and their borrowers in recent years (Table 2).

Table 2
Publications by year

Years	Publications	Absolute percentage (%)	Cumulative percentage (%)
2021-2022	5	12.8	12.8
2019-2020	4	10.3	23.1
2017-2018	9	23.1	46.2
2015-2016	5	12.8	59.0
2013-2014	7	17.9	76.9
2011-2012	4	10.3	87.2
2009-2010	2	5.1	92.3
2007-2008	2	5.1	97.4
1998	1	2.6	100.0
Total	39	100.0	100.0

Source: Own elaboration from SCOPUS.

Concerning the sources of publication, the chosen articles were published in a total of 31 different outlets, demonstrating the wide range of publications that address the profitability or financial sustainability of MFIs and their borrowers. Within these journals, several publications emerged as notable contributors, with a very high number of articles. These prominent journals include *Applied Economics*, *World Development*, *Annals of Public and Cooperative Economics*, *International Journal of Social Economics*, *Plos One*, and *Quality and Quantity*, which collectively account for 36% of all articles.

3.2. Publications by territories or countries

The analyzed documents exhibit a diverse geographical distribution, spanning all continents and emphasizing the global breath of the subject under investigation. The countries with the highest number of published documents were the United Kingdom and the United States, each contributing 5 out of the 39 documents, accounting for 13% of the total, respectively. India closely followed with 4 documents, representing 10% of the total. The Netherlands had 3 documents, while Australia, Belgium, France, Italy, Malaysia, and Tanzania each had 2 documents, representing 5% each.

3.3. Relationship among keywords, title content and source

The analysis of the relationship between keywords (DE), titles (TI_TM), and sources (SO) is presented in Figure 3, through a three-field plot using the Sankey diagram (Arroyo Esteban *et al.*, 2022; Asif *et al.*, 2023; Parvanda & Kala, 2023; Yihua *et al.*, 2023). According to Yihua *et al.* (2023), Sankey diagrams are a type of flow diagram in which the arrows' width is proportional to the flow rate.

The interplay between three indicators is shown in Figure 3, utilizing the Biblioshiny package within RStudio. The largest rectangle nodes for each element under analysis depict the relationship between the three elements. The analysis starts with the keywords, extends to the title content and the source.

Figure 3 reveals "microfinance" as the most frequently used title across nearly all sources, appearing in 26 different outlets, like *Applied Economics*, *International Journal of Social Economics*, *World Development*, and *PLoS One*. "Institutions," "performance," and "outreach" follow closely as prominent titles. As keywords, "microfinance," "microfinance institutions," "outreach," and "financial performance" stand out. Notably, "microfinance" as a title connects heavily with 25 other keywords, including "microfinance institutions," "social capital," "asset size," "efficiency," "social performance," and "sustainability." Notably, "institutions" appears in 13 different publications and 13 keywords, while "performance" appears in 10 publications and is connected to 12 keywords.

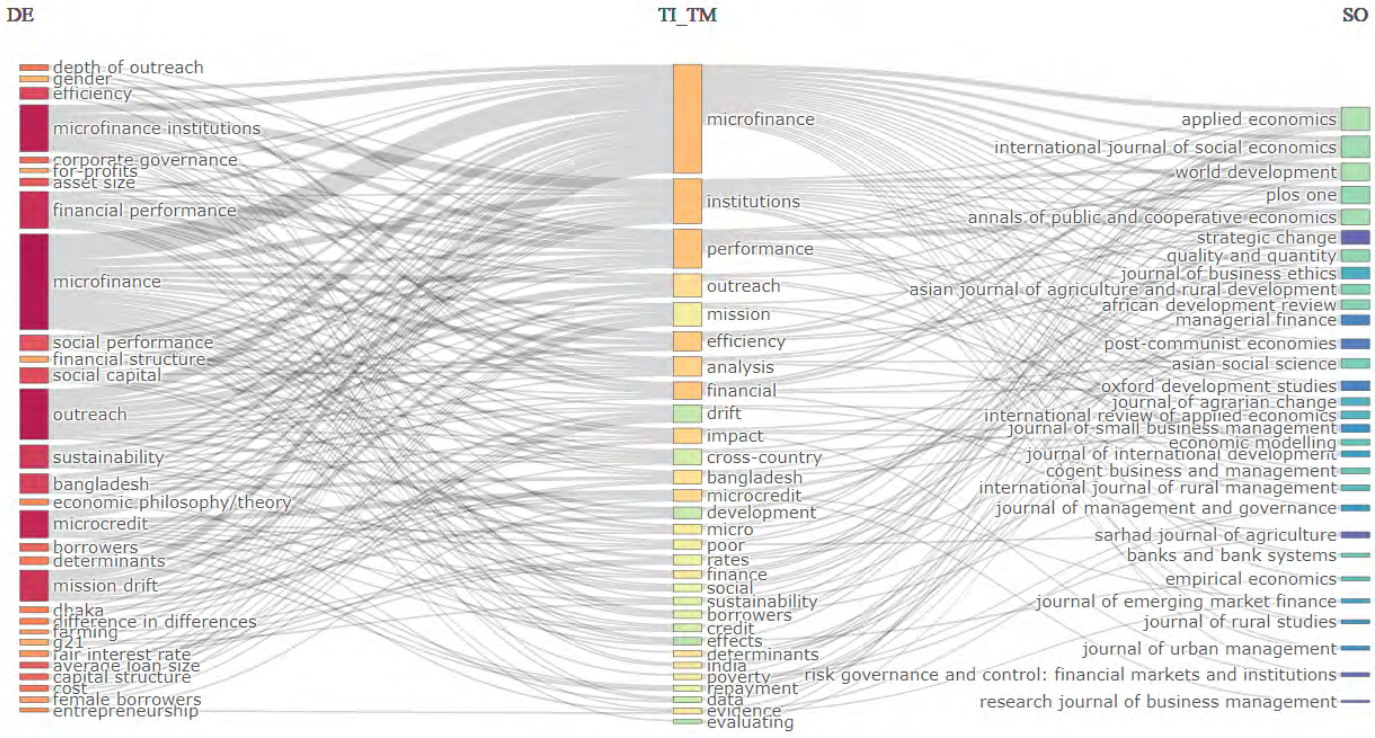

Figure 3
Three-fields plot representing the keywords, titles and sources
Source: Authors own creation, based on data retrieved from Scopus, using Bibliometrix R package.

3.4. Driving the profitability of MFIs, borrowers and framework

To identify the drivers of profitability and their corresponding indicators, an inductive thematic analysis approach, as described by Braun and Clarke (2006), was employed. This method ensured that the identified themes directly emerge from the data itself, avoiding pre-conceived coding structures or the researcher's own biases. Following an interpretative synthesis logic outlined by Mota *et al.* (2020), the 39 articles were grouped thematically and by author, focusing on factors influencing profitability of MFIs and borrowers. The findings are presented in Tables 3, 4 and 5, categorized by geographical coverage. Table 3, presents the articles that cover countries analyzing multiple geographical locations. Table 4 presents studies covering the Asian continent. Finally, Table 5 presents studies from the American and African continents.

Table 3
Characterization of geographical coverage of Worldwide sample

References and citations	Geographical coverage	Sample	Method/Methodology
Hermes *et al.* (2011); 364	Africa, Asia Europe, Latin America, and the Caribbean	Data from MIX; 435 MFIs, more than 1,300 observations	It employed Stochastic Frontier Analysis (SFA) to examine whether there is a trade-off between outreach to the poor and efficiency of MFIs.
Mosley and Hulme (1998); 157	Latin America, Africa, Asia	13 MFIs; 100 borrowers; control group of 50 non-borrowers	It measured financial performance using two alternative indicators: the proportion of loans more than six months in arrears, and the Subsidy Dependence Index. It utilized descriptive statistics.
Abdullah and Quayes (2016); 48	Asia, Africa	892 MFIs over a period of 10 years	It used three different measures of financial performance –, Profit Margin Rate (PMR), ROA, and OSS – as proxies to measure the sustainability of an MFI using descriptive statistics.
Bos and Millone (2015); 44	Worldwide dataset	1,146 MFIs, 3,880 observations	It introduced a simple approach accommodating a wide range of business models and estimated the operational efficiency of MFIs using descriptive statistics.
Postelnicu and Hermes (2018); 39	Worldwide dataset	6934 observations covering 934 MFIs based in 100 countries	It employed an econometric model to investigate the determinants of the MFI financial performance.
Kar (2013); 37	71 countries, worldwide	409 MFIs in 71 countries	It utilized benchmark regressions to understand if there is a trade-off between MFIs' increased motivation for profitability and depth of outreach.
Lopatta *et al.* (2017); 22	Africa, Asia, Eastern Europe, Latin America and the Caribbean	Period 1995–2012; total of 7,253 MFI-year observations for 952 MFIs	It proposed a model of MFIs' contribution to sustainable development based on their outreach and profitability focus, measured by percentages of female borrowers and profit margins.
Estapé-Dubreuil and Torreguitart-Mirada (2015); 21	Worldwide dataset	MIX; 1,261, nonbanking financial intermediaries and banks and rural banks	It examined diverse governance mechanisms implemented by microfinance institutions using descriptive statistics.
Caserta *et al.* (2018); 10	Bangladesh, Indonesia and Mexico	Unspecified	It tested for-profit monopolistic MFIs or a non-profit benevolent MFIs using a comparative model.
Harper (2012); 10	Africa, Eastern Europe, and Central Asia	Data from MIX; yields for the 1,081	It calculated differences in return rates using descriptive statistics.
Gupta and Mirchandani (2020); 8	Unspecified	456 MFIs from 87 countries from 2005–2015	It relied on descriptive statistics for analysis.
Nwachukwu (2014); 8	Asia, Europe, Latin America, the Middle East, and Sub-Saharan Africa	Data from MIX; 426 institutions	It combined descriptive statistics and a quadratic regression model for analysis.
Kendo and Tchakounte (2022); 3	Unspecified	953 MFIs	It applied a panel quantile approach with non-additive fixed effects.
Karaivanov (2018); 3	Worldwide dataset	346 MFIs globally observed in 2002–2004	It used an econometric model to analyze MFI's effort choice.
Bumacov *et al.* (2017); 3	Africa, Asia, Pacific, Eastern Europe, Latin America and the Caribbean	Unspecified	It employed linear regression models and ordinary least squares models.
Wondirad (2022); 2	Europe, Asia, Pacific, Africa and Latin America and The Caribbean	Unspecified	It used a literature review and a qualitative approach method.
Bennouna and Tkiouat (2016); 1	Unspecified	Unspecified	It focused on the interest rate applied by Moroccan microfinance institutions. It presented a stochastic model of the interest rate in microcredit built in random loan repayment periods.

Source: Own elaboration.

Table 4
Characterization of geographical coverage of Asian countries

References and citations	Geographical coverage	Sample	Method/Methodology
Agbola *et al.* (2017); 39	Northeastern Mindanao, Philippines	211 microfinance client and non-client households	It conducted a quasi-experimental design to measure the impact of microfinance.
Crombrugghe *et al.* (2008); 38	India	42 MFIs for the year 2003	It studied the role of each determinant of operational performance, conditional upon other determinants and upon indicators of MFI specificity, using regression analysis.
Field *et al.* (2012); 29	India	213 clients	It examined if small adjustments in loan structure that reduce repayment rigidity enable clients to experience the economic benefits of microfinance with minimized financial stress, using a randomized controlled trial experimental design.
Bhanot and Bapat (2015); 23	India's MFIs	Data from MIX database; 81 MFIs	It constructed an Index of sustainability by aggregating multiple indicators (operational self-sufficiency ratio, the average loan balance per borrower, and the number of active borrowers) to arrive at a composite sustainability score of MFIs.
Janda and Turbat (2013); 16	Asia	90 MFIs from 1998-2011	It analyzed the determinants of the earnings performance of microfinance institutions in several Asian countries using descriptive statistics.
Kumar and Sensarma (2017); 13	India	75 MFIs during 2004-2011	It employed the stochastic output distance function approach to ascertain whether there is a trade-off between efficiency and outreach.
Mukherjee (2014); 8	Indian	Secondary data Unspecified	It examined the role of MFIs in bringing capital to the ultra-poor using a qualitative approach method based on secondary data.
Nasrin *et al.* (2018); 6	Bangladesh	Data from 2007 to 2013, and 690 MFIs	It measured portfolio yield and profit margin using two dependent variables and deploying fixed effect and random effect time series analyses.
Hossain and Wadood (2020); 4	Bangladesh	200 slum households	It used econometric techniques of difference in differences (DID) and the probit model.
Pati (2021); 2	The private Indian MFIs	34 MFIs	It employed a panel regression model using STATA software.
Rahman and Mazlan (2014); 2	Bangladesh	5 MFIs	It measured the determinants of operational self-sufficiency using the multiple regression technique.
Anjum *et al.* (2020); 0	District Dera Ismail Khan, Pakistan	300 borrowers	It utilized descriptive, inferential, and chi-square statistics, and simple linear regression models to analyze the following parameters: family income, family health status, children's educational status, living standard, food/diet pattern, crop production, and transportation.
Hemtanon and Gan (2020); 0	Thailand	90 Village Funds and 70 Save Group Productivity	It used descriptive statistics to compare the performance of Village Funds (VFs) and Saving Groups for Production (SGPs).

Source: Own elaboration.

The methods and procedures used to gather the necessary information were outlined within the project or research design. This framework establishes the data types to be collected, the sources of origin, and the procedures to be applied (Arunkumar *et al.*, 2016).

The identification and classification of the profitability drivers were conducted through an inductive analysis of the articles based on the predefined criteria. Information regarding the profitability drivers was extracted from each analyzed article and recorded in a table, along with other relevant information. The factors were then categorized into two groups: those pertaining to the MFIs and those relating to the borrowers. Each group contains a range of factors that drive profitability (Baklouti, 2013; Caserta *et al.*, 2018; Harper, 2012; Hossain & Wadood, 2020; Jumpah *et al.*, 2018; Karaivanov, 2018).

Two different groups emerged addressing profitability drivers, with each group consisting of several factors. These factors include financing for women and group credit, portfolio quality, appropriate active and passive interest rates, control of operating costs, low cost per credit, increase in active customers, avoidance of client over-indebtedness, customer monitoring, and technology (Bhanot & Bapat, 2015; Estapé-Dubreuil & Torreguitart-Mirada, 2015; Fadikpe *et al.*, 2022; Gupta & Mirchandani, 2020; Hemtanon & Gan, 2020; Jumpah *et al.*, 2018; Karaivanov, 2018; Kumar & Sensarma, 2017; Nasrin *et al.*, 2018; Pati, 2021;

Wondirad, 2022). The most frequently referenced factors driving the profitability of MFIs are the control of operating costs and appropriate active and passive interest rates, as shown in Figure 4.

The factors driving the profitability of borrowers, also shown in Figure 4, are: training in small business management, innovative and well-structured business idea, access to microcredit and adequate passive interest rates, monitoring of MFIs, social capital, credit focused on investment rather than consumption (Anjum *et al.*, 2020; Bradley *et al.*, 2012; Caserta *et al.*, 2018; Harper, 2012; Hossain & Wadood, 2020; Jumpah *et al.*, 2018; Karaivanov, 2018; Mosley & Hulme, 1998; Pollinger *et al.*, 2007; Postelnicu & Hermes, 2018). The most mentioned factors are: training in small business management, access to microcredit and adequate interest rate and, credit focused on investment rather than consumption.

Table 5
Characterization of geographical coverage: other geographies

References and citations	Geographical coverage	Sample	Method/Methodology
Pollinger *et al.* (2007); 45	MFIs in USA	Not specified	Through an econometric model, it calculates discounted cash-flows based on loan portfolio size, loans in portfolio, hours per month, direct staff expenses, and indirect costs.
Baklouti (2013); 29	Tunisian	5,022 applications deposited	It uses a binary logistic regression model to examine the factors that affect default among borrowers.
Kessy and Temu (2010); 20	MFIs in Tanzania	225 micro and small enterprises - micro credit recipients	It uses independent t-tests to examine business performance between two specific groups of microfinance clients: those with entrepreneurship training and those without.
Becchetti and Conzo (2013); 10	Buenos Aires, Argentina	359 micro-entrepreneurs	It uses Ordinary Least Squares (OLS) and ordered probit estimates.
Brau *et al.* (2009); 9	Guatemalan MFIs	393 clients from Guatemalan MFIs	It uses descriptive statistics to investigate microlending outcomes among Latin American non-governmental organizations (NGOs), specifically MFIs.
Bradley *et al.* (2012); 8	Dominican Republic	Unspecified	It uses a Probit model to examine the role of business innovation intervening in the relationship between microcredit loans and income level.
Kasoga and Tegambwage (2021); 2	Tanzania	535 micro-borrowers	It uses descriptive, thematic, and logistic regression techniques for data analysis and was conducted among micro-borrowers from two major microfinance institutions in Tanzania.
Jumpah *et al.* (2018); 1	Ghana	224 microcredit borrowers	It uses logistics regression model to analyze factors determining repayment rates among smallholder farmer borrowers.
Fadikpe *et al.* (2022); 0	Sub-Saharan Africa	735 observations from 105 MFIs	It uses the Generalized Method of Moment and Seeming Unrelated Regression for the analyses. ROA, ROE, and OSS measure financial performance.

Source: Own elaboration.

4. DISCUSSION OF RESULTS AND IMPLICATIONS

The objective of this SLR is to identify the main drivers of financial profitability for MFIs and their borrowers, based on relevant articles on the subject. For this, a comprehensive analysis was conducted within a framework that considers the factors influencing the profitability of FMIs and borrowers, categorized according to their nature. Figure 4 exhibits the whole process of mutual profitability, in particular its driving factors and the corresponding measurement indicators.

There are several factors driving the profitability of MFIs, namely: financing for women and group credit; the quality of the client portfolio; effective control of operating costs; low cost per credit; increasing the number of active customers, preventing client over-indebtedness and employing appropriate clients' monitoring systems and technology.

Microfinance for women ensures MFIs the desired repayment rate due to the greater methodical and disciplined approach of women in managing micro-businesses compared to some men. When women receive funding, they are more likely to allocate it to the purpose for which it was contracted ensuring that they generate income to repay the credit, unlike many men. Therefore, as long as women invest microcredit in businesses, they can ensure the income that allows them to repay the credit, which happens if MFIs combine microfinance with other factors such as their training, constant monitoring and advice.

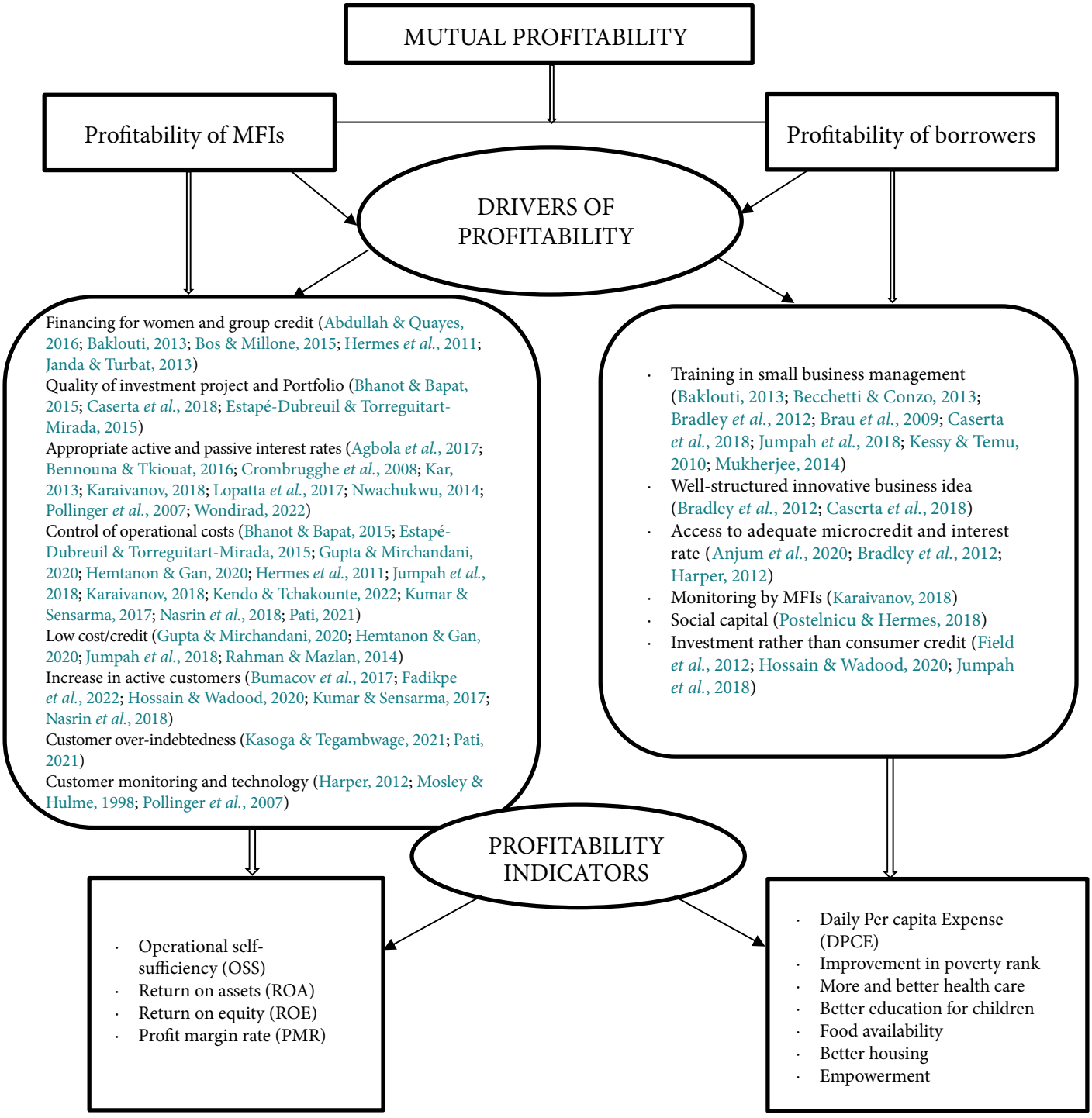

Figure 4
Framework on financial profitability system from the perspective of MFIs and borrowers
Source: Own elaboration.

Group-based joint liability microcredit serves as a tool to extend the outreach of microfinance products, particularly for niche populations that lack sufficient collateral to secure individual microcredits. By facilitating joint loan liability groups, MFIs fulfill what is at the genesis of microfinance, which is the sustained reduction of poverty and the improvement of the living conditions of the poor. This approach enhances the profitability of MFIs without compromising their social impact, which is in line with Fadikpe *et al.* (2022). Hence, it is essential for MFIs to guide these very vulnerable populations in forming joint liability groups to mitigate financial exclusion resulting from the inability to provide individual guarantees.

Through the financial inclusion of very poor, especially women, who do not have any form of collateral, MFIs can expand the scope and depth of their services by providing credits through joint liability groups. MFIs thus increase the extent and depth of the reach of their services, creating a good portfolio with the increase of active customers. This implies the improvement in financial profitability of MFIs, not least because the cost of monitoring also decreases, as a result of maintaining a high-quality client portfolio (women and solidarity groups loans), consistent with, e. g., Fadikpe *et al.* (2022), Kumar and Sensarma (2017), Abdullah and Quayes (2016).

Over-indebtedness among customers is a detrimental factor that negatively impacts the efficiency of MFIs. When borrowers are burdened with debts that exceed their actual repayment capacity, they face significant difficulties in meeting their installment payments. This can result in higher default rates, leading to substantial losses in MFI profitability. To address this issue, MFIs need to implement robust due diligence policies that assess and estimate the disposable income of each borrower, ensuring their ability to repay. Furthermore, it is important for MFIs to have access to the credit risk database of the country in which they operate. This helps prevent borrowers from obtaining multiple microcredits from different institutions, which can erode their ability to repay.

Customer monitoring is also a critical factor for the operational success of any MFIs, as many borrowers after obtaining microcredits, if not constantly monitored by MFIs, may fail to repay their installments. However, there is a high cost associated with good constant monitoring, which increases the operational expenses of these MFIs with consequences for microcredit borrowers, namely the increasing costs. Hence the justification that the active interest rates of autonomous subsidies of MFIs are significantly higher than those of commercial banks, as banks do not engage in constant on-the-ground monitoring of their customers.

Introducing technologies and fintech solutions into the system can be beneficial to reduce monitoring costs. This would allow financially literate and qualified customers to digitally contract microcredits and make installments payments, avoiding the need for MFI agents or borrowers to travel for collection and repayment. Such technological advancements would decrease operating costs for both parties involved.

MFIs profitability drivers allow them to perform well financially. Hence, the higher their financial profitability, the greater their ability to serve the poorest more with better services, with the extension of credits to the various social strata of the population. Moreover, poor financial performance or dependence on subsidies hampers the growth and efficiency of MFIs, limiting their reach, exacerbating financial inclusion issue. These findings are in line with, e.g., Karaivanov (2018), Bhanot and Bapat (2015) and Kumar and Sensarma (2017), contrasting those of Kar (2013), Hermes *et al.* (2011), Brett (2006) and Woller *et al.* (1999).

To ensure the financial profitability of microfinance program borrowers, several factors drive their profitability as borrowers (Bradley *et al.*, 2012; Caserta *et al.*, 2018; Harper, 2012): training in small business management; having an innovative and well-structured business idea; access to adequate microcredit and interest rates; monitoring by MFIs, social capital among borrowers and focus on microinvestment credit.

The training provides borrowers with the necessary skills to continue with their income-generating activities to obtain the desired results, while an innovative business idea that meets market needs is important for their development (Bradley *et al.*, 2012; Caserta *et al.*, 2018). Access to microcredit tailored to the needs of their microbusiness with interest rates that facilitates the investment's financial viability is crucial. These factors also interact with MFI monitoring and social capital. (Anjum *et al.*, 2020; Harper, 2012; Karaivanov, 2018; Postelnicu & Hermes, 2018). It is important for borrowers to direct their contracted microcredits toward microinvestments rather than consumer actions, as highlighted by Hossain and Wadood (2020) and Jumpah *et al.* (2018). Contracting microcredits for consumption purposes could result in the complete loss of financing and repayment difficulties due to a lack of income sources.

When analyzing the factors that contribute to mutual profitability, it is important to consider indicators that assess the level of profitability for both MFIs and borrowers. These indicators are presented in Figure 4. The findings of this research suggest the existence of several indicators for measuring the profitability of MFIs, including Operating Self-Sufficiency (OSS), Return on Assets (ROA), Profit Margin Rate (PMR) and Return on Equity (ROE) (Abdullah & Quayes, 2016; Bhanot & Bapat, 2015; Fadikpe *et al.*, 2022; Gupta & Mirchandani, 2020; Hemtanon & Gan, 2020; Kendo & Tchakounte, 2022).

OSS is commonly used as an indicator to measure financial performance. While ROE and ROA are widely employed as profitability measures in the literature, OSS is predominantly used to assess financial sustainability in the microfinance sector (Fadikpe *et al.*, 2022).

ROA is calculated by dividing the net operating income of MFIs by their assets. It serves as a profitability measure that evaluates the capability of MFIs to generate income from their assets. ROA enables comparisons of MFI performance and provides an indication of the expected return for investors on a particular investment.

The ROE is calculated by dividing the net income of a microcredit institution by its equity. It is particularly relevant for for-profit MFIs as it demonstrates the efficiency of MFIs in generating profits from each unit of capital invested by partners or shareholders. The PMR, also known as the return on sales ratio or gross profit ratio, is an index that measures the profit margin.

OSS refers to an MFI's ability to cover all its costs through its financial revenues. This measure provides an accurate assessment of an MFI's financial viability as it indicates whether an MFI can cover its expenses through its operational balance. Operational self-sufficiency, ROE, and ROA have been widely used to measure the financial sustainability of MFIs (Fadikpe *et al.*, 2022).

From these indicators, we will focus on the calculation of OSS, as it represents the most specific metric for gauging the profitability of MFIs. In computing this ratio, MFIs are required to include, in the numerator, all financial income, encompassing active interest, commissions, and other fees accrued through the execution of their activities. Conversely, within the denominator encompassing total costs, they must account for operating

costs, financial expenses (interest liabilities, commissions, and other fees incurred), as well as impairments for the loss of credits granted.

A 100% outcome for the OSS ratio signifies that an MFI has reached the break-even point. Consequently, a ratio exceeding 100% indicates that the MFI is generating additional income surpassing its overall costs, signaling positive financial performance. Conversely, a ratio below 100% implies that MFIs are incurring losses, necessitating immediate corrective measures to restore equilibrium in their financial outcomes. Such measures may involve a thorough reassessment of total costs, including the elimination or reduction of non-essential expenditures affecting operational efficiency, heightened efforts to prevent impairments or bad loans, and an augmentation of financial revenue without compromising relationships with borrowers. These actions aim to raise the OSS ratio to ensure sustained financial viability.

On the other hand, the following indicators measure the profitability of the borrowers (Anjum *et al.*, 2020; Brau *et al.*, 2009): daily per capita expenditure (DPCE), improvement in poverty rank, more and better health care, better education for children, food availability, better housing and empowerment. DPCE reflects the daily expenses of the borrowers and helps gauge their income level. Increased income enables borrowers to afford better healthcare, education for their children, improved food, housing, and results in an improvement in poverty rank and empowerment.

For the indicators of profitability measurement of Borrowers, DPCE, is used to measure their profitability and well-being which is a proxy through their daily expenses. Accounting for daily expenses will easily reach your income. The important thing for this study is to know the income from the activities financed by microcredits and not other sources of income that can be earned on the one hand. But, on the other hand, before excluding other sources of income from the calculation, it will be necessary to analyze the direct and indirect influences of income from activities financed by microcredit in obtaining other sources of income earned by Borrowers.

In the context of profitability indicators for Borrowers, the DPCE serves as a metric to gauge their economic viability and well-being, acting as a proxy through their daily expenditures. Accounting for daily expenditures provides a direct link to their income. The crux of this study lies in discerning the income specifically derived from activities financed by microcredits, distinct from other potential income sources.

It is imperative, however, to conduct an analysis of the direct and indirect influences of income from microcredit-financed activities on the acquisition of other income sources by Borrowers before excluding them from the calculation. While other sources of income may be incorporated into the calculation if they contribute to the attainment of financial objectives, the exclusion of unrelated sources of income is crucial for precision.

The relationship between expenditure levels and income is notable; higher levels of expenditure imply a corresponding increase in income. Alternatively, the OSS metric can be applied to evaluate borrowers' profitability. Yet, its calculation is deliberately confined to revenues stemming from microcredit-benefiting activities and the associated operational expenses. This exclusion extends to other family income and expenses unrelated to microcredit-funded activities, aiming to forestall potential biases in the outcome.

The key findings of this SLR are as follows: (i) identification and categorization of factors driving the profitability of both MFIs and borrowers, referred to as mutual profitability. These driving factors, when effectively considered by the involved entities, support their profitability without compromising the scope and depth of social sustainability, in line with Fadikpe *et al.* (2022); (ii) the future of microfinance lies not in subsidies but in applying market principles. Only through this approach can MFIs grow, expand their services in a financially sustainable manner, serve a larger population of financially excluded individuals, and provide ongoing support, consistent with Karaivanov (2018); (iii) as a contribution to the field of research, this study provides, for the first time, an integrated framework that presents the factors contributing to the profitability of MFIs and borrowers, along with their respective indicators, thus offering a comprehensive analysis of the mutual profitability process.

This study differs from previous ones in that the profitability factors were analyzed in an isolated and non-integrated way. Prior studies have often focused on analyzing specific profitability factors of MFIs without considering those related to the profitability of the borrowers, or vice-versa. Therefore, it is not possible to find in any of the previous studies providing a comprehensive analysis of the two groups of factors interconnected as well as their respective measurement indicators.

5. CONCLUSIONS, IMPLICATIONS, LIMITATIONS AND FUTURE INVESTIGATIONS

The profitability of microfinance institutions (MFIs) and their borrowers is a crucial area of study, given the widespread financial exclusion that traps many in poverty. For MFIs to acheive their goal of poverty reduction, they need financial sustainability, to grow and expand their services to the financially excluded who lack creditworthiness (income and collateral).

MFIs must ensure this financial sustainability through market principles, rather than relying on government subsidies or other institutions as a permanent source of financing. While subsidies might initially seem to make microfinance more affordable for the borrowers, they can lead to long-term inefficiency, distortions, and a lack of dynamism. Competitive practices should be applied in both borrowing and lending. Although subsidies may offer a short-term financial autonomy and lower microcredit costs, they can hinder the adoption of competitive practices and effective monitoring, as the funding source reduces the pressure for debt recovery. Therefore, MFIs operating independently of subsidies tend to be more efficient, effective and have a more focused organizational structure oriented to customer needs and mutual profitability. As such, these institutions are better positioned for sustained growth, expansion, and service to the financially excluded.

Borrower profitability is inseparable from MFI profitability. Clients can only repay the microcredit if their business generates sufficient and regular income to cover the installments and

sustain operations. unless they have a collateral that can be utilized to for debt repayment. This practice of enforcing collateral is not advisable in the microfinance process because it could hinder the client's ability from pursuing income-generating activities and feeling empowered. In any case, the profitability of clients is very dependent on their dedication to the business they carry out and, the more exclusive the dedication, the higher their profitability potential. Thus, two groups of driving factors that contribute to profitability have been identified: MFIs ensuring their operational continuity in a sustained way over time and the borrowers who contribute to their profitability. Moreover, relevant indicators for measuring profitability have also been identified.

Supported by the literature reviewed in this study, it is possible to mention that the driving factors of mutual profitability above identified play a crucial role in this process because their correct and integrated application results in financial sustainability for all parties involved. Likewise, the indicators associated with these driving factors are essential elements for measuring the outcomes of their implementation. The identified driving factors have been aggregated into two groups: those pertaining to MFIs and those related to borrowers.

The driving factors of MFIs include for women-focused financing and group credit, ensuring a quality-based portfolio that ensures that MFIs fulfill their poverty reduction role, as well as financial and social sustainability. Appropriate active and passive interest rates enable MFIs to provide microcredits to their customers at recoverable prices and to finance themselves without compromising their profitability. Effective control of operating costs and low costs per credit enhance the degree of efficiency of MFIs while an increase in active customers allows wider scope and improved profitability. Avoiding clients' over-indebtedness is important because highly indebted clients face immense difficulties in meeting their repayment obligations with negative consequences for the profitability of MFIs. Client monitoring and technology are essential elements in the implementation of an efficient microfinance process. Regular monitoring of clients, for example involving weekly or biweekly visits, is important for successful debt recovery with positive impacts for the financial sustainability of MFIs. The technology is also interesting because it supports MFIs in decreasing costs associated with the logistics of the monitoring process and can expand the reach and depth of microfinance services.

The main driving factors of borrowers' profitability are: training in small business management, the generation of innovative and well-structured business ideas, access to appropriate microcredit with favorable interest rate, monitoring by MFIs, social capital and credit focused on investment rather than consumption.

With these factors that drive mutual profitability, we have been able to establish guiding principles so that MFIs and their clients have a valuable operational instrument in their day-to-day activities. Policymakers can also utilize these findings when designing microfinance poverty reduction policies. In any case, despite an exhaustive investigation carried out and the results obtained, further studies are necessary to assess the true impacts of the integrated application of these factors in different regions across the world.

Despite the results obtained, this study has limitations. Notably, it does not undertake the segregation of different sources of revenue that MFIs and borrowers can obtain. Both MFIs and borrowers can obtain revenue from different sources in addition to operating microfinance activities. If the effects of those alternative sources of revenue are not analyzed separately, they may bias the understanding of profitability based on empirical approaches. Another limitation of this study is that, other aspects of poverty, such as the general well-being of borrowers, women's empowerment, physical and mental health of borrowers are not considered. The focus of this study was on financial aspects because they are engine that will drive MFIs to be sustainable and the progressions of the borrowers to other dimensions of well-being. Consequently, other aspects are left for further studies. Future research involving the measurement of the profitability of MFIs and borrowers in the field of microfinance should work on the segregation of their sources of revenue, limiting them, on one hand, only to those arising only from microfinance activities, in order to have a more comprehensive view of its impact, and, on the other hand, to assess the impact that complementary sources of revenue from MFIs and borrowers have on their own profitability. Furthermore, further studies might delve into evaluating the true impact of income from microcredit-financed activities on the personal, familial or business aspects of borrowers, contextualized within the multidimensional nature of poverty. Future studies can also delve into the different perspectives followed by NPOs and MFIs as they target not only a diverse group of borrowers but also have differing mission statements and are supported by different stakeholders.

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The Effect of Vigor and Affective Commitment on the Performance of Women Student Entrepreneurs: the Moderating Role of the Social and University Environment

El efecto del vigor y el compromiso afectivo en el desempeño de las mujeres estudiantes emprendedoras: el papel moderador del entorno social y universitario

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ABSTRACT

This study aims to analyze the performance of university women in active entrepreneurship from the perspective of cognitive variables, such as vigor and affective commitment, and contextual variables, such as the social and university environments. The study follows a multilevel analysis with a three-way interaction model. The data analysis covers 6779 university students from 39 countries, included in the GUESSS Survey, 2018. The evidence indicates a positive influence of the interaction between vigor and affective commitment on the performance of companies created by female university entrepreneurs. It shows the dependence of this interaction on the social and university environment, mainly on the social environment. This empirical study focuses on university students with active startups and determines the main influences on their business performance. This study has important theoretical implications that enrich the understanding of the relationships between the studied variables and contribute to existing knowledge. It mainly highlights the relevance of vigor and affective commitment for business success. Furthermore, it suggests the need for a more elaborate theory on interactions in the business context.

Keywords: Performance, Vigor, Affective commitment, University environment, Social environment, GUESSS.

RESUMEN

Este estudio tiene como objetivo analizar el desempeño de emprendimientos activos de mujeres universitarias desde la perspectiva de variables cognitivas como el vigor y el compromiso afectivo y variables de un contexto como el entorno social y universitario. El estudio aplica un diseño cuantitativo. El análisis de los datos abarca una muestra de 6779 estudiantes universitarias de 39 países, incluidas en la Encuesta GUESSS, 2018. Se aplicó un análisis multinivel. La evidencia indica que existe una influencia positiva de la interacción entre el vigor y el compromiso afectivo en el desempeño de empresas creadas por mujeres emprendedoras universitarias, así como la dependencia de esa interacción con el entorno social y universitario, principalmente con el social. Este estudio empírico se centra en las estudiantes universitarias con emprendimientos activos y determina las principales influencias en su desempeño empresarial. Este estudio tiene implicaciones teóricas importantes que enriquecen la comprensión de las relaciones entre las variables estudiadas y contribuyen al conocimiento existente, principalmente destaca la relevancia del vigor y el compromiso afectivo para el éxito empresarial. Además, sugiere la necesidad de una teoría más elaborada sobre interacciones en el contexto empresarial.

Palabras clave: Desempeño, Vigor, Compromiso afectivo, Entorno universitario, Entorno social, GUESSS.

1. INTRODUCTION

Entrepreneurship constitutes a significant field of study (Shane & Venkataraman, 2000) due to its contribution to job creation and socioeconomic growth (Bellò *et al.*, 2018; Jones & Colwill, 2013). New companies bring new jobs, higher income, and added value, in part through the introduction of new ideas, technologies, and products to society (GEM, 2022; Stoica *et al.*, 2020), as well as for stimulating competition and competitiveness (Stoica *et al.*, 2020).

The rate of creation of new businesses among women doubled during the pandemic years (WEF, 2022). The GEM report (2022) showed that one in three high-growth, innovative ventures focused on local and international markets corresponded to women. A nation's Gross Domestic Product (GDP) increases as women in a country advance in entrepreneurship and innovation (Sinha & Kumar, 2018). Literature has highlighted that female entrepreneurship is a crucial driver for economic growth, with the potential to significantly boost a nation's GDP (Nagabhaskar & MohanPrasad, 2022). In support of this claim, a study by the McKinsey Global Institute revealed that a total of $12 trillion could be added to the global GDP by 2025 by advancing gender equality. This optimistic projection is based on the premise that the capabilities of women in the workforce are fully developed and that both genders assume the same responsibilities and opportunities (McKinsey, 2015).

The literature has drawn attention to the study of various independent variables associated with the performance of women entrepreneurs (Corrêa *et al.*, 2022) in different regions and has pointed out the social and cultural challenges that women entrepreneurs face in those contexts (Cardella *et al.*, 2020).

Among those independent variables, vigor and emotional commitment influence business performance, although the results are still not definitive. Existing literature invites further exploration of the topic together with the study of contextual aspects such as the university environment (Bergmann *et al.*, 2016; Gnyawali & Fogel, 1994; Herrera *et al.*, 2020; Holienka *et al.*, 2017; Shirokova *et al.*, 2016; Spigel, 2017) or the social environment influencing business performance.

The general literature on female entrepreneurship suggests deepening research on the contexts surrounding female entrepreneurs and how these contexts influence the performance of their businesses (Adom *et al.*, 2018; Kim *et al.*, 2020). So, it seems essential to study the role of the cultural context and social environments in the business environment (Laskovaia *et al.*, 2017) by mainly focusing on women and the performance of their businesses (Corrêa *et al.*, 2022).

The GUESSS study (2021) indicates that active entrepreneurship comprises around 10.8% of the university population, with approximately 2.6% corresponding to women already in charge of their businesses. This group shows a promising level of performance; almost 36% of these ventures obtain a rating above 5 on a scale of 1 to 7. Despite these positive results, a gender gap persists with noticeable differences among countries. This issue requires focused attention (Romaní *et al.*, 2021).

As far as we have been able to investigate, the literature needs to include specific studies about the active entrepreneurship of university women (AEWUS), most significantly from the perspective of cognitive variables such as vigor and affective commitment or contextual variables such as social and university environments. Therefore, this study seeks to answer the following research questions: how does the interaction between vigor and affective commitment affect the performance of companies created by women university entrepreneurs? Moreover, how do the social and university environments influence this relationship?

This issue is particularly relevant for universities and actors in the academic sector supporting entrepreneurship in its advanced stages and for those governmental agencies and institutions that consider entrepreneurship as an alternative to development and self-employment. Therefore, this study aims to provide knowledge and understanding of the performance of female university entrepreneurs and their link to cognition and context.

The document is structured as follows. Section 2 presents the arguments that support the study and proposed hypotheses. Section 3 contains a description of the empirical method. Section 4 presents the results, and the final section synthesizes and discusses the main findings and describes their practical implications and future lines of research.

2. THEORETICAL BACKGROUND AND HYPOTHESES

The theory of planned behavior states that behavior is preceded by one's predisposition to carry out such behavior (Ajzen, 1991). This theory can help understand how internal and external factors influence female entrepreneurship and how to promote a more favorable environment for it.

Authors such as Lerner *et al.* (1997) have mentioned how environmental factors affect performance and how environmental motivations are strongly related, particularly in female entrepreneurship. The present study also analyses the relationship between the performance of university women in entrepreneurship and two cognitive variables, vigor and affective commitment, and two contextual variables, the social environment, and the university environment.

2.1. Vigor, affective commitment and performance

Vigor is defined by Ryan and Frederick (1997) as a positive feeling of vitality and energy, often associated with self-motivation; this term has been associated with well-being derived from a psychological effect of one's available energy and feeling good (Bostic *et al.*, 2000), which can vary due to internal or external individual conditions (Wiklund *et al.*, 2019).

Shir *et al.* study (2019) showed that active engagement in entrepreneurial tasks is associated with feeling good. They also link feeling good with vigor in entrepreneurship, showing that higher levels of well-being are more frequent in entrepreneurs than in employees. Associated with the above, Shirom (2011) proposed that vigor has positive consequences for individuals and organizations and is related to job satisfaction, organizational commitment, and job performance. When referring to affective commitment, for Bowlby (1979), attachment behaviors are instinctive and will be activated by any condition that may threaten the achievement of proximity at the business level; entrepreneurs, for example, usually show intense commitment and dedication to maintaining that relationship.

For Lahti *et al.* (2019), the emotional ties of founding entrepreneurs toward their ventures are surprisingly similar to the emotional ties of parents toward their children. Using neuroimaging techniques, researchers discovered neural correlations between company and parental attachment. This finding suggests that entrepreneurs may establish a similar emotional bond with their company and children, influencing their emotional commitment to the business.

Added to the above, Dawson *et al.* (2014) considered that affectively committed entrepreneurs assume behaviors and make decisions that positively impact the performance of their family businesses. Their study focuses on members of the next generation in family businesses and examines the consequences of commitment to the family business. The authors found that the affective commitment of members of the next generation is positively associated with favorable behavioral outcomes, such as job satisfaction, performance, and intention to remain in the family business.

Referring to the relationship between vigor and affective commitment, studies such as that of Hemsworth *et al.* (2020), whose purpose was to examine the impact of different levels of personal energy on the well-being of nurses, found that a solid and positive relationship between vigor and the affective commitment of employees is related to greater productivity, performance, and the quality of work and life. Their study demonstrates the positive relationship between vigor and affective commitment, well-being, and personal performance.

Studying the combined aspect of the interaction between vigor and affective commitment is relevant to understanding how these factors interact in performance as variables that contribute to each other (Puspitasari *et al.*, 2023). In this relationship, the literature has shown that vigor, a component of positive psychological capital, positively affects work performance and is linked to affective commitment (Sari *et al.*, 2023). Studying their combined impact is essential to understanding the psychological and emotional factors that drive entrepreneurial success (Budiningsih *et al.*, 2018; Tasnim *et al.*, 2014). Likewise, Kundi *et al.* (2021) investigated the mediating role of affective commitment between well-being and job performance, concluding that affective commitment and well-being can be very advantageous for the results of an organization since it generates security in the employees, improves performance, and promotes work-related attitudes and behaviors. The above suggests that the relationship between affective commitment and vigor impacts ventures' performance equally.

The previous arguments allow us to postulate that:

H1: The interaction between vigor and affective commitment is positively related to female university students' active entrepreneurship performance.

2.2. The moderating role of the university environment

The literature has mentioned that universities can encourage people's decisions to pursue an entrepreneurial career (Bergmann *et al.*, 2016; Ramos-Rodríguez *et al.*, 2019). Furthermore, the literature has highlighted the concept of the entrepreneurial university (Forliano *et al.*, 2021; Hayter *et al.*, 2018; Schmitz *et al.*, 2017) as a valuable source of resources for university ventures ranging from the accumulation of knowledge reservoirs, support infrastructure, opportunities to access contact networks and social capital (Bergmann *et al.*, 2016; Morris *et al.*, 2017).

The literature also mentioned that the university environment determines students' interactions based on their practices, policies, and behaviors (Castillo *et al.*, 2006). Previous studies have been emphatic about the influence of the university environment on entrepreneurship and the environmental factors associated with this environment (Shirokova *et al.*, 2016; Víquez *et al.*, 2022). For example, it is mentioned that this environment enhances the role of university graduates as founders of innovative companies (Franke & Lüthje, 2004) and often enhances the knowledge and skills of students in favor of entrepreneurship and the sustainability and performance of their venture (Jones, 2022; Orobia *et al.*, 2020; Robinson & Sexton, 1994).

Various studies have shown that inducers such as the university context and the development of behaviors and decision-making to establish one's own business can encourage entrepreneurship and impact its performance (Bergmann *et al.*, 2016; Holienka *et al.*, 2017). Studies about the university environment demonstrate the more significant value female students give to the university contexts (Díaz Bretones & Radrigán, 2018; Wilson *et al.*, 2007) since they feel more confident having training and the support of the university.

All the above leads us to hypothesize that:

H2: The university environment moderates the positive relationship between vigor and affective commitment and female university students' active entrepreneurship performance.

2.3. The moderating role of the social environment

The social environment is determined by the relationships between the physical, natural, social, and cultural aspects surrounding an individual and their interaction with others (Barnett & Casper, 2001). Liñán and Chen (2009) have stated that entrepreneurship is conditioned and favored by the social environment; the more the social environment favors entrepreneurship, the better entrepreneurship is carried out.

It has been mentioned that good knowledge of this environment guides people, their skills, and abilities to carry out a business with greater business efficiency (Păunescu *et al.*, 2018). Particularly in the case of women, it is suggested that feeling integrated into the social context and the strength of a woman's relationships help women confront gender structures, entrepreneurship, and challenges and favor the performance of their entrepreneurship. The above strengthens the process of making suitable entrepreneurs, building relationships, and changing processes favoring entrepreneurship (Roos, 2019).

Regarding vigor and performance moderated by a social environment, Obschonka *et al.* (2015) reveal that the local culture (which is part of the social environment) alone is not responsible for business vitality and its contribution to the economy of a region; it rather depends on the interaction between culture and the creation of knowledge by entrepreneurs. The study, therefore, suggests that local culture provides a specific cultural environment. However, entrepreneurs' ability to har-

ness and combine that cultural knowledge with their knowledge creation drives business vitality and economic contribution in a region.

Moreover, recent studies have shown that the social environment is related to vigor and entrepreneurial spirit (Stephan *et al.*, 2020) since it shapes the entrepreneur's experience and meaning, his work autonomy, and, indirectly, subjective vitality. Studies suggest that the social environment plays a fundamental role in entrepreneurship since social support and resources are key factors that can energize and enable entrepreneurship, positively impacting the well-being of individuals involved in business activities.

All the above leads us to postulate our third hypothesis:

H3: The social environment moderates the positive relationship between vigor and affective commitment and female university students' active entrepreneurship performance.

Figure 1 shows the study model.

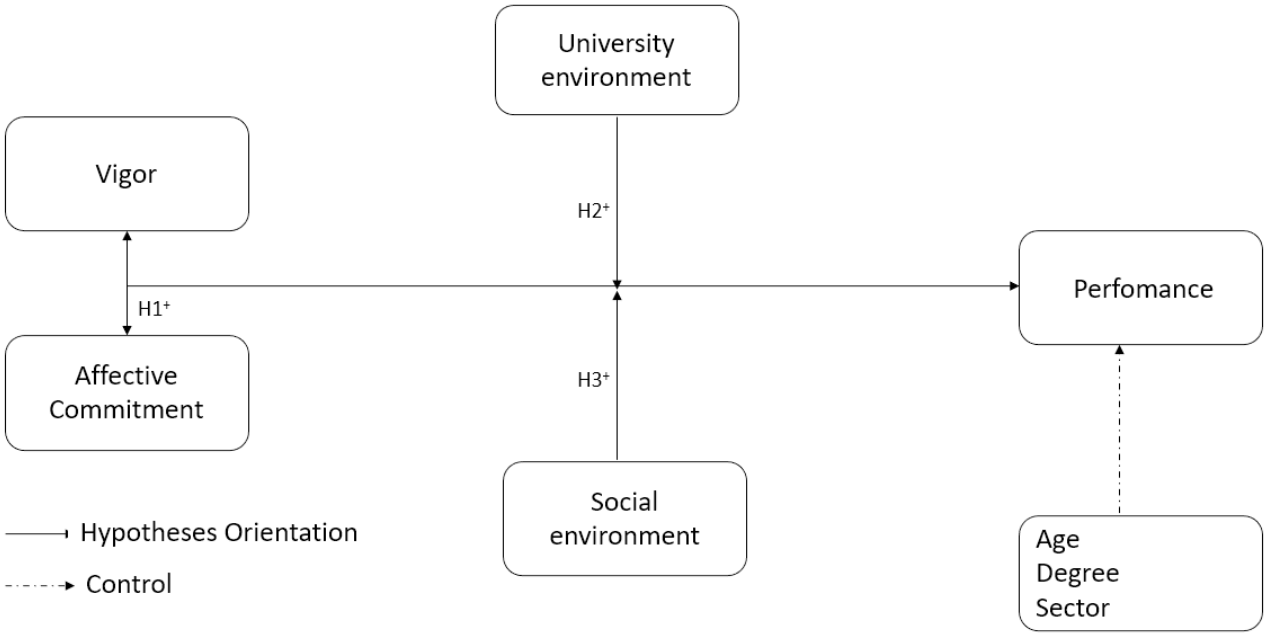

Figure 1
Proposed theoretical research model
Source: Own elaboration based on the theoretical framework.

3. SAMPLE, DEFINITION OF VARIABLES AND METHOD

3.1. Sample

This study utilizes data from the 2018 Global University Entrepreneurial Spirit Students' Survey (GUESSS) data wave. GUESSS is part of an international research project aiming to unveil insights into student entrepreneurship worldwide through regular surveys across numerous countries. Enabled by a centralized online platform, it facilitates comprehensive cross-country comparisons and in-depth analyses (see www.guesssurvey.org/goals/). Each team from participating international universities strives to maximize student participation in completing the online questionnaire provided by the central GUESSS team. While not necessarily a random sampling strategy, a specific sample of active startup founders was selected based on Politis *et al.* (2012), illustrating the heterogeneity of student data by comparing causal and effectual logics. Additionally, as described by Dillman *et al.* (2009), an online survey method is suitable for reaching students from various universities in different countries.

Due to our interest in active university entrepreneurs, we only used those respondents who ran their businesses or were already self-employed. Thus, the subset of data resulted in a sample of 6779 entrepreneurial university students based on the variables of interest in this study. Several works focusing on the study of active entrepreneurs have used GUESSS data (Bergmann *et al.*, 2016; Braun & Sieger, 2021; Hahn, 2020; Holienka *et al.*, 2017; Laskovaia *et al.*, 2017).

For this final sample, university women show an age range between 21 and 64 years, with an average age of 31 (SD = 7.93). The students come mainly from majors related to Computer Science/IT (29.81%), followed by Business Administration (14.43%). The sample represents 39 countries (Appendix 1) and includes countries with a sample of greater than ten observations (Shirokova *et al.*, 2021). The average age of the companies is 11 years (DS = 12), 31% are companies in the Advertising / Design / Marketing and Trade (wholesale/retail) sectors, and 54% have from 0 to 2 employees.

3.2. Variables

A. Dependent variable

Company performance was measured using the Dess and Robinson (1984) and Eddleston *et al.* (2008) scales used by

GUESSS. The latter measures firm performance through five items on a 7-point Likert scale (1 = much worse, 7 = much better), where the variable is measured based on the venture's performance compared to its competitors concerning sales, market share, profits, job creation, and innovation.

It is essential to note that, as highlighted by Camisón and Villar-López (2014), supported by other authors (Dess & Robinson, 1984; Homburg *et al.*, 1999; Venkatraman & Ramanujan, 1987), the existing literature advocates for the utilization of diverse performance metrics, primarily distinguished by their objective or subjective nature. While it is often assumed that objective measurements possess superior validity compared to subjective ones, previous studies consistently demonstrate in the literature a strong correlation and concurrent validity between both types of measurements.

Additionally, the validity of employing this scale stems from its attributes. For instance, Dijkhuizen *et al.* (2018) forecasted personal success perceptions, highlighting the validity of assessing performance through personal perceptions in companies. This notion is further supported by Wach *et al.* (2020), who argue that entrepreneurs' success ought to be gauged via personal perceptions, as they value subjective indicators like personal fulfillment and community impact, not solely financial performance. This comprehensive approach enhances the comprehension of overall performance, extending beyond traditional company growth metrics, as discussed by Kiyabo and Isaga (2020).

B. Independent variables

The independent variable subjective vitality (vigor) is measured with Bostic *et al.* (2000) scale, also used in Hahn *et al.* (2012) as used by the GUESSS study, through six items on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree), associated with expressions of vitality, for example, *I feel alive and vital, and I nearly always feel awake and alert.*

As in the GUESSS study, Dawson *et al.* (2014) scale was used to measure affective commitment through three items on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree), with expressions associated with the level of significance of the business for the entrepreneur such as, *I feel like if my business's problems are my own, and My business has great personal meaning for me.*

C. Moderating variables

In this study, we included well-established scales used in GUESSS that have also been used in prior research. First, we utilized the scale introduced by Franke and Lüthje (2004), further adapted by Geißler (2013). This scale evaluates the university environment using three items measured on a 7-point Likert scale (ranging from 1 = not at all to 7 = very much). These items encapsulate expressions closely tied to the university environment and its conductive conditions for fostering entrepreneurship.

Second, to capture the social environment variable, we used the scale developed by Liñán and Chen (2009), following the methodology of the GUESSS study. This variable assesses individuals' perceptions of how their close family, friends, and fellow students would react if they were to pursue a career as an entrepreneur. Respondents provided their responses on a 7-point Likert scale, ranging from 1 (very negatively) to 7 (very positively).

D. Control

As control measures, we consider the age of the student (Gimenez-Jimenez *et al.*, 2020; Hahn, 2020; Laskovaia *et al.*, 2017; Liñán & Chen, 2009; Maresch *et al.*, 2016; Silva *et al.*, 2021) the sector of activity (Laskovaia *et al.*, 2017) and the type of career (Criaco *et al.*, 2017). These variables have been widely used in the literature and will contribute to outlining the profile of active female entrepreneurship. These control variables are chosen based on the substantial relationships between the independent and dependent variables, as discussed in the entrepreneurship literature. Specifically, the literature has highlighted the importance and influence of age (Prasad *et al.*, 2015), the choice of university major (Mahmood *et al.*, 2021; Wadhwa *et al.*, 2008), and the sector in which the entrepreneurial activity takes place (Kosa *et al.*, 2018; McDougall *et al.*, 1994) on the performance of entrepreneurship.

E. Data processing

Before exploring our hypotheses, we followed a rigorous methodological approach to ensure the reliability and validity of the scales and constructs used in our study. First, we carried out a confirmatory factor analysis (Hair *et al.* 2019) to evaluate the internal consistency of our measurements and to identify the convergence of variables in different countries, following previous practices (Lafuente *et al.*, 2010). It is worth mentioning that the analysis was carried out through the STATA Statistical package software, version 17, following the process suggested by Acock (2013). All model variables are reliable and acceptable.

In the second phase, we calculated the intraclass correlation coefficient (ICC), a key metric to determine the proportion of total variability of the dependent variable attributed to variability between groups (in this case, countries). The resulting coefficient was calculated at 0.13, exceeding the commonly accepted threshold of 0.15 (Hox, 2010). This observation suggests that there is adequate variability between groups to justify the implementation of a multilevel model. In this case the ICC level is close to 0.15, within the moderate rating range.

Subsequently, we applied a multilevel analysis following the methodology that Acock (2014) and Rabe-Hesketh and Skrondal (2012) proposed. This approach has been used in related research (Shirokova *et al.*, 2021; Wales *et al.*, 2021). Given the number of interaction terms in our model estimates, we prioritized consideration of the independent variables before calculating the product terms.

Active entrepreneur students are nested within countries; thus, the proposed hierarchical multilevel regression model (estimated via OLS) had the following notation (Snijders & Bosker, 1999):

$$Y_{ij} = \beta_{oj} + \beta_{kij}{}^{*}X_{kij} + \beta_{5ij}{}^{*}(X_{1ij}{}^{*}X_{2ij}) + \beta_{6ij}{}^{*}(X_{1ij}{}^{*}X_{3ij}{}^{*}X_{4ij}) + \\ + \beta_{7ij}{}^{*}(X_{2ij}{}^{*}X_{3ij}{}^{*}X_{4ij}) + \beta_{mij}{}^{*}C_{mij} + eij; \quad (1)$$

where i = 1, …., Nj; j = 1, …, J; k = 1, 2, 3, 4; m = 8, 9, 10

In equation (1), β_{oj} is the intercept for the dependent variable in group j (country's subscript j = 1, ..., J), βkj represents the regression coefficient estimated for the k-th predictor variable, Xkij denotes the k-th predictor variable (X_1 = Vigor, X_2 = Affective Commitment, X_3 = University Environment, and X_4 = Social Environment), β_{5ij} indicates the regression coefficient for the two-way interaction among predictors X_1 and X_2; β_{6ij} designates the regression coefficient for the triple-way interaction among predictors X_3, X_1 and X_2; β_{7ij} denotes the regression coefficient for the triple-way interaction among predictors X_4, X_1 and X_2; β_{mij} designates the regression coefficient for m-th control variable, eij is the residual error term estimated for each sampled individual in j-th country, and assumed to have a mean of 0 and a variance to be estimated; and Y_{oj} represents firm´s performance for the i-th active entrepreneur student in his/her j-th country (the subscript i is used for individual active entrepreneur students in each j-th country; j = 1, ..., 39).

The β_{oj} and β_{kj} change if the intercept and the regression coefficients vary across countries.

$$\beta_{oj} = \Upsilon_{oo} + \mu_{oj} \text{ (level 2 equation)} \quad (2)$$

$$\beta_{kj} = \Upsilon_{ko} + \Upsilon_{6o} + \Upsilon_{7o} + \Upsilon_{mo} + \mu_{kj} \text{ (level 2 equation)} \quad (3)$$

Regarding equation (2), Υ_{oo} represents the overall intercept, that is, the grand mean of the dependent variable scores across all groups when all predictors equal 0, and μ_{oj} denotes the random error component for the deviation of the intercept of a group from the overall intercept. On the other hand, in equation (3), Υ_{ko}, Υ_{6o}, Υ_{7o}, Υ_{mo} represents the overall regression coefficient for the relationship between a k-th, 6, 7, and m-th level 1 predictor and the dependent variable, and μ_{kj} is the error component for the slope, which is the deviation of the group slope from the overall slope.

We generated four models to evaluate our hypotheses. Model 1 examines the effects of the control variables on the dependent variable. Model 2 adds the independent variables to the previous model. Model 3 incorporates a two-way interaction; finally, Model 4 adds the effects of the three-way interactions. The results of these models will provide crucial information to support or refute our hypotheses.

4. RESULTS AND DISCUSSION

4.1. Correlation between Variables and Results of Multilevel Analysis

Table 1 presents the correlations between the variables studied, showing low and moderate correlations. The results derived from the multilevel analysis and their corresponding models are detailed in Table 2. This comprehensive analysis provides a deeper understanding of the relationships between the variables and their implications in the context of our study.

Regarding the control variables, throughout the models, it is possible to observe that the age variable is positively associated with the performance of female entrepreneurship ($\beta 1$ = 0.007, $p < 0.01$), while the choice of career and sector did not prove to be determining variables.

The subsequent Model 2 explored the positive relationship between vigor, affective commitment, and business performance. Both factors positively impact company performance ($\beta 4$ = 0.311, $p < 0.01$ and $\beta 5$ = 0.151, $p < 0.01$). This positive association persists throughout subsequent models.

4.2. Exploring Interactions in Successive Models

In Model 3, interaction terms were introduced between vigor, affective commitment, and business performance. The results revealed that the interaction between vigor and affective commitment is positively related to the performance of companies led by female university entrepreneurs ($\beta 6$ = 0.49; $p < 0.01$), supporting hypothesis *H1*.

To facilitate the understanding of the interaction effect, we have generated Figure 2. According to Figure 2, the double interaction reveals a significant pattern. Those entrepreneurs with a high level of vigor present a notably higher performance, which supports a direct and statistically solid relationship between this cognitive variable and performance. In contrast, this relationship is practically nonexistent in those entrepreneurs with a low level of vigor. Therefore, this result supports *H1*, which postulates that the interaction between vigor and affective commitment is positively correlated to performance in active entrepreneurship of female university students.

Model 4 expanded the exploration to interaction terms by incorporating the university and social environment as moderators.

In the case of the university environment, the results indicated that this interaction is positive concerning the joint impact of vigor and affective commitment on the performance of companies created by university women entrepreneurs ($\beta 7$ = 0.038). This finding means that the university environment effectively moderates the relationship between the cognitive variables under study and performance. This effect is intensified in students who experience more significant support from this environment, while it is attenuated when the university environment does not exert this moderation. Therefore, the analysis provides empirical support for hypothesis *H2*. Figure 3 facilitates the understanding of the interaction effect.

Similarly, we found a positive moderation of the social environment between vigor and affective commitment and the performance of these companies ($\beta 8$ = 0.015; $p < 0.1$). That is, when considering the effect of the three-way interaction between vigor, affective commitment, and the social environment with performance, the moderation exerted by the social environment stands out. The above allows us to confirm hypothesis *H3*. To facilitate the understanding of the interaction effect, we have generated Figure 4. According to Figure 4, performance is higher when the moderation of the social environment is high compared to when it is low, but only when both the level of vigor and emotional commitment are high. Therefore, this result supports that the social environment positively influences performance, but only when combined with significant levels of vigor and affective commitment.

Table 1
Descriptive Statistics and Correlations between variables, N = 6779

Variable	Obs	Mean	Std. Dev.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Age	6779	1991.940	7.924	1959	2002	1.000							
(2) Degree	6779	5.014	3.175	1	12	−0.044***	1.000						
(3) Sector	6779	7.720	4.373	1	13	0.001*	0.012*	1.000					
(4) Vigor	6779	0	1	−3.529	1.232	−0019*	−0.084***	−0.076***	1.000				
(5) Affective Commitment	6779	0	1	−3.504	1.108	−0.072***	−0.084***	−0.063***	0.491***	1.000			
(6) University environment	6779	0	.999	−2.221	1.220	0.047***	−0.125***	−0.118***	0.388***	0.269***	1.000		
(7) Social environment	6779	.001	1	−4.236	1.002	0.003*	−0.021*	0.059***	0.309***	0.235***	0.279***	1.000	
(8) Performance	6779	−.001	1.001	−2.710	1.382	0.086***	−0.097***	−0.072***	0.442***	0.346***	0.319***	0.205***	1.000

Note: Results of descriptive data and correlations of the variables. The variables show low and moderate associations. They are statistically significant. Significance level *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Source: Research data; generated using STATA.

Table 2
Results of multilevel analysis, N = 6779

	Model 1	Model 2	Model 3	Model 4
Control Variables				
Age	.001	.007***	.007***	.007***
Degree	−.011***	−.004	−.004	−.004
Sector	.002	.003	.003	.003
Independent Variables				
Vigor		.311***	.339***	.327***
Affective Commitment		.151***	.159***	.142***
Double interactions				
c.Vigor#c. Affective Commitment			.049***	.068***
c. University environment#c.Vigor			.036*	.044**
c. University environment#c. Affective Commitment			−.012	0
c. Social environment#c.Vigor			.016	.022*
c. Social environment#c. Affective Commitment			−.017	-.005
Triple interactions				
c. University environment#c.Vigor#c. Affective Commitment				.038
c. Social environment#c.Vigor#c. Affective Commitment				.015*
Log likelihood	−9106.8395	−8476.0833	−8450.4489	−8428.9665
Wald test (Chi-square)	13.64	212.80	299.44	856.86
Number of obs	6753	6753	6753	6753
Number of countries	39	39	39	39

Note: This table shows the multilevel analysis results and their corresponding models. Level of significance: *** p<0.01, ** p<0.05, * p<0.1

Source: Own analysis based on data run in STATA.

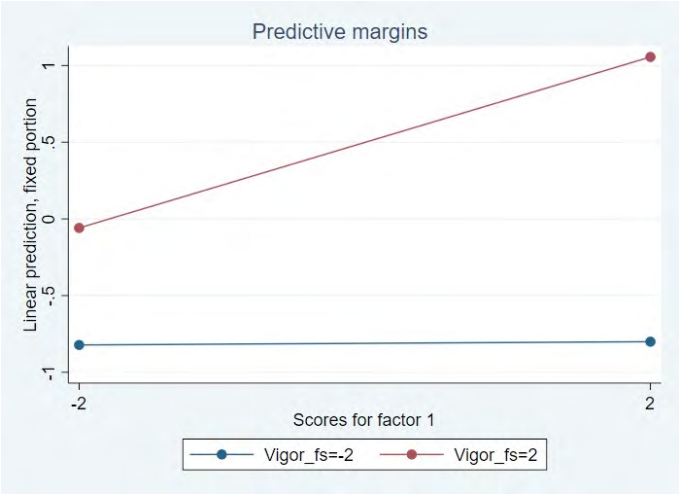

Figure 2
Effect of the double interaction between Vigor and Affective Commitment with Performance

Note: This figure shows the effect of the two-way interaction between Vigor and Affective with performance.

Source: Research data; generated using STATA.

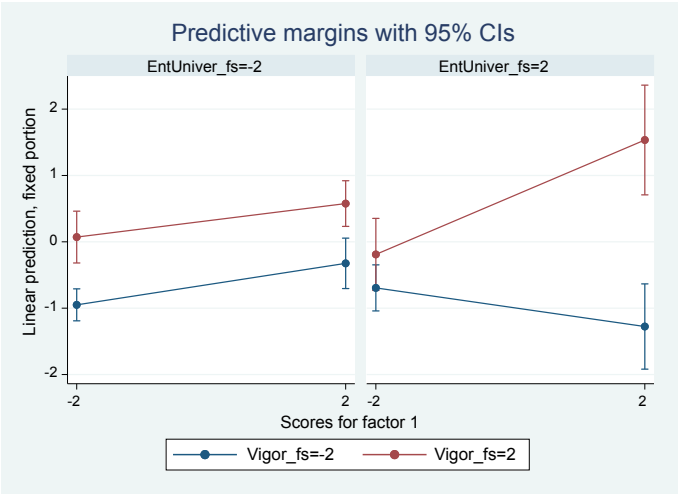

Figure 3
Effect of the triple interaction of the independent variables with the dependent variable when moderated by the university environment

Note: This figure shows the effect of the three-way interaction of the independent variables with the dependent variable when moderated by the university environment.

Source: Research data; generated using STATA.

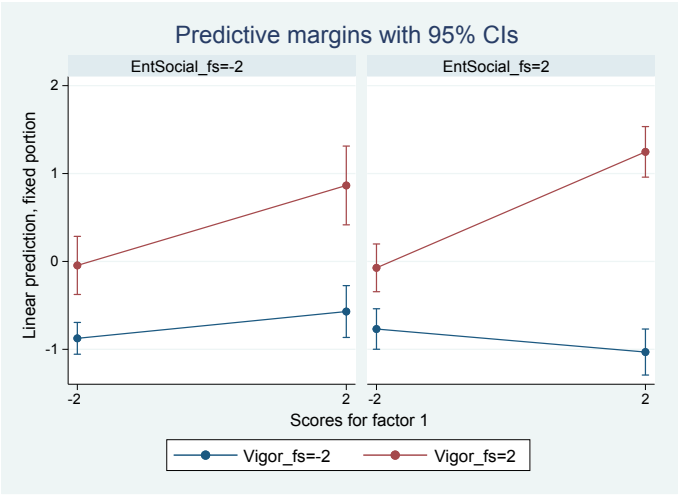

Figure 4
Effect of the triple interaction of the independent variables with the dependent variable when it moderates the social environment

Note: This figure shows the effect of the three-way interaction of the independent variables with the dependent variable when moderated by the social environment.

Source: Own analysis based on data run in STATA.

Our findings contribute to a deeper understanding of the link between cognitive and contextual factors and the performance of university female entrepreneurship. First, we contribute to the existing body of knowledge by highlighting the importance of the interaction of management styles, specifically vigor and affective commitment, as critical factors in entrepreneurial success. This interaction positively impacts business performance, a relationship that had already been hinted at in previous research unrelated to entrepreneurship (Hemsworth *et al.*, 2020; Kundi *et al.*, 2021). We must emphasize that the literature has shown how combining these variables contributes to understanding the psychological and emotional factors that drive business performance (Budiningsih *et al.* 2018; Tasnim *et al.*, 2014).

Secondly, regarding the influence of contextual factors, we have added to the existing literature by identifying the university environment as a variable that can enhance the knowledge and skills of students in favor of entrepreneurship and their performance (Orobia *et al.*, 2020; Robinson & Sexton, 1994). Likewise, the university environment can encourage entrepreneurship and impact its performance (Bergmann *et al.*, 2016; Holienka *et al.*, 2017) and has been positively valued by women (Díaz Bretones & Radrigán, 2018; Wilson *et al.*, 2007).

The moderation of the social environment in the effect of the interaction between vigor and affective commitment, positively related to the performance of companies created by female university entrepreneurs, is significant and greater than the moderation of the university environment. This finding highlights the importance of this environment as it can have a significant impact on female entrepreneurship, as mentioned by Păunescu *et al.* (2018), in the case of women, this environment allows them to face the challenges towards the best performance of their entrepreneurship.

This underlines the need to continue promoting the participation of this environment in the academic sphere, especially in promoting relationships with family, friends, and university colleagues, as suggested in previous studies, such as Liñán and Chen (2009) who have stated that entrepreneurship is conditioned and favored by the social environment; since its influence makes it carried out in a better way. These findings support the notion that the performance of female entrepreneurs is positively affected when they have a favorable social environment, as has been observed in previous research (Liñán & Chen, 2009; Roos, 2019; Stephan *et al.*, 2020).

5. CONCLUSIONS

This study aimed to analyze AEWUS's performance from the perspective of cognitive variables such as vigor and affective commitment and contextual variables such as the social and university environment. To address the above, we conducted a multilevel regression analysis. The results revealed significant findings that contributed to our understanding of entrepreneurship in this demographic group.

The study's findings show a significant influence of the cognitive factors under study (vigor and affective commitment) on the performance of female university entrepreneurship. This result is consistent with what previous literature has emphasized: this interaction improves business performance (Budiningsih *et al.*, 2018; Hemsworth *et al.*, 2020; Kundi *et al.*, 2021; Tasnim *et al.*, 2014).

This influence remains significant when these cognitive variables interact with each other. Furthermore, the results indicate that when the university environment moderates this relationship, entrepreneurship performance is better, as is the case of the social environment; this has a more significant impact on the relationship between the interaction of vigor and affective commitment and the business performance of women's businesses, conclusion that is reinforced by previous studies (Stephan *et al.*, 2020).

Our findings significantly support the need to promote the link between cognitive and contextual factors and the performance of university female entrepreneurship. This finding demonstrates the need to care for and promote cognitive and contextual links that would translate into more favorable results for business performance, conclusion that preceded by what was suggested in Hemsworth *et al.* (2020).

The results of this study have important theoretical implications that can enrich the understanding of the relationships between the variables studied and contribute to the existing body of knowledge. First, the results support the importance of vigor, which includes energy and enthusiasm, as essential for entrepreneurial success, coincident with Shir *et al.* (2019), driving motivation and performance in entrepreneurship. The same is true for affective commitment, as the entrepreneurs reflect a deep personal connection to the business, a passion for solving problems, and a lasting meaning in their careers, lined with Dawson *et al.* (2014). This result strengthens the theory of entrepreneurial behavior by highlighting the relevance of psychological and emotional aspects in the entrepreneurial process of university women.

As a second theoretical implication, the theories related to female entrepreneurship are enriched when considering the importance of individual factors in women's business success. Finally, confirming the interactions between vigor, affective commitment, and the university and social environment suggests the need for a more elaborate theory on interactions in the business context.

This study also has several practical implications for universities. Firstly, in terms of public policy, guide support for female entrepreneurship from the social environment can be proposed to understand and promote initiatives that strengthen this environment. Specific actions can be considered, such as support for university students through support programs that include the accompaniment of mentors, institutional actions, specific support policies for networks, financial support, and capacity building.

Secondly, it is relevant for the social actors in the university ecosystem to promote support and accompaniment to current entrepreneurs' actions. Links between graduates who have been successful in entrepreneurship and support networks fostered and organized from within the university can create the exchange of experiences, support between ventures, and support networks, among others.

Specifically, it is suggested that both the university and social environments consider enhancements to better support female entrepreneurship. These include: providing opportunities for experiential learning such as internships and research projects focusing on entrepreneurship, establishing support networks among students, faculty, and entrepreneurs to foster the exchange of experiences and knowledge, hosting networking events for student entrepreneurs to connect with business owners, investors, and industry experts, promoting the formation of support networks to bolster student entrepreneurs' projects, facilitating connections between students and the local business community to receive feedback on their projects and access collaboration opportunities, among other initiatives.

As a limitation, this study focuses only on two cognitive and two contextual factors; future studies could emphasize other contextual factors, such as governmental and cultural ties. Additionally, it is advisable to study the links in depth through case studies to delve deeper into the elements that influence each link and the recommendations that can emerge from experienced active entrepreneurs. Moreover, a longitudinal approach could allow for a more detailed analysis of how these relationships evolve as entrepreneurs advance in their trajectories. Finally, a potential avenue for future research is to explore how cultural factors, varying by country or geographic region, affect the interplay between cognitive and contextual variables and the business performance of university students, particularly in the realm of female entrepreneurship. Such investigation would enable us to pinpoint and analyze disparities and parallels in each country's cultural, economic, and educational contexts and their implications for the entrepreneurial success of university women.

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APPENDIX

Table A.1
Detail of the study sub-sample taken from GUESSS 2018

Country	Sample	Total Answer Percentage
Albania	20	0,30%
Argentina	238	3,51%
Austria	30	0,44%
Chile	346	5,10%
China	1440	21,24%
Colombia	772	11,39%
Costa Rica	292	4,31%
Czechia	38	0,56%
Ecuador	188	2,77%
England	49	0,72%
El Salvador	11	0,16%
Estonia	85	1,25%
France	101	1,49%
Germany	32	0,47%
Greece	193	2,85%
Hungary	142	2,09%
Indonesia	17	0,25%
Ireland	123	1,81%
Japan	74	1,09%
Jordan	99	1,46%
Korea	17	0,25%
Liechtenstein	43	0,63%
Lithuania	228	3,36%
RepNorthMaced	59	0,87%
Mexico	33	0,49%
New Zealand	153	2,26%
Pakistan	10	0,15%
Panama	50	0,74%
Peru	15	0,22%
Poland	78	1,15%
Portugal	87	1,28%
Saudi Arabia	99	1,46%
Slovakia	161	2,37%
Slovenia	550	8,11%
South Africa	67	0,99%
Switzerland	16	0,24%
Turkey	19	0,28%
Ukraine	13	0,19%
Total	6779	100,00%

Note: Sample distribution by country; it shows the number answers, the answer percentage value.

Source: Based on Sieger *et al.* (2018).

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CSR in Times of Crisis According to ESG Indicators in Europe: Analysis of the Impact of COVID-19

La RSC en tiempos de crisis según los indicadores ASG en Europa: análisis del impacto del COVID-19[1]

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ABSTRACT

We live in a globalised world, characterised in recent times by events that have led to crises of international and global scope, in which companies have played a leading role. These circumstances have created a unique opportunity to study how Corporate Social Responsibility (CSR) varies as companies adapt to this new environment. A key example of this is the situation resulting from the COVID-19 pandemic. This health crisis has obliged companies to adopt new management guidelines to adapt to the difficult conditions of this setting and be able to survive in this "new normal". Thus, it will be interesting to know whether the impact of this global health crisis, which hit countries differently, has affected companies' environmental, social and governance (ESG) indicators. Using a large sample of companies from European Union (EU) countries, the results confirm that corporate engagement in CSR increased during the pandemic (2020-2022) compared to the previous period (2017-2019). Additionally, the results of this study confirm that the intensity of the impact of this crisis improves the companies' ESG indicators. From a practical standpoint, it is possible to establish certain political and management implications based on our findings and use them to plan possible strategies for potential future crises.

Keywords: Covid-19, CSR, ESG, Environmental, Social, Governance.

RESUMEN

Vivimos en un mundo globalizado caracterizado en los últimos tiempos por acontecimientos que han derivado en crisis de alcance internacional y mundial, en las que las empresas juegan un papel protagonista. Estas circunstancias crean una oportunidad única para estudiar cómo varía la responsabilidad social corporativa (RSC) al adaptarse las compañías al nuevo entorno, siendo un buen ejemplo al respecto el relacionado con la situación derivada del Covid-19. Esta crisis sanitaria provocó que las empresas se vieran obligadas a adoptar nuevas pautas de gestión para adaptarse a las difíciles condiciones del entorno y poder sobrevivir en esa «nueva normalidad». Así, será interesante saber si el impacto de esta crisis, que fue desigual entre países, afecta a los indicadores ambientales, sociales y de gobierno (ASG) de las compañías. Utilizando una amplia muestra de empresas de los países de la Unión Europa (UE), los resultados confirman que el compromiso empresarial en materia de RSC aumentó en el periodo de la pandemia (2020-2022) con respecto al periodo previo (2017-2019). Adicionalmente, los resultados de este estudio confirman que la intensidad del impacto de dicha crisis hace que mejoren los indicadores ASG. Desde un punto de vista práctico, es posible establecer ciertas implicaciones a nivel político y de gestión a partir de nuestros resultados y aprovecharlos para planificar posibles actuaciones frente a potenciales crisis futuras.

Palabras clave: COVID-19, CSR, ASG, Environmental, Social, Governance.

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1. INTRODUCTION

Worldwide crises are worth studying in depth due to their significance in the economic and business context. For example, the recent COVID-19 pandemic rapidly impacted daily life and business and interrupted commerce and the movement of goods and people for some time. This pandemic affected, to a greater or lesser degree, all the countries in the world, with many people infected and many deaths. This was accompanied by great social, financial and educational disorder, among other effects (Akrofi & Antwi, 2020). The number of infected people in Europe by the end of 2022 reached nearly 270 million (World Health Organization [WHO], 2023). Although in countries that enacted strict social distancing rules and restricted movement from the beginning of the pandemic the number of people infected was relatively low, in others, much higher numbers were observed, with differing recuperation horizons (Barmparis & Tsironis, 2020).

This health crisis has obliged companies to adopt new management guidelines to adapt to the difficult conditions of this setting and be able to survive in this "new normal" (Carracedo *et al.*, 2021). The COVID-19 crisis has had adverse effects on organisations, such as falling sales (Meyer *et al.*, 2022; Purwanto *et al.*, 2020), loss of employment or pay cuts, reduced productivity and business closings, and these adverse effects have had different repercussions in different sectors (Carroll, 2021). However, it has also brought some positive changes, like implementing innovative activities resulting in new products and services (Amoah *et al.*, 2021) and improvements in environmental, social and governance aspects, as will be discussed in this study. In general, worldwide crises, such as the COVID-19 pandemic, demonstrate the need for companies to initiate new ways of acting to improve citizens' quality of life (Purwanto *et al.*, 2020).

Another current topic is corporate social responsibility (CSR) since it has long been evident that the shift in citizens' value systems has resulted in increased concern about social and environmental issues (Nieto & Fernández Gago, 2004). The use of environmental, social and governance indicators (ESG) is crucial to determine whether a company stands out in these areas, as this is relevant information for sustainability reports and gaining investors' trust (Ferrell, 2021; Li & Mei, 2021), in addition to having a positive impact on company value (Wong *et al.*, 2021). Integrating ESG factors can improve long-term performance for investors, who increasingly demand these factors (Delgado-Ceballos *et al.*, 2023). This is due to the fact that ESG performance may affect the relationship between sustainable investment and financial performance, which is the principal objective of companies (Khan *et al.*, 2016; Kocmanova *et al.*, 2012). Various articles (Costa *et al.*, 2022; Park *et al.*, 2023) contend that CSR and ESG are different but complementary concepts since both involve considering the impact of business decisions on society and the environment. CSR aims to hold firms accountable for more than just complying with their legal obligations. It intends to have a positive impact on society and the environment. Meanwhile, the ESG criteria permit the efforts made in these areas to be measured (Barko *et al.*, 2022).

With the spread of global health crises, such as COVID-19, great concern about environmental, social and governance problems has arisen. Broadstock *et al.* (2021) analyse the link between the role of performance in ESG and the COVID-19 pandemic, and they conclude that portfolios high in ESG generally perform better than those low in ESG. They find that ESG performance mitigates financial risk during financial crises, and the role of ESG performance lessens in "normal" times, confirming its importance in crises. It seems, therefore, that strengthening a firm's environmental, social and governance responsibilities is always relevant, but it is especially so after a global pandemic.

In this context, this study aims to contrast the effects of global crises, like that of COVID-19, on firms' CSR and ESG matters. Specifically, unlike previous works whose study periods were the years of the COVID-19 pandemic (Boubaker *et al.*, 2022; Broadstock *et al.*, 2021; García-Sánchez & García-Sánchez, 2020; Qiu *et al.*, 2021), this study first analyses whether there really was a change during the years of the pandemic (2020, 2021 and 2022), compared to the period just before this global health crisis (2017, 2018 and 2019), in CSR issues. In addition, we analyse whether the intensity of COVID-19, which impacted countries differently as evidenced by the differences in the numbers of infected people, affects the indicators of environmental, social and governance matters in organisations.

Consequently, the main contributions of this study are the following. First, it provides evidence about whether the pandemic has caused a change in the responsible behaviour of companies. This topic is relevant due to firms' increasing interest in corporate sustainability. Second, the extant literature has analysed other relationships of cause and effect, such as whether CSR practices can mitigate the adverse effects of COVID-19 and therefore help firms survive (Boubaker *et al.*, 2022; Pham *et al.*, 2021), the link between ESG and the companies' objectives during COVID-19 (Arias *et al.*, 2024), or the relationships among specific company characteristics, such as the board of directors and ESG performance during this crisis (Paolone *et al.*, 2024). However, this study analyses the relationship between the intensity of the COVID-19 pandemic and each of the ESG indicators in companies. As far as we know, this relationship has not been analysed before, and it is essential for different agents, like managers and investors, to learn how firms could be affected by unforeseen events like this one in the future. In addition, a quantitative analysis has been undertaken in response to calls in previous studies (Nahar & Mohamad, 2023; Ranjbari *et al.*, 2021). Ranjbari *et al.* (2021), in an exhaustive review of the implications of COVID-19 for sustainable practices, observed that 88% of the sample articles applied a qualitative approach. These authors proposed that more quantitative studies on these topics be carried out in the future. To do this, the present study uses a broad sample of European Union (EU) countries comprising 1,786 firms from different sectors. This contrasts with previous empirical research, which has only studied the effects in one country, for one year, or in one sector.

The rest of the paper is organised as follows. First, section 2 presents the conceptual model and the theoretical framework supporting the research hypotheses. Next, section 3 explains the design used to collect the data and define the variables. Section 4 presents the methodology used in the empirical analysis and the results. Finally, section 5 explains the main conclusions and implications of the results, the limitations and future lines of research.

2. THEORETICAL FRAMEWORK AND HYPOTHESES

2.1. The COVID-19 pandemic as a driver of corporate social responsibility

As Freeman (1984) asserts, according to the stakeholder theory, a company must adequately manage its relationships with stakeholders to become successful. In critical periods, such as a global crisis like the one provoked by the COVID-19 pandemic, it is especially relevant that these stakeholders feel supported.

According to the institutional theory (DiMaggio & Powell, 1983; Meyer & Rowan, 1977), organisations adapt to their surroundings, following the laws and norms in each case and seeking legitimacy by becoming isomorphic with their institutional environment. That is, they pursue acceptance from their external environment. Following this legitimacy theory, firms should continuously legitimise their activities to maintain the unity between the objectives of society and those of the organisation to ensure their survival.

Therefore, in a crisis context like that caused by COVID-19, it seems especially reasonable that firms seek to enhance and promote CSR actions to achieve this legitimacy in the eyes of society and, consequently, help ensure their survival. Between the period before COVID-19 and during the pandemic, there are likely to be differences since companies had to test their capacity to adapt to new circumstances in times of uncertainty and respond to new social, environmental and economic challenges. Fortunately, many companies not only resisted engaging in unethical commercial practices during this period but they actively participated in diverse CSR activities. This has been especially true of firms that could provide immediate assistance in the fight against the virus, thereby boosting their CSR practices (Aguinis *et al.*, 2020; He & Harris, 2020).

Some studies claim that the COVID-19 pandemic has created opportunities for firms to increase their CSR activities and address global challenges despite the economic instability of this difficult period (Abed, 2022; He & Harris, 2020; Navickas *et al.*, 2021). Other studies (Khanchel *et al.*, 2023; Poursoleyman *et al.*, 2024) confirmed that the companies that engaged in more CSR practices during the pandemic were less affected by it. Ferrón-Vílchez & Leyva-de la Hiz (2023) share this opinion and add that resilient SMEs were able to improve their profitability during the pandemic. This is so because SMEs more oriented towards CSR practices are more resilient and, therefore, in better conditions to resist adverse economic situations like the COVID-19 crisis. For possible future periods of crisis, Qiu *et al.* (2021) explain that companies should not only invest in CSR during a crisis but should regularly commit to these activities to increase the effectiveness of their investment in CSR and avoid a notable difference between pre- and post-crisis periods.

Considering the arguments explained above, the first hypothesis is:

H1. Firms' commitment to CSR is greater during the COVID-19 pandemic than in the pre-pandemic period.

2.2. The influence of COVID-19 on firms' environmental, social and governance indicators during the pandemic

A crisis can provoke changes in society, lifestyles, health and the business environment. Thus, after experiencing a global crisis like COVID-19, it is reasonable to assume that notable changes have been made, whether due to learning, the need to adapt or fear of a similar situation in the future, among other reasons. Nevertheless, the pandemic did not affect everyone equally. There could be differences between organisations in one place or another, depending on their specific context. In the case of this pandemic, which was managed differently in each location (Barrachina & Barrachina, 2021; Nhamo *et al.*, 2020; Yan *et al.*, 2020), it is to be expected that the management and impact would differ for different organisations. As Shen *et al.* (2020) explain in their study, the impact of COVID-19 on firm performance is more pronounced in the areas and industries more affected by the virus.

Below, considering the context of a crisis, such as the COVID-19 pandemic, we will analyse each ESG component separately and examine how these indicators might have been affected.

Firms' environmental indicator

Environmental sustainability is one of the three dimensions of sustainable development, together with the social and economic dimensions (Woodcraft, 2012). Protecting the environmental may stimulate the ecological transformation of companies (Wang *et al.*, 2024) without hurting corporate competitiveness (Liu *et al.*, 2023; Liu *et al.*, 2024).

Therefore, many companies have remained committed and have adapted their practices to address the environmental impact of the pandemic. For example, they have taken measures to reduce energy and water consumption and promote the circular economy. With the increase in consumer awareness and the demand for sustainable products and services, some firms have increased their efforts in this area (Carroll, 2021). Moreover, teleworking has reduced vehicle traffic, resulting in less pollution, which has positively impacted the environment (Riggs, 2020).

Various studies (Colli, 2020; Kumar, 2021; Rashed *et al.*, 2020) have determined that water consumption and greenhouse gas emissions decreased during the COVID-19 pandemic. The reduction in pollutants from vehicles and industry has also had positive effects on bodies of water (Rashed *et al.*, 2020). Therefore, the fact that industries were inactive in many countries may have significantly reduced industrial waste emissions. In turn, this reduction led to a limit on the use of fossil fuels and conventional energy sources due to less energy demand in industries (Colli, 2020; Kumar, 2021). Moreover, the increase in online shopping with subsequent home delivery helped to reduce emissions. This mode of shopping has since become a much-used and more sustainable option for many consumers (Rita *et al.*, 2021). Finally, recent qualitative studies have demonstrated that firms have improved their environmental management systems (with better use of energy and water and reduced impact of

gas emissions) as a result of the COVID-19 pandemic (Islam *et al.*, 2024; Rumman *et al.*, 2024).

Therefore, the following hypothesis is proposed:

H2. The intensity of the impact of the COVID-19 pandemic affected positively the firms' environmental indicators.

Firms' social indicator

Although it is true that, on many occasions, the pandemic has had a very negative impact on people, companies have collaborated to mitigate these effects and have acted positively towards the community, their employees and consumers. As a global health emergency, the pandemic has greatly affected social sustainability since it threatened people's quality of life, well-being and safe and healthy lives. Health, well-being and education are citizens' basic social needs (Ranjbari *et al.*, 2021).

This crisis has produced an increase in donations and social engagement. Many organisations have allocated resources to support affected communities, donated medical supplies and financed research on the virus (Carroll, 2021). Others have aided the community and its most vulnerable citizens through associations and non-governmental organisations. Specifically, the economic consequences of the pandemic have made it necessary that firms helped in different areas, such as food, health, society and technology (Raimo *et al.*, 2021).

The extant literature also suggests that the relationships between a company and its employees, clients and the local community can shape corporate resilience during a crisis (Ding *et al.*, 2021). Social commitment could strengthen the links between a company and its stakeholders, and these stronger ties can, in turn, help to retain high-quality employees and maintain supply chains and loyal customers in difficult times (Albuquerque *et al.*, 2019). Telework should also be mentioned when discussing social issues and workers. Although telework presented some challenges, such as concentration and coordination problems, prolonged working hours, worse mental health and employees' loss of privacy (Afonso *et al.*, 2022; Katsabian, 2020), it also had positive effects. Working from home allowed some employees more autonomy, decision-making power, job satisfaction, productivity and work-life balance (Campo *et al.*, 2021; Fana *et al.*, 2020; Liu *et al.*, 2021; Massimo, 2020; Moens *et al.*, 2020). In fact, despite the challenges, most workers wanted to continue teleworking after the lockdown was lifted (Baek *et al.*, 2021; Moens *et al.*, 2020).

Nevertheless, it is important to mention that many employees were laid off, saw their working hours reduced or had to work in dangerous conditions, and parents had difficulties caring for their children (Carroll, 2021). In addition, some employees' salaries were cut during this difficult time (Meyer *et al.*, 2022). In any case, employees in countries where the pandemic had less impact were less affected by the crisis than others (Adams-Prassl *et al.*, 2020). The intensity of COVID-19 also influenced job insecurity, provoking emotional exhaustion and organisational deviation, although companies may take measures to alleviate these harmful effects (Lin *et al.*, 2021; Phugat *et al.*, 2021).

Companies responded to consumers' need for social commitment. This is because the pandemic was traumatic for many of them, causing physical, psychological and emotional damage. Thus, it is more likely that responsible and pro-social behaviour could satisfy more of consumers' social and self-fulfilment needs (He & Harris, 2020). Specifically, Waheed *et al.* (2022) found that in uncertain times, such as the pandemic period, clients are more attached to and satisfied with organisations that are socially responsible and value their stakeholders.

Therefore, during the pandemic, it seems that firms were concerned about recuperating well-being and providing benefits to society, their employees and consumers since it was a time in which society faced serious threats to living standards and health.

In line with the previous arguments, the following hypothesis is proposed:

H3. The intensity of the impact of the COVID-19 pandemic affected positively the firms' social indicators.

Firms' governance indicator

The interruption caused by the pandemic also affected organisations' governance practices and standards due to the challenges posed by COVID-19. However, there are contrasting opinions about whether the relationship between the impact of the pandemic and governance has been positive or negative.

According to Patel & Patel (2020), social distancing made shareholder and board meetings difficult to carry out in person, which caused delays in urgent commercial transactions and the postponement of annual general assemblies. However, Kaur *et al.* (2021) examined the new challenges the pandemic posed for boards of directors, such as virtual meetings, adequate board composition, dynamic risk assessment and continuity and resilience, and they found that virtual meetings, rapid and efficient responses and the efficiency of the board helped firms survive. COVID-19 has also created opportunities to improve governance and prioritise key sectors (Ajeigbe & Ganda, 2023). In general, COVID-19 has highlighted the importance of governance in crisis management and protecting shareholders' interests (Kumar *et al.*, 2021). According to Amorelli & Sánchez (2023), the pandemic had a less adverse effect on corporate commitment to stakeholders in companies with more women on the board. Furthermore, board members guarantee the continued social and environmental commitment of previous years, with their contribution being especially relevant in companies whose revenue was affected by the pandemic.

It is important to point out that more emphasis was placed on risk prevention and strategic planning during the pandemic. Thus, companies had to adapt their strategies and make quick decisions to address different challenges. This led to a greater focus on risk management and implementing mechanisms to

evaluate and mitigate risks (Pourmansouri *et al.*, 2022), indicating that this area took on special relevance in firms during these times of crisis. In terms of company strategic planning, COVID-19 could inhibit the implementation of global socio-economic activities, threatening the achievement of the Sustainable Development Goals (SDGs). However, it could also be a driver for a more sustainable way of living (Rassanjani *et al.*, 2021).

It seems reasonable to expect that organisations want to plan ahead and strengthen their government structures (meeting format, strategic priorities, etc.) to be more resilient and prepared for another crisis (Patel & Patel, 2020).

In light of the previous arguments, the last hypothesis is proposed:

H4. The intensity of the impact of the COVID-19 pandemic affected positively the firms' governance indicators.

3. RESEARCH DESIGN

3.1. Sample

The Refinitive Eikon database was used to obtain the sample and collect the information necessary to measure most of the variables. In addition, information about the number of people infected with COVID-19, provided by the World Health Organisation (2023), and the total population of each country in the study, offered by Eurostat (2023), were used to construct the main explanatory variable.

For the period 2017-2022, listed companies from the 28 EU countries have been considered since the United Kingdom was member of the EU during some of the years of the study period (Ministerio de Asuntos Exteriores, Unión Europea y Cooperación, 2023). It was deemed appropriate to begin the study in 2017 to verify the proposed research model three years before the COVID-19 pandemic and during the three years of the pandemic. The study period ended in 2022 because no data were available past this point.

To obtain the sample, companies listed in the EU during the period 2017-2022 with information about the dependent variables used in this study (CSR and each of the components of ESG) were collected, resulting in 2,183 companies and 13,098 observations. Next, two filters were applied. First, companies with data regarding the dependent variables for only one year of the study were eliminated (98 companies and 588 observations). Second, financial and insurance firms were excluded (299 companies, 1,794 observations) due to the particular characteristics of these kinds of firms, such as their specific accounting practices and the regulation and structure of financial markets (Ben Saad *et al.*, 2022; Lins *et al.*, 2019). After applying these two filters, the result was an unbalanced panel of 1,786 companies and 10,716 observations of companies from 22 EU countries. Table 1 shows the 22 EU countries whose firms comprised the sample for this study. It is necessary to mention that to test Hypotheses 2, 3 and 4, the final sample of the estimations rises to 1,807 observations (746 companies). This is due to some missing values and the use of lags to control a possible endogeneity problem.

Table 1
Sample distribution by country

Country	Companies		Observations	
	Number	Percentage	Number	Percentage
Austria	31	1.74	186	1.74
Belgium	44	2.46	264	2.46
Cyprus	11	0.62	66	0.62
Czech Republic	1	0.06	6	0.06
Denmark	54	3.02	324	3.02
Finland	74	4.14	444	4.14
France	163	9.13	978	9.13
Germany	250	14.00	1,500	14.00
Greece	25	1.40	150	1.40
Hungary	5	0.28	30	0.28
Ireland	48	2.69	288	2.69
Italy	103	5.77	618	5.77
Luxembourg	34	1.90	204	1.90
Malta	6	0.34	36	0.34
Netherlands	64	3.58	384	3.58
Poland	26	1.46	156	1.46
Portugal	13	0.73	78	0.73
Romania	1	0.06	6	0.06
Slovenia	1	0.06	6	0.06
Spain	63	3.53	378	3.53
Sweden	293	16.41	1,758	16.41
United Kingdom	476	26.65	2,856	26.65
TOTAL	1,786	100.00	10,716	100.00

Source: Own elaboration.

3.2. Variables

Dependent variables

To test Hypothesis 1, corporate social responsibility is the variable analysed. For the rest of the hypotheses, dimensions of ESG are considered.

First of all, corporate social responsibility (CSR) is measured through the daily decisions regarding economic, social and environmental matters reported by the firm. The scores for this variable range from 0 to 100, with the companies reporting the best CSR actions receiving a score of 100 (Refinitiv, 2023).

Firms' environmental, social and governance indicators were also obtained from the Refinitiv Eikon database. The information for these variables is not only that issued by the companies themselves but is complemented with negative information not reported by the companies, called "controversies", resulting in fewer possibilities of attribution bias (Mezulis *et al.*, 2004). According to Refinitiv (2023), to achieve the necessary information, 630 ESG measures are collected and calculated, of which 186 of the most relevant and comparable, depending on the industry, form subgroups that become the basis of each category's evaluation and scoring. The scores of the categories are then integrated into the scores of the three pillars: environmental, social and governance. In addition, the number of controversies rises

to 23, which are added to the total calculation of the indicator. The final scores are normalised in percentages that range from 0 to 100 on a metric scale, where firms with the best practices and outstanding performance in the considered items receive a score of 100 and vice-versa (Refinitiv, 2023).

The score of the environmental indicator (Environmental) has been created from 158 items, and it measures the impact of an organisation on natural living and not living systems, including the air, earth and water, as well as complete ecosystems. It reflects the extent to which a company uses the best management practices to avoid environmental risks and takes advantage of environmental opportunities to create long-term value for its shareholders.

The score of the social indicator (Social) considers 238 items, and it measures a firm's capacity to create trust and loyalty among its workforce, clients and society by using the best management practices. It is a reflection of the company's reputation, which is a key factor in determining its capacity to create long-term value for its shareholders.

Finally, the score of the governance indicator (Governance) (141 items) measures the firm's systems and processes, which ensure that its board members and executives act in the best interests of its long term shareholders. It reflects a company's capacity, through its use of best management practices, to direct and control its rights and responsibilities through the creation of incentives, as well as checks and balances in order to generate long term shareholder value.

Independent variable

The number of employees infected with COVID-19 (incorporated as a logarithm in the regression analyses) (Infected_Covid) is the explanatory variable used to test Hypotheses 2, 3 and 4. Specifically, we have created a variable for each of the pandemic years that is the result of multiplying the number of infected people nationally (Covid_country = the number of confirmed cases of COVID-19 each year in each country/ country's population) by the number of employees in each company (Employees). Thus, this new variable reflects the effect of the pandemic at the country and company levels.

Control variables

Five control variables theoretically related to the dependent variables have been introduced into the proposed econometric model to reduce possible bias in the results when testing the last three hypotheses.

The company's age (Age) is the number of years between its foundation and the reference year (2017-2022). Although some studies have not found a significant relationship between age and CSR actions (Cera *et al.*, 2020; Cincalova & Hedija, 2020), it is possible to argue that young companies carry out fewer actions in these matters due to their lack of financial resources, experience and reputation (Beji *et al.*, 2021; D'Amato & Falivena, 2020; Malik *et al.*, 2020).

The indebtedness of each company (Debt) is calculated as the ratio between total debt and total assets (multiplied by 100). Firms with large amounts of debt are generally more focused on managing commercial risks than CSR practices since, in this context, suppliers can exert pressure on companies to refrain from engaging in sustainable practices that are not directly related to improving financial performance (Sheikh, 2019; Swandari & Sadikin, 2016). On the other hand, one could expect a positive relationship between high debt levels and CSR as an attempt to reduce global risk (Arora & Dharwadkar, 2011; Orlitzky & Benjamin, 2001).

The activity sector each company belongs to (Sector) was measured as a dummy variable taking the value of 1 if, according to the SIC code and the sector the firm belongs to, the company could be classified as "environmentally sensitive" (mining, gas, chemical, paper, iron, steel and other metals) and 0 otherwise. It could be expected that companies in more environmentally sensitive sectors adopt more CSR initiatives (Fernández-Gago *et al.*, 2016; Reverte *et al.*, 2016).

The financial performance of a firm is measured by its economic profitability (Return on Assets) (ROA). On the one hand, if a firm is very profitable, socially responsible practices could be promoted (hypothesis of available funds) (Godos-Díez *et al.*, 2020; Kludacz-Alessandri & Cyganska, 2021; Nguyen *et al.*, 2021; Orlitzky *et al.*, 2003). On the other hand, according to the managerial opportunism hypothesis, if the company's economic performance is high, managers could reduce CSR activities to increase their personal short-term gains (Ballesteros *et al.*, 2015; Raza *et al.*, 2012).

The country where each company is headquartered (Legal_Origin) could contribute to notable differences between organisations based in one place and another since laws and external pressures influence corporate decisions. It is defined as a dummy variable that takes the value of 1 if the company's headquarters is in the United Kingdom or Ireland (countries with an Anglo-Saxon legal system) and 0 otherwise. Specifically, in different contexts, political and legal systems can greatly influence organisations' strategies and activities and, consequently, their sustainability goals and performance (Rosati & Faria, 2019). Countries with a common law legal system have less political influence on economic activities, and organisations are more focused on their shareholders' needs than the needs of their stakeholders (La Porta *et al.*, 1998; Luo *et al.*, 2012; Rosati & Faria, 2019).

Finally, annual effects were considered by adding two dummy variables to the model since the panel encompasses three years.

4. ANALYSES AND RESULTS

4.1. Analyses

To test Hypothesis 1, IBM SPSS Statics 26 was used to determine whether there were differences between the two periods selected, that is, between the socially responsible behaviour of the companies before and during the COVID-19 health crisis. To do this, the mean of the data in each of the periods (the mean of the three years of one period and the mean of the three years of the other period) was calculated. According to the Kolmogorov-Smirnov test, the variable in each period was not normally distributed and due to the fact that

they were related samples, the Wilcoxon test was used to obtain the results corresponding to this hypothesis.

To test the rest of the hypotheses in relation to the pandemic period (2020-2022), a linear regression model (OLS, Ordinary Least Square) clustered at company level was estimated using the cluster option and STATA17 software. This option helps to control the fact that we have information about the firms in more than one moment in time. In addition, the endogenous variables have been lagged by one year to control possible endogeneity problems in the proposed model[2]. The estimations have also been corrected due to a heteroscedasticity problem using the robust option of the STATA software. It was necessary to estimate three regression analyses to test the proposed hypotheses, alternatively considering each of the ESG indicators and including all of the control variables and the annual dummies with the main explanatory variable.

Specifically, the proposed model is a linear regression model, as shown below:

$$INDICATOR\ ESG_i = \alpha_0 + \beta X_{it-1} + \sum_{t=2020}^{2022} D_t + \varepsilon_i$$

where:

X are the explanatory and control variables, $\sum_{t=2020}^{2022} D_t$ is the set of dummy time variables and ε_i is the error term.

Although we initially considered the possibility of using a panel-data methodology, specifically, a two-step dynamic panel-data estimation, the Generalized Method of Moments (GMM) developed by Arellano & Bond (1991), this panel study has a maximum of three years per firm. Thus, it was not viable to apply this methodology since we could not estimate m_2, which tests the lack of second-order correlation of the residuals in first-order differences since a minimum of four years is required (Pindado & Requejo, 2015).

4.2. Results

The results of the first analysis are presented in Table 2. As can be seen, there is a significant difference between the mean values of the variable CSR in the two periods at a 99% confidence level, supporting this study's first hypothesis. This hypothesis proposed that firms' commitment to CSR matters was greater during the COVID-19 pandemic (2020-2022) than in the pre-pandemic period (2017-2019). The COVID-19 health crisis seems to have enhanced companies' engagement in socially responsible actions. Table 3 shows the principal descriptive statistics of the variables used to estimate the models corresponding to Hypotheses 2, 3 and 4.

Table 2
CSR before and during the COVID-19 pandemic

Variables	Pre- COVID		During COVID		Difference		Z
	Mean	Median	Mean	Median	Mean	Median	Wilcoxon
CSR	42.121	41.633	54.925	57.071	12.804	15.438	–24.120***

n = 1,418

* p < 0.10; ** p < 0.05; *** p < 0.01

Source: Own elaboration.

[2] The following variables have been considered endogenous: Infected_Covid and ROA.

Table 3
Descriptive statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Environmental	57.803	23.517	0.000	99.094
Social	65.707	20.034	2.453	97.517
Governance	63.789	19.274	3.548	98.733
Covid_Country	0.192	0.173	0.007	0.698
Employees	28,845.790	64,817.100	3.000	675,805
Infected_Covid[a]	5,896.732	19,183.070	0.104	303,530.400
Age	36.686	33.412	0.000	186.000
Debt	30.745	22.525	0.000	464.942
ROA	5.464	10.187	–113.990	189.889
Other variables	**% (number of observations = 1)**			
Sector	1,045 (48.33)			
Legal_Origin	567 (26.23)			

n = 2,162.

[a] Data obtained before log transformation.

Source: Own elaboration.

Table 4 shows the correlation coefficients among the variables of the proposed model. We used Spearman's correlations since Pearson's correlations do not work well with discrete or non-normal continuous variables (Bishara & Hittner, 2014; Wang *et al.*, 2023), which is the case of some of the variables in this study. Nevertheless, the analysis of the variance inflation factors (VIF) did not show evidence of multicollinearity, as they were all below 10 (Kleinbaum *et al.*, 1988).

The results of the regression analysis for the 2020-2022 period are presented in Table 5. Model 1 (Table 5) indicates that the coefficient of the main explanatory variable for the environmental indicator (Environmental) is positive and significant at the 99% level, confirming Hypothesis 2. Based on this study, the intensity of the impact of the COVID-19 pandemic improves firms' environmental indicators. Regarding firms' social indicator (Social), the variable Infected_Covid shows a positive and significant coefficient at 1% (Model 2, Table 5), indicating that Hypothesis 3 is also accepted. During the COVID-19 health crisis, the intensity of the pandemic seemed to improve firms' social indicators. Finally, as shown in Model 3, the last hypothesis can also be confirmed since the variable of people infected with the virus (Infected_Covid) is significant at a 99% confidence level. The impact of the COVID-19 pandemic improves firms' governance indicators (Governance).

Table 4
Correlation Matrix

Variables	1	2	3	4	5	6	7	8	9
1. Environmental	1								
2. Social	0.666***	1.000							
3. Governance	0.292***	0.364***	1.000						
4. Infected_Covid	0.446***	0.482***	0,294***	1.000					
5. Age	0.228***	0.224***	0,044	0.209***	1.000				
6. Debt	0.088***	0.098***	0,054*	0.118***	−0.054*	1.000			
7. Sector	0.186***	0.193***	0,095***	0.099***	0.126***	−0.191***	1.000		
8. ROA	−0.025	−0.011	−0,012	−0.025	0.015	−0.196***	0.072**	1.000	
9. Legal_Origin	−0.032	−0.118***	0,163***	0.065**	−0.015	−0.034	−0.045	0.037	1

* p < 0.10; ** p < 0.05; *** p < 0.01

n= 1,252

Source: Own elaboration.

Table 5
Regression Analysis[a]

Variables	Model 1	Model 2	Model 3
Infected_Covid	4.638*** (0.434)	4.252*** (0.357)	2.543*** (0.311)
Age	0.055*** (0.020)	0.059*** (0.016)	−0.004 (0.017)
Debt	0.032 (0.048)	0.001 (0.039)	0.010 (0.022)
Sector	6.163*** (1.447)	4.786*** (1.222)	2.550** (1.256)
ROA	0.133** (0.059)	0.002 (0.061)	−0.004 (0.060)
Legal_Origin	−1.793 (1.664)	−5.947*** (1.425)	6.572*** (1.211)
Annual effect considered	Yes	Yes	Yes
F	24.610***	33.61***	17.280***
R_2	0.239	0.281	0.128
Number of companies	692	692	692
Number of observations	1,252	1,252	1,252

In Models 1, 2 and 3, the dependent variable is Environmental, Social and Governance, respectively.

[a] Standardised coefficients with robust standard error in parenthesis.

* p < 0.10; ** p < 0.05; *** p < 0.01.

Source: Own elaboration.

The control variables are significant in at least some of the models, at a 95% or 99% confidence level, except for the variable Debt, which was not significant in any of the three models. The variable Sector is significant in the three econometric models, and the variable ROA is only significant in the first model. Finally, the variables Age and Legal_Origin are significant in two of the three models.

4.3. Robustness tests

As additional tests and to check robustness, the following procedures have been carried out. Instead of considering the actual explanatory variable, the percentage of people infected with COVID-19 each year in each country, defined as the number of confirmed cases each year in each country divided by each country's population, was considered, and the results did not vary. In addition, the Sector variable was alternatively defined as a dummy variable that takes the value of 1 if the company belongs to a regulated sector as opposed to an unregulated sector or belongs to the industrial sector as opposed to the service sector. The variable ROA was substituted for the variable ROE (Return on Equity). Furthermore, two additional variables, the number of women on the board and the number of independent board members, were incorporated into the models. In all of the cases above, the results presented in Table 5 relating to the main explanatory variable did not vary. Finally, it is necessary to mention that the variable Sales (expressed as a logarithm) was added as a proxy variable for company size, with no significant changes in the results since a significant effect of the main independent variable was found in the first two models but not in the model considering the governance dimension of ESG.

5. DISCUSSION AND CONCLUSIONS

Global crises such as the COVID-19 pandemic not only affect people but also have important repercussions for companies all over the world. First of all, using a broad sample of firms from EU countries, this study has analysed whether there has been a change in CSR matters during the pandemic (2020-2022) compared to the period right before this global health crisis began (2017-2019). Subsequently, it has tested whether the intensity of COVID-19, which did not impact all countries equally, as reflected in the number of cases, affected organisations' behaviour in environmental, social and governance issues.

The empirical evidence confirms that commitment to CSR matters was higher during the pandemic than in the pre-pandemic period, in line with the results of other studies that have found a strong commitment to CSR during the pandemic (Aguinis *et al.*, 2020; He & Harris, 2020). It can also be confirmed that the intensity of the impact of the COVID-19 pandemic affected positively the firms' environmental indicators. This argument is support-

ed by previous research showing how some environmental items benefited from the pandemic (Colli, 2020; Kumar, 2021; Rashed *et al.*, 2020). However, this improvement is not necessarily associated with firms' proactive behaviour but may be the result of the pandemic *per se*. This is the case of the environmental indicators, whose improvement could be partly due to the reduction in company activity caused by COVID-19.

Unlike previous studies (Afonso *et al.*, 2022; Katsabian, 2020; Lin *et al.*, 2021; Phugat *et al.*, 2021), our results also show an improvement in the social indicators. In line with studies that support an improvement during the crisis due to, for example, teleworking, which increased job satisfaction among many workers (Campo *et al.*, 2021; Fana *et al.*, 2020; Liu *et al.*, 2021; Massimo, 2020; Moens *et al.*, 2020), support for the community and its more vulnerable members (Raimo *et al.*, 2021) and increased consumer satisfaction (Waheed *et al.*, 2022). Finally, an improvement in the governance indicators can be confirmed, supported by previous studies showing that during this crisis period, governance was essential to manage the crisis and protect shareholders' interests successfully (Kumar *et al.*, 2021).

From an academic point of view, this study contributes to the literature by providing new evidence about CSR and ESG in the context of global crises, such as COVID-19, which has scarcely been studied. These results could be useful for future research aiming to delve deeper into the relationships between firms and their stakeholders and matters concerning the environment in crisis situations. From a practical point of view, it is possible to determine some political and business management implications from the results of this study. First, companies' increased commitment to CSR matters as a result of the pandemic shows their willingness to contribute to the well-being of those around them in difficult times. This should be exploited by public administrations when coordinating responses to potential future crises and establishing permanent relationships with the private sector, which could guarantee firms' continued social commitment. It is also necessary for public figures to promote awareness about diverse problems such as climate change, geopolitical conflicts and increasing inequality, which frequently do not receive the attention they deserve. Given the risk that the measures taken regarding these issues could be too late and knowing that firms are willing to help, it could be effective to emphasise a feeling of urgency to provoke increased commitment on the part of companies. From the business management perspective, firms should reflect on how their response to a crisis defines them as an organisation and identify the elements that comprise their corporate mission and vision. Once their social aims are known, they can design and implement the necessary policies and actions to achieve them. In this study, an improvement in firms' environmental, social and governance indicators has been observed during the pandemic. In the cases in which these improvements are the result of companies' voluntary initiatives and not the reduced activity provoked by the pandemic (as could be the case with some environmental parameters), it would be a good idea to analyse the efforts made and the consequences of these efforts. Some actions provoked by this extraordinary situation may have had a positive net effect on the organisation. They could have, for example, improved productivity, increased employees' motivation, captured and retained talented workers, increased customer loyalty and improved the company's reputation or guaranteed greater control of the firm by its owners. When these actions and interests are identified, measures can be adopted to transform these efforts from a response to an extraordinary situation into habitual practices that continually benefit the firm and society.

Despite the above, some limitations of this study should be recognised and considered in future research. The Refinitiv Eikon database uses a firms' headquarters as the localisation criterion instead of the country where it principally does business and most of its employees are located. In addition, the dependent variables of the environmental, social and governance indicators are measures that include various items. Therefore, it would be interesting to separate them since the COVID-19 pandemic may not have affected them all equally. The study period could also be lengthened in the future to observe whether the changes reflected in this study have been maintained after the pandemic or whether any other transformation has occurred. A longer study period would allow the use of a panel data methodology. Another limitation is that the sample comprises large companies; a study of small or medium-sized firms could have different results. Finally, a univariate analysis of subsample comparisons was carried out to test the first hypothesis. Thus, it was not possible to consider other factors that could affect and increase CSR.

Beyond the limitations, there are other areas of future research that could be interesting to explore. For example, some of the sectors most affected by the pandemic (like the automotive, hospitality and transport sectors) could be individually studied to see whether the results differ from those obtained in this work. In addition, in line with Ahmad *et al.* (2021), the average impact of global ESG and the individual dimensions of ESG on corporate financial performance could be estimated. Finally, the ESG variables could be considered mediating variables in the relationship between COVID-19 and firm performance.

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Entrepreneurial intention among Colombian university students: A theory of planned behavior analysis in Colombia

Intención emprendedora en estudiantes universitarios: un análisis desde la teoría del comportamiento planificado en Colombia

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ABSTRACT

Studies on entrepreneurship have used several approaches, among which, research on entrepreneurial intention (EI) can be highlighted. Studies on EI help researchers better understand entrepreneurial behavior. In this sense, one of the most relevant frameworks in EI studies is the Theory of Planned Behavior (TPB), which stands out for its predictive capacity, mainly in a university context. The aim of this research was to determine the relationship between the variables of Personal Attitudes (PAs), Subjective Norms (SNs), and Perceived Behavioral Control (PBC) with respect to the EI of university students in Colombia. For this purpose, we constructed a model that integrates the elements of the TPB with EI with reference to the validated instrument of the Global University Entrepreneurial Spirit Student's Survey (GUESSS) project applied to a sample of 12,383 students. The estimation of the model uses structural equations (SEMs) by means of Partial Least Squares-Path Modelling (PLS-PM). The findings show that PAs and PBC are determinants of EI, while SNs have no direct influence; however, their effects are indirect. These results have implications for how to promote entrepreneurship in emerging economies through the university environment. The results indicate that the development of students' capabilities is essential for entrepreneurship and its incorporation into the university's knowledge transfer model.

Keywords: Entrepreneurial Intention, University Students, Theory of Planned Behavior, SEM, Emergent Economy.

RESUMEN

Los estudios sobre el espíritu empresarial han tenido varios enfoques, entre los que destaca la investigación sobre la intención emprendedora (IE). Los estudios sobre la IE permiten explicar y comprender el comportamiento emprendedor. En este sentido, uno de los marcos más relevantes en los estudios de IE es la Teoría del Comportamiento Planificado (TCP), que ha destacado por su capacidad predictiva principalmente en el contexto universitario. El objetivo de esta investigación es determinar la relación entre las variables Actitudes Personales (AP), Normas Subjetivas (NS) y Control Conductual Percibido (CCP) con respecto a la IE de estudiantes universitarios en Colombia. Para ello se construye un modelo que integra los elementos de la TCP con la IE tomando como referencia el instrumento validado del proyecto *Global University Entrepreneurial Spirit Student's Survey* (GUESSS) aplicado a una muestra de 12.383 estudiantes. La estimación del modelo se realiza a través de ecuaciones estructurales (SEM) mediante *Partial Least Squares - Path Modelling (PLS-PM)*. Los resultados muestran que las AP y el CCP son determinantes de la IE, mientras que las NS no tienen influencia directa; sin embargo, sus efectos son indirectos. Estos resultados tienen implicaciones sobre cómo promover el espíritu empresarial en las economías emergentes desde el ámbito universitario. Por lo tanto, es evidente que el desarrollo de las capacidades de los estudiantes es esencial para el emprendimiento y su incorporación al modelo de transferencia de conocimiento de la universidad.

Palabras clave: Intención emprendedora, Estudiantes Universitarios, Teoría del Comportamiento Planificado, SEM, Economía Emergente.

1. INTRODUCTION

Within the various fields of study on entrepreneurship, there are several analyses on the characteristics of the entrepreneur as a subject, where the determination of the entrepreneur contributes to development through the creation of new companies (Pfeilstetter, 2020). These studies have been focused on explaining the subject (Shapero & Sokol, 1982) in order to understand entrepreneurship behavior (Ajzen, 1991). Indeed, EI studies seek to explain the interactions of people and their contexts to determine entrepreneurial behavior (Liñán & Fayolle, 2015), which both play a significant role (Bandura, 1982).

EI studies focus on the identification of personal factors and their relationship with the context (Liñán & Fayolle, 2015). Several studies focused on personal factors and tended to estimate the relationship between the influence of factors such as gender (Nowiński *et al.*, 2017; Contreras-Barraza *et al.*, 2021), family history (Amofah & Saladrigues, 2022a), and vocational training (Piperopoulos & Dimov, 2015) and EI. Other studies have contrasted the behavior of groups at the territorial level to understand the influence of cultural and environmental factors on EI (Franke & Lüthje, 2004; Liñán & Chen, 2009; Moriano *et al.*, 2012; Torres *et al.*, 2017; Blanco-Mesa *et al.* 2021). There are also studies that combine both types of factors and focus on the role of institutions in promoting EI (Amofah & Saladrigues, 2022a; Su *et al.*, 2021). Specifically, approaches with personal and contextual factors allow one to generate a more complete vision of the interactions between elements that can influence entrepreneurial behavior.

Recently, EI research has extended to prosocial personality traits, such as social capital and social entrepreneurship, through regional approaches (Alfaro-García *et al.*, 2022), where the social environment significantly influences behavior (Bandura, 1999). The implications of the social environment have been studied in various classes of individuals, with several studies focusing on university students and their environments in relation to their life goals (Awang *et al.*, 2016). According to the *Global Entrepreneurship Monitor* (GEM, 2022), there are structural conditions for entrepreneurship, where higher education plays a significant role in the generation of competencies, the formation of thinking, and the identification of opportunities for entrepreneurial development. In this sense, entrepreneurial environmental conditions can have key roles for university students in relation to entrepreneurship (Fu *et al.*, 2022). The social environment can stimulate or deter IE (Santos *et al.*, 2016). Therefore, the understanding of these traits among university students has brought with it a diversity of methodological approaches that have allowed the analysis of IE under heterogeneous perspectives that contribute diversely to the field of study.

Methodologies used to address EI in a university context are varied. The most popular are the construction of structural equations (SEM) (Krueger *et al.*, 2000, Zhao *et al.*, 2005), the evaluation of hierarchical order via cluster analysis (Giacomin *et al.*, 2016; Roman & Maxim, 2017), the application of fuzzy set analysis (Nowiński & Haddoud, 2019), and the analysis of symmetric and asymmetric evaluations of estimators (Ali *et al.*, 2019). Each methodology has a specific function. For example, cluster analysis allows the identification of territorial or social nodes of university entrepreneurship, while fuzzy analysis also allows comparison between groups of individuals. Structural equations address the relationship between individual and contextual variables, making it possible to validate the existence and degree of relationship (weak or strong) between them.

Based on the above factors, the main aim of the present study is to determine the relationship between the variables PAs, SNs, and PBC and the EI of university students in Colombia. For this purpose, constructs validated in the framework of the GUESSS project are used to establish the determinants of EI by estimating structural equations with PLS-PM. The study of these variables is relevant since seeking higher education for entrepreneurship in Colombia is the factor with the best performance in the construction of the entrepreneurial ecosystem, even surpassing that of countries with greater investments in this area (GEM, 2022). Therefore, determining the effects of the variables studied will contribute to the construction of elements that facilitate the promotion of entrepreneurship from higher education in the context of an emerging economy.

This article is structured as follows. The second section presents the theoretical framework on EI and the elements associated with the TPB in a university context, as well as the development of the hypotheses and proposed theoretical model. The third section explains the methodological design and model estimation process through PLS-PM. The fourth section presents the main findings related to the model estimation and hypothesis testing. The fifth section presents a discussion and analysis of the results. Finally, the sixth section presents the conclusions of the research.

2. THEORETICAL BACKGROUND

2.1. The Theory of Planned Behavior and entrepreneurial intentions

Entrepreneurship is a field of research dedicated to the identification of characteristics that guide behavior around the generation of value (Ang & Hong, 2000). EI studies consider situational elements that determine the entrepreneurial event (Shapero & Sokol, 1982) and beliefs that integrate human behavior and guide intentions in specific contexts (Ajzen, 1991). Thus, behavioral beliefs (attitudes), normative beliefs (subjective norms), and control beliefs (perceived behavioral control) are used to predict entrepreneurial behavior and comprise the TPB. Hence, these elements help explain human behavior in terms of EI and are promising and applicable in a variety of contexts (Liñán & Fayolle, 2015; Yuriev *et al.*, 2020).

The TPB explains that intentions are not the starting point of the entrepreneurial process (attitudes and perceptions) (Kautonen *et al.*, 2015). Likewise, intentions allow one to understand the motivational factors that influence a behavior (Ajzen, 1991) and why some people take advantage of opportunities and others do not (Ang & Hong, 2000). Thus, intentions could help us understand the behaviors that could be performed to create a new business in the future.

Intentions allow one to predict behaviors with the understanding that individuals will develop actions to achieve their

objectives (Bandura, 1999). It should be noted that intentions are produced through the interaction between PAs, PBC, and SNs (Ajzen, 1991). PAs are defined as a form of self-perception (Bandura, 1982) that can guide the positive or negative assessment of a behavior (Liñán & Chen, 2009). PBC involves self-perception but in relation to the degree of competence and performance. SNs involve the individual's environment and are defined as a form of social pressure to perform (or not perform) a behavior (Feola *et al.*, 2019). Each of these elements can have a significant impact on intentions if self-perception and the social environment interact in the same direction to enhance the execution of those intentions.

2.2. Entrepreneurial Intention among university students

Social cognitive theory states that different types of environmental structures influence individuals' personal aspirations through family, economic, educational standards, etc. (Bandura, 1982). For EI, individuals' environmental conditions such as support from family and friends can be influential in a broad sense (Fu *et al.*, 2022). Because of this factor, social norms can favor or deter the perception of entrepreneurship as a career choice (Santos *et al.*, 2016). Aspects such as entrepreneurship education can directly impact EI, turning the social environment into a platform for intentionality towards an entrepreneurial career (Awang *et al.*, 2016). Specifically, the study of EI pays special attention to university students due to the vulnerability that is evident in their employment conditions and professional development (Amofah & Saladrigues, 2022a), their entrepreneurial potential (Contreras-Barraza *et al.*, 2021), and the ways in which they are influenced by their social environment for decision making (Awang *et al.*, 2016).

One of the most relevant lines of research within EI is the study of university students and the conditions that influence their decisions regarding entrepreneurship (Liñán & Fayolle, 2015). Some studies have focused on cultural factors (Gaofeng, 2019; Liñán & Chen, 2009; Moriano *et al.*, 2012), family members (Altinay *et al.*, 2012), gender (Montero & Camacho, 2018; Santos *et al.*, 2016; Shinnar *et al.*, 2012), and career intention (Fayolle & Gailly, 2015; Liñán *et al.*, 2011; Nabi *et al.*, 2017; Nabi *et al.*, 2018). This last set of factors has gained relevance with the understanding that learning and inspiration can generate certain incentives for EI among university students (Nabi *et al.*, 2018).

Likewise, research on EI employs different approaches such as the demographic and social approaches of students and researchers (Ahmed *et al.*, 2010; Feola *et al.*, 2019), as well as the incidence of intervention and support exerted by universities on entrepreneurial behavior (Coduras *et al.*, 2008; Su *et al.*, 2021), which can be used to compare the performance of these factors against EI promotion (Fayolle & Gailly, 2015; Franke & Lüthje, 2004; Souitaris *et al.*, 2007). These factors become even more important for young people with an average age of 25, whose decisions will significantly impact their future (Turker & Selcuk, 2009).

EI in an emerging economy context presents characteristics of interest in relation to the underlying cultural factors. University students in an emerging economy are more inclined to seek self-employment. In Latin America, students showed a positive relationship between their skills, family background, and risk propensity to engage in entrepreneurship (Torres *et al.*, 2017). Colombian university students presented an EI of considerable magnitude mediated by preparation for entrepreneurship received during their university studies (Cano & Tabares, 2017). Thus, studying EI in an emerging economy such as Colombia's will help us better understand this phenomenon.

2.2.1. Attitudes and entrepreneurial intention of university students

PAs are defined as the degree to which a person's assessment of a behavior is favorable or unfavorable (Ajzen, 1991). Attitudes play an important role in motivation, which is derived from the self-perception of one's own capabilities (Bandura, 1982). In this sense, attitude includes affective and evaluative considerations about behaviors that lead an individual to consider a behavior as convenient (or not) for personal development (Liñán & Chen, 2009).

PAs represent one of the most relevant predictive elements of this theory, serving as a constant variable throughout the analysis of EI among university students from different cultures (Liñán & Chen, 2009; Moriano *et al.*, 2012). Nabi *et al.* (2018) have demonstrated that entrepreneurship training can play a more significant role in inspiration than in knowledge since emotional factors can be very powerful in both supporting students in and dissuading them from their intention. Thus, personal beliefs and expectations constitute strong elements in the EI of researchers and academics (Feola *et al.*, 2019).

PAs with a proactive approach reinforce the intention towards entrepreneurship (Barba-Sánchez *et al.*, 2022). A favorable attitude towards such behaviors can make university students perceive them as challenges that they are willing to face (Rueda-Barrios *et al.*, 2022). There are several factors that can shape PAs, such as personality, beliefs, and perception capability (Kobylińska, 2022). Likewise, attitude is derived from the hedonic values of individuals, which makes it a determinant that remains constant over and above other factors and externalities (Yasir *et al.*, 2021). Therefore, the influence of PAs can be a determinant in EI. In this sense, we propose Hypothesis 1:

H1. Personal attitudes are positively related to the entrepreneurial intention of university students.

2.2.2. Social environment and entrepreneurial intention of university students

Subjective norms (SNs) are an important part of the TPB and are defined as the perceived social pressure to perform or not perform a behavior (Ajzen, 1991). SNs measure the manner in which the social environment influences a person to carry out, or not, entrepreneurial behaviors (Feola *et al.*, 2019). However, the perceptions of "people of reference" can influence the approbation or disapprobation of the entrepreneur's decision (Liñán & Chen, 2009). Thus, the influence of SNs can be diverse, as social pressures are perceived in different ways depending on different social groups' characteristics.

SNs are a form of social pressure that drives or restrains an individual's intentions (Blanco-Mesa *et al.*, 2022). However, SNs can be considered the weakest theory predictor and consider the perception of the individual's immediate environment (Kautonen *et al.*, 2015). Hence, environmental factors can play a key role in fostering or limiting the entrepreneurship in particular groups. In this sense, the social environment can be a referent for assessing capabilities with respect to perceived advantages and obstacles (C. Chen *et al.*, 1998). There are several stakeholders that can influence an individual's behavior, such as family (Altinay *et al.*, 2012); close social groups (Maresch *et al.*, 2016); normative influences (Kor & Mullan, 2011; Santos *et al.*, 2016); and, in the context of university students, the environment of the surrounding training centers and educational programs (Díaz-García & Jiménez-Moreno, 2010; Fayolle & Gailly, 2015; Souitaris *et al.*, 2007). The latter factor is notable because universities have tools that can guide students' entrepreneurial behaviors or even discourage them (Franke & Lüthje, 2004).

The university environment plays an important role in EI. Franke and Lüthje (2004) showed that a favorable environment for entrepreneurship makes university students more inclined toward this behavior. Accordingly, institutional entrepreneurship is a way of promoting the creation of companies through the active participation of universities in each stage of their development (Parada *et al.*, 2019). Likewise, Nowiński *et al.* (2017) showed that the university environment increased self-efficacy for entrepreneurship. Hence, there are several variables that could be relevant for EI, such as academic programs focused on entrepreneurship (Bae *et al.*, 2014) and cultural, institutional, and pedagogical variables that encourage entrepreneurial behavior (Liñán & Fayolle, 2015).

Additionally, the university environment's influence can have indirect effects since it can shape students' attitudes by motivating or dissuading them from their intentions (Barba-Sánchez *et al.*, 2022). When universities promote innovative entrepreneurial training tools, they can also indirectly broaden the basic knowledge and skills of university students in entrepreneurship, which can engender the idea of becoming an entrepreneur (Su *et al.*, 2021). In this sense, the university environment can facilitate a deeper understanding of the external factors that shape attitudes and capabilities for entrepreneurship (Contreras-Barraza *et al.*, 2021). In this sense, we propose the following hypotheses:

H2. Subjective norms regarding entrepreneurial decisions are positively related to the entrepreneurial intention of university students.

H2a. Subjective norms are positively related to entrepreneurial intention through personal attitude.

H2b. Subjective norms are positively related to entrepreneurial intention through perceived behavioral control.

2.2.3. Capacity for Action and Entrepreneurial Intention of University Students

Perceived behavioral control (PBC) refers to individuals' perception of the ease or difficulty of performing a behavior (Ajzen, 1991). This element is related to the self-efficacy concept, which refers to the degree of effectiveness in the execution of actions to deal with future situations (Bandura, 1982). For entrepreneurial intention, self-efficacy refers to an individual's belief that he or she is capable of successfully performing the tasks of an entrepreneur (Chen *et al.*, 1998). Thus, PBC could be assumed to represent behavioral performance that is properly dependent on the individual (Blanco-Mesa *et al.*, 2022).

PBC involves risk propensity that can be mediated by the perception of one's own abilities to deal with ambiguity (Zhao *et al.*, 2005). In this sense, Kautonen *et al.* (2015) noted that participants who put their capabilities into practice in activities aimed at starting a business reported a positive level of intention to continue doing so. Hence, PBC might be a more objective measure for the implementation of intentions, which is a concept recognized as mediating action-taking in the entrepreneurial context (van Gelderen *et al.*, 2018).

When studying IE among college students, the results of personal and social factors can be mixed. Thus, related research on indicators of the transition from intention to entrepreneurial behavior is key to understanding the gaps in this theory (Nabi *et al.*, 2017). In this sense, PBC has a strong impact on university students in terms of their need for achievement and independence (Barba-Sánchez & Atienza-Sahuquillo, 2018), the development of self-efficacy for their entrepreneurial orientation (Liñán *et al.*, 2011; Nowiński *et al.*, 2017), and the generation of self-confidence given by skills and capacities for entrepreneurship (Bae *et al.*, 2014; Oosterbeek *et al.*, 2010). In emerging economies, university students have demonstrated the ability to take charge of their actions despite perceived difficulties in their contexts (Torres *et al.*, 2017).

Notably, university students' own capabilities are often the basis for their decisions, meaning that students who consider themselves well prepared to play the role of entrepreneur are more inclined to engage in this behavior (Bae *et al.*, 2014; Kobylińska, 2022). Thus, PBC is related to EI since an entrepreneur is characterized by constant preparation to assert his or her ability to manage a business (Nowiński *et al.*, 2017).

University students' perception of their own capabilities can be determined by previous family experiences of entrepreneurship (Amofah & Saladrigues, 2022) and early training in entrepreneurial skills (Bae *et al.*, 2014). These factors can encourage an individual to consider entrepreneurship as a viable alternative for his or her life goals (Liñán *et al.*, 2011). PBC is an important element because it connects to an individual's values of self-transcendence, which can lead to a greater capacity to take risks and face adversity to achieve his or her purpose (Yasir *et al.*, 2021). In this sense, we propose Hypothesis 3:

H3. Perceived behavioral control is positively related to entrepreneurial intention among university students.

Figure 1 shows the theoretical model. The proposed hypotheses are presented with their abbreviations to facilitate identification, alongside proposed indirect effects. The proposed theoretical model is composed of four latent variables that are related to each other through a system of three hypotheses, which suggest that TPB elements have a direct relationship with the EI of Colombian university students. Estimation of these relationships enables one to determine their magnitude and test the hypotheses proposed for the specific context.

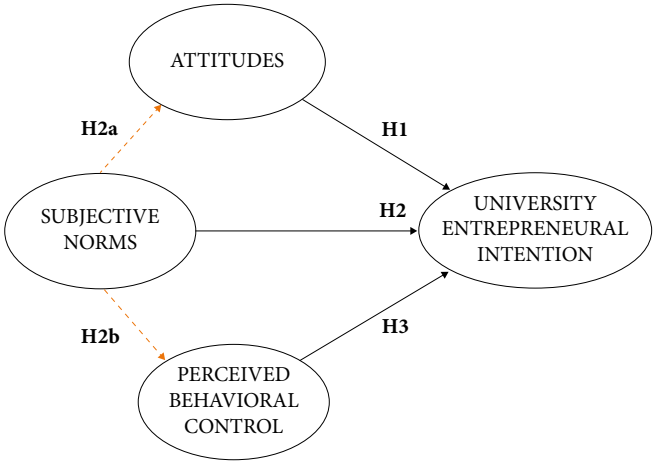

Figure 1
Theoretical model to IE
Source: Own elaboration based on theoretical review.

3. RESEARCH METHOD

Once the theoretical constructs that support the research have been established, we present some data on the population and the method of empirical validation for the hypotheses used. The population consists of Colombian university students interviewed within the framework of the GUESSS Global University Entrepreneurial Spirit Student's Survey project in which 57 national universities participate and whose questionnaire includes the theoretical dimensions presented up to this point. The methodology used to estimate the Path coefficients and validate the hypotheses is Partial Least Squares Path Modeling (PLS-PM), a two-stage methodology that allows one to construct indexes associated with the theoretical unobservable variables and establish their statistical relationship with the theoretical variables.

3.1. Sample

The GUESSS project started in 2003 with the objective of systematically studying and documenting the entrepreneurial intention and activity of university students around the world (Martins *et al.*, 2019). In its most recent version (2021), 208,636 students from 54 countries participated. In the case of Colombia, there is a survey record of 12,383 students belonging to 57 national universities. Considering that the objective of this study is to determine the relationships between the latent variables defined as determinants of EI among university students in Colombia, the population under study is defined as the 12,383 respondents in the country. This condition made it unnecessary to carry out any type of sampling since the necessary records were already available.

3.2. Dataset

The students surveyed belong to 12 departments of the country, with Valle del Cauca (20.42%) and Antioquia (18.44%) having the highest participation among the total population. Table 1 shows the frequency by department (see statement of data availability).

Table 1
Population distribution by department of residence

Departament	Individuals	Participation (%)
Valle	2504	20.42
Antioquia	2262	18.44
Atlántico	1788	14.58
Risaralda	1512	12.33
Caldas	1077	8.78
Boyacá	958	7.81
Cauca	928	7.57
Cundinamarca	629	5.13
Bolívar	343	2.80
Nariño	216	1.76
Quindío	48	0.39

Source: Prepared by the authors based on data from Project GUESSS (2021).

Regarding the responses, it should be noted that the GUESSS survey uses a 7-point scale, with 1 being the lowest level of qualification and 7 the highest. The response frequency for each of the proposed theoretical dimensions is shown in Figure 2. The average scale for the Personal Attitudes (PAs) variable is 3.2 points and indicates somewhat negative behavior among the students. The same analysis applies to the dimensions of Perceived Behavioral Control (PBC) (3.0) and Entrepreneurial Intensity (EI) (3.2). In the case of Subjective Norms (SNs), it is interesting that although students perceive the existence of these norms based on an average evaluation scale of 5.35 points, these norms do not ultimately have a relationship with the scales of entrepreneurial intention.

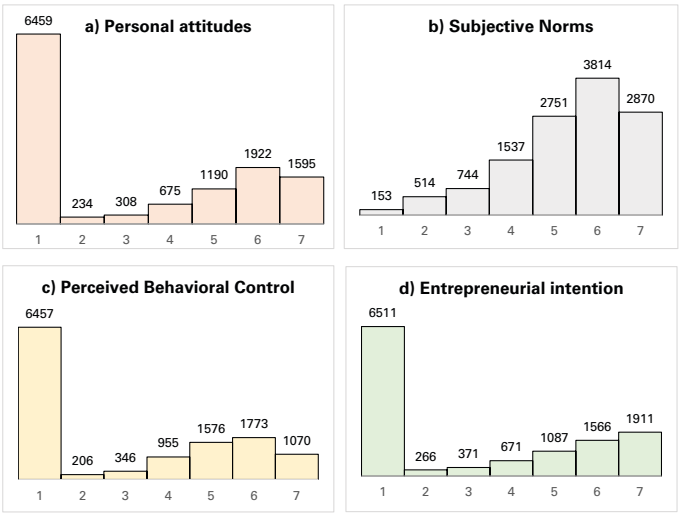

Figure 2
Frequency of responses by scale and dimension
Source: Prepared by the authors based on GUESSS Project (2021).

Figure 2 shows a scenario of relative pessimism on the part of Colombian university students. Here, EI is evaluated at a low level. Approximately 50% of the students do not have many incentives to start their entrepreneurial processes. The few that engage in entrepreneurship do so based on good indicators for PAs and PBC. This result highlights a preliminary disconnection between SNs[1] and EI.

[1] Which, although they exist, are not reflected in concrete undertakings.

3.2. Estimation method: Partial Least Squares-Path Modeling

Structural equation models (SEM) are used here to evaluate the proposed hypotheses. Such models have become an important tool for multivariate analysis during the last two decades in the social sciences (Castillo-Vergara & Torres Aranibar, 2019; Cepeda Carrión & Roldán Selgueiro, 2004). This method combines the use of unobserved variables (latent variables), which usually correspond to theoretical constructs, with the use of measurable variables for their estimation. These measurable or observable variables are usually handled using instruments measured on a Likert scale (Castillo-Vergara & Torres Aranibar, 2019; G. David Garson, 2016).

The SEM are made up of two stages that are estimated at different times. The first, called the External Model, establishes the relationships between latent variables or theoretical constructs and, through an analysis associated with Principal Component Analysis, allows one to estimate indexes associated with each of the latent variables. The second, known as the internal model, is made up of the causal relationships or relationships established between the latent variables. These relationships are presented as hypotheses, and the objective is to validate or invalidate these hypotheses by means of an estimation of relationship coefficients (Path) using Ordinary Least Squares (OLS) (Amofah & Saladrigues, 2022b; Chin, 1998; G. David Garson, 2016; Sánchez, 2013). The estimation of SEM is carried out via one of two types of techniques: 1) covariance analysis or 3) variances or correlations (Barroso *et al.*, 2010). In this case, estimation by means of variances or correlations will be used to establish relationships between the proposed theoretical constructs (Nguyen *et al.*, 2022).

To estimate the relationships between variables, Partial Least Squares-Path Modeling (PLS-PM) is used. This process uses blocks of manifest variables associated with an estimated variable to create a series of data associated with the theoretical concept. This construction is validated by applying Cronbach's Alpha and Dillon Goldstein's Rho statistics. Subsequently, parameter estimation is performed through OLS, and statistical validation is performed through t-Student and bootstrapping (Chin, 1998; G. David Garson, 2016; Sánchez, 2013). Estimates are made using the PLS.PM library developed by Sánchez (2013) for the programming language R.

3.3. Empirical Finding

As a first step, an evaluation of the blocks of manifest variables and their relevance in the latent variables' measurement is carried out. This is a Confirmatory Factor Analysis - CFA performed on the instrument to determine the statistical validity of the questions (Gil-León *et al.*, 2021). The validation of the manifest variables is carried out through four indicators. First, Cronbach's Alpha, which measures the overall relevance of the block of manifest variables based on the variance explained as a whole, the critical value of the Alpha must be greater than 0.8 to be considered excellent and greater than 0.6 to be acceptable (Castillo-Vergara *et al.*, 2018; Castillo-Vergara & Torres Aranibar, 2019). Chin (1998) and Latan and Richard (2018) consider an Alpha of 0.7 to be optimal. Second, Dillon Goldstein's Rho, which is defined by Sánchez (2013) as an estimator of the variance between manifest variables that structure a variable, its validity indicators are the same as those of the Alpha (with a trend equal to or greater than 0.7). Loading is an indicator of individual variance explanation for each of the manifest variables that structure the instrument, must be greater than 0.7 to give validity to the indicator. Finally, the communality of the variables, which is understood as a type of variance associated with the behavior of the data series for each question, is defined as the square of the loading value, so the critical value for validation is 0.5. Table 2 presents the results of the CFA performed on the blocks of manifest variables. As can be observe, validity and statistical robustness are found to be able to affirm that each of the manifest variables considered for the explanation of the hypotheses is significant and valid. This implies giving validity to the external model proposed in the research.

In addition, we performed an evaluation of cross-correlations, which showed the relevance of each of the manifest variables to its block or latent variable and not to others. The results showed that each of the manifest variables has the highest level of correlation with its own explained variable and that there is no type of variable that should be eliminated or changed in the distribution of blocks. Once the external model was statistically validated, the results of the internal model were presented and validated. To statistically evaluate the hypotheses using the PLS-PM methodology, three aspects must be considered: the direction and magnitude of the effect, validation of the t-statistic, and validation according to the bootstrapping interval.

Regarding the direction and magnitude of the effect between variables (Path), where the estimator is expected to be positive, as the formulation of hypotheses is carried out in the affirmative, a negative result suggests the existence of an opposite effect. The magnitude should be greater than 0.2 to find a weak relationship and greater than 0.8 to establish a very strong relationship (Chin, 1998). In this case, we found a strong statistical relationship between PAs and the corresponding EI (H_1). For H2, a negative sign was found, which indicates an inverse relationship between SNs and EI, a condition that directly invalidates this hypothesis and leads to the conclusion that it does not have statistical significance. Finally, H3 assembles the direction criterion (positive), but the magnitude establishes the existence of only a very slight relationship (0.17). Because we were close to the validation limit, we checked the other indicators to define the statistical validity of the hypothesis.

The t-Student statistic is a validation statistic for estimators obtained through OLS, which requires that the statistic obtained be greater than 0. Following Gujarati & Porter (2010), the statistic must be greater than the critical value of 5% confidence, i.e., greater than 1.96. In this case, statistical significance is again found for H_1 because the elements together with the Path of the existence of a strong relationship between the variables that structure this hypothesis are sufficient. In the case of H_2, there is not enough evidence to affirm its significance, so the hypothesis is considered not validated. In the case of H_3, validity is given to the existence of an effect (which is weak), and the t value of 26.6 gives statistical significance to the proposed relationship.

Table 2
Measurement evaluation results

Latent Variables	Cronbach's Alpha	Rho de Dillon Goldstein	Observed Variables	Loading	Communality
Personal Attitudes	0.985	0.988	Q4.1b_1	0.950	0.902
			Q4.1b_2	0.972	0.945
			Q4.1b_3	0.976	0.953
			Q4.1b_4	0.980	0.961
			Q4.1b_5	0.974	0.949
Subjective Norms	0.937	0.948	Q3.1_1	0.763	0.583
			Q3.1_2	0.846	0.716
			Q3.1_3	0.830	0.690
			Q3.2_1	0.828	0.686
			Q3.2_2	0.859	0.738
			Q3.2_3	0.862	0.743
			Q3.2_4	0.816	0.666
			Q3.2_5	0.854	0.729
Perceived Behavioral Control	0.989	0.991	Q4.2_1	0.963	0.928
			Q4.2_2	0.968	0.937
			Q4.2_3	0.975	0.951
			Q4.2_4	0.962	0.926
			Q4.2_5	0.970	0.941
			Q4.2_6	0.975	0.951
			Q4.2_7	0.974	0.949
Entrepreneurial Intention	0.989	0.991	Q4.1a_1	0.943	0.889
			Q4.1a_2	0.978	0.957
			Q4.1a_3	0.984	0.968
			Q4.1a_4	0.982	0.964
			Q4.1a_5	0.972	0.945
			Q4.1a_6	0.979	0.958

Source: own elaboration based on estimation results in R Studio.

Finally, a bootstrapping test was performed. This test consists of performing 100 simulations of the model estimation with the objective of constructing confidence intervals for each of the estimated Path coefficients. This test allows one to measure the degree of volatility of the data and its replicability with similar sample sets. In this case, notable robustness was found for each of the results obtained. Here, the calculated intervals comply with the condition of being short and not offering any surprises, thereby giving robustness and significant statistical validation to the estimated model.

Tabla 3
Resultados y validación de hipótesis

Hypothesis	Path	t-value	Boots. Interval	Hypothesis
H_1 – Personal attitudes → Entrepreneurial intention	0.81013	128.00	(0.80991 - 0.81034)	Validated***
H_2 – Subjective Norms → Entrepreneurial intention	–0.00119	–0.54	(–0.00123 - –0.00114)	No Validated
H_3 – Perceived Behavioral Control → Entrepreneurial intention	0.16951	26.66	(0.16929 - 0.16973)	Validated***

Note: *** denotes significance at 1% accepted error.

Source: Prepared by the authors based on estimation results in *R Studio.*

The statistical results validate two of the three hypotheses proposed in the internal model. The value obtained for the t-Student test exceeds the critical value of 1.96 for the evaluation. In addition, the bootstrapping intervals have a small deviation. Thus, significance was found in the relationships between PAs and PBC with the object variable EI among Colombian university students. Figure 3 shows the estimated model and the indirect effects, which will be discussed in the next section.

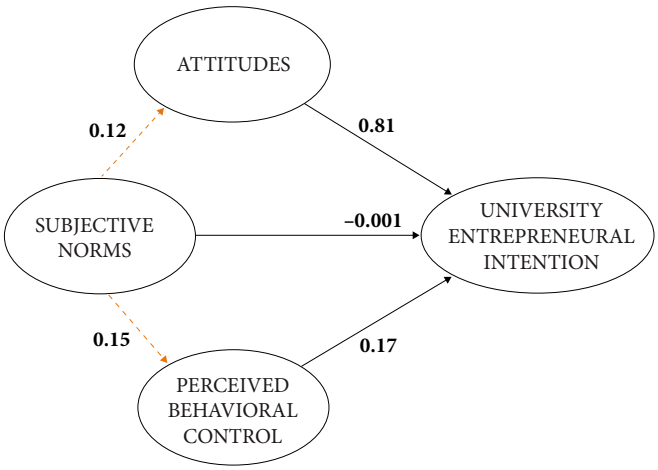

Figure 3
Estimated model
Source: own elaboration.

4. DISCUSSION

The TPB focuses on the influence of behavioral, normative, and control beliefs to explain human behavior (Ajzen, 1991). Through an empirical study, this research used these elements to analyze their relationship with the EI of university students in Colombia. The findings showed that the PBC and PA variables play a significant role in EI, while the SN variable is not relevant among Colombian university students. These results are consistent with studies conducted on university students in emerging economies such as India, China, and Iran, where SNs play an indirect role in EI (Esfandiar *et al.*, 2019; Roy *et al.*, 2017; Su *et al.*, 2021). It is noteworthy that Colombian university students have a negative perception of EI. When evaluating the PA and PBC variables, 54% of the sample revealed some favorability, while only 28% evaluated their EI within scales of 6 or 7 (see Figure 2). Precisely, these last scales evaluate the PA and PBC variables positively, explaining the relevance of both in EI and validating hypotheses H1 and H3. In this sense, a direct relationship was found between EI and the variables of PAs and PBC, and an inverse relationship was found between SNs and EI, which could indicate a possible disconnect between university initiatives and entrepreneurial actions among students.

The results show that PBC has only slight relevance in EI (H3), although it is important in explaining the entrepreneurial intentions of university students. First, Colombian university students showed progress in moving from intention to implementation of their actions. This result reveals that there are goals that guide intentions and allow the construction of a clear line of action focused on entrepreneurship (van Gelderen *et al.*, 2018). Second, we found a favorable perception of entrepreneurial capabilities; as more technical, creative, and managerial skills are developed, students' abilities to face the challenges associated with entrepreneurial activities also improve (Rueda-Barrios *et al.*, 2022). Those that have comprehensive preparation will be able to better act as entrepreneurs (Kobylińska, 2022). Third, PBC can be due to an increased propensity to engage in risk, which is common at this stage of life, especially among Latin American students (Torres *et al.*, 2017). This combination of factors allows us to better understand that skill development for university students is crucial to focus their actions and assume the risks involved in entrepreneurial activities.

The most relevant variable was found to be PAs (H1). This result is based on personality characteristics, which have been shown to have a high predictive capacity in emerging economies (Munir *et al.*, 2019). Likewise, attitudes are derived from the hedonic values that guide behavior, which can remain unchanged in different contexts (Kobylińska, 2022; Yasir *et al.*, 2021). Indeed, a favorable attitude allows students to perceive challenges in a more optimistic way (Barba-Sánchez *et al.*, 2022). It is, therefore, noteworthy that Colombian university students who presented favorable PAs had a greater propensity towards entrepreneurial activities.

The direct effects of PAs and PBC on EI show that as Colombian students feel they have more control over a behavior, they also develop a more favorable attitude towards that behavior. This favorable attitude is given not only in terms of taste but also in terms of feasibility (Liñán & Chen, 2009). Indeed, a notable cohort of university students in Colombia do not perceive that entrepreneurial activities will be viable or lead to advantages for the development of their life goals. However, students with favorable PAs perceived a greater capacity for entrepreneurship, knowing the challenges and difficulties that could arise in the development of their objectives. Hence, the favorability of PAs has an indirect effect that can potentiate PBC, allowing a combination of both variables to explain the orientation of EI among university students in Colombia.

The SNs did not show a significant relationship with, or a direct effect on, the EI of university students in Colombia (H2) (Amofah & Saladrigues, 2022; Barba-Sánchez *et al.*, 2022; Kobylińska, 2022). This result could be explained by perception of the university's climate and the approaches of entrepreneurship programs, many which are focused on theoretical discourse rather than practical tools for capacity building and have a negative effect on EI (Piperopoulos & Dimov, 2015). Hence, university students' perceptions related to entrepreneurship university programs are favorable in an academic scenario but not in a practical scenario. In fact, SNs did not have the expected effect, given that Colombian culture is considered collectivist (Seo, 2020). Students perceived the university's environmental conditions for entrepreneurship as indifferent in a real scenario, generating low adjustment toward normative beliefs and leading to behavioral and control beliefs (Esfandiar *et al.*, 2019).

SNs were found to have an indirect effect through the variables PAs and PBC (see Table 4). Although the perception of the environment was not significant enough to have a direct effect on EI, some aspects were found to have an important influence on PAs and PBC, indirectly shaping PAs (Barba-Sánchez *et al.*, 2022). Likewise, the construction of a university environment oriented toward entrepreneurship can form knowledge and skills that improve self-efficacy. Thus, the relevance obtained in PBC among Colombian university students could be partially and indirectly due to the university climate and entrepreneurship programs of their institutions (Kobylińska, 2022). In this sense, although there is no direct effect of the SNs on EI, the capabilities are indirectly potentiated by the resources of the environment and the structural support that is perceived in that context.

Table 4
Direct and indirect effects of the variables

Relationships	Direct	Indirect	Total
SN → PA → EI	0.000	0.12	0.120
PA → PBC	0.000	0.00	0.000
PA → EI	0.810	0.00	0.810
SN → PBC → EI	0.000	0.15	0.150
SN → EI	–0.001	0.00	–0.001
PBC → EI	0.170	0.00	0,170

Source: Prepared by the authors based on estimates made in *R Studio.*

These results allow us to understand the predictive capacity of TPB elements in relation to EI among university students in Colombia. In this sense, we determined how the perception of PAs and PBC can stimulate or dissuade EI. A negative effect was evidenced by a low perception of the viability of entrepreneurial activities and existing capabilities for executing such activities. However, we found that the incidence of SNs is directly irrelevant, which suggests that the development of conditions in the university environment to stimulate EI is still incipient. One of the shortcomings of universities in entrepreneurship promotion is the lack of connections with the productive sector and the generation of spaces outside the classroom for entrepreneurial skill development (Parada *et al.*, 2019).

These findings have practical implications for universities by promoting the understanding that entrepreneurship can help fulfill the third mission through knowledge transfer (Lopes *et al.*, 2021). Indeed, the integration of university students in knowledge exchange processes through external relationships contributes to the formation of capabilities that can stimulate EI. According to Calderón & Pérez (2021), there is a direct relationship between the increase in patents in universities, knowledge exchange, and the capacity building of academics. Therefore, developing capabilities for entrepreneurship is fundamental. Additionally, shifting the focus of entrepreneurship training programs from theoretical to experiential is crucial to engender such capabilities in a practical way and thereby close knowledge gaps and stimulate EI (Anosike, 2018). In short, the formation of capabilities among university students through an experiential process of knowledge exchange could become a strategy to stimulate entrepreneurship and transform it into one of the main ways of disseminating knowledge as a contribution of universities to their stakeholders.

5. CONCLUSIONS AND LIMITATIONS

The study of EI among university students is relevant in the field of entrepreneurship research due to its transcendence and implications in the orientation of entrepreneurial behavior, with EI being the best predictor of behavior. In this sense, the TPB proposed by Ajzen (1991) was applied here as a study framework with a high predictive capacity to analyze the influence of the PA, SN, and PBC variables on EI. Following international trends and the specific conditions of the study, a model of three latent variables (according to the dimensions of the TPB) with three directly related variables was proposed. The model was estimated using the Partial Least Squares Path Modeling methodology with a sample of 12,383 university students in Colombia.

The results showed a low perception of university students' favorability towards entrepreneurship, with the variables PBC and PAs being key determinants for this intention (i.e., the degree of favorability in these variables could stimulate or dissuade students' EI). However, SNs did not present any relevance in relation to EI, with the university environment as a variable perceived to have low significance in relation to entrepreneurial decisions. Nevertheless, SNs were found to have indirect effects through PBC and PAs. Hence, the entrepreneurial environment can play an important role in the development of entrepreneurial capabilities and beliefs among students. These findings have implications for this field of study since the results contribute to the understanding of the interactions between each of the elements of the entrepreneurial environment, TPB, and EI.

This research shows the effects and predictive ability of PAs and PBC in the context of an emerging economy. It also explores the indirect effects that can shape intentions, with the understanding that SNs can be associated with a change in vision regarding the role of universities in the promotion of EI. From this perspective, entrepreneurship can be considered a way of disseminating knowledge. However, it is necessary to develop a university climate focused on knowledge transfer that allows students to see entrepreneurship as a form of professional development. Accordingly, future lines of research in this field could focus on how entrepreneurship is consolidated within the processes of appropriation and knowledge transfer in the mission development of universities.

Finally, it is important to consider the limitations of this study, including the limited scope of the data and the consolidation of the constructs of each latent variable, as there was limited access to the instrument applied by the GUESSS project. In addition, the study provided results consistent with the geographical area of reference (Colombia), so it is possible that this methodology would obtain different results if applied to another territorial context. This is not a methodological limitation, per se, but a consideration for future replicability scenarios.

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Drivers and obstacles on refugee entrepreneurship. The host country perspective

Impulsores y obstáculos de la iniciativa empresarial de los refugiados. La perspectiva del país de acogida

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ABSTRACT

Refugee entrepreneurship encompasses the enterprising endeavors undertaken by individuals forced to flee their home countries. This research area has gained scholarly traction due to its profound relevance in the socio-economic perspective. To provide a comprehensive understanding of this phenomenon, a thorough systematic literature review was conducted, drawing upon the Scopus and Web of Science databases. The review scrutinized a corpus of 57 scholarly articles, which were analyzed and categorized into two main themes: the profile of refugees regarding their entrepreneurial intentions, and the contextual factors within the host countries that either facilitate or impede their entrepreneurial pursuits. Refugee entrepreneurship is associated with the necessity-driven perspective, as individuals often embark on entrepreneurial ventures due to the shortage of viable employment opportunities in their host countries. However, there exists a nuanced perspective wherein some refugees leverage their innate entrepreneurial traits, finding resonance between the economic landscapes of their home and host countries. Nevertheless, the inception of entrepreneurial endeavors is invariably accompanied by some obstacles, spanning legal, financial, and socio-economic domains. These obstacles do not deter the entrepreneurial spirit ingrained within many refugees. Instead, they serve as catalysts for resilience and innovation, prompting the formulation of adaptive strategies to surmount barriers and carve out pathways to success, underscoring the economic activity of displaced individuals and exemplifying their capacity to effectuate positive change amidst adversity.

Keywords: Refugee entrepreneurs, Social entrepreneurship, Drivers, Obstacles, Host country, Systematic Literature Review.

R E S U M E N

El espíritu empresarial de los refugiados engloba las iniciativas empresariales emprendidas por personas obligadas a huir de sus países. Esta área de investigación ha ganado terreno en los círculos académicos debido a su profunda relevancia desde el punto de vista socioeconómico. Para comprender este fenómeno, se implementó una revisión sistemática de la literatura utilizando las bases de datos Scopus y Web of Science. Se analizaron y clasificaron 57 artículos en dos temas principales: el perfil de los refugiados en cuanto a sus intenciones empresariales y los factores contextuales de los países de acogida que facilitan o impiden su actividad empresarial. El espíritu empresarial de los refugiados se asocia con la perspectiva de la necesidad de supervivencia, ya que las personas suelen embarcarse en proyectos empresariales debido a la escasez de oportunidades de empleo viables en sus países de acogida. Sin embargo, existe una perspectiva matizada en la que algunos refugiados aprovechan sus rasgos empresariales innatos, encontrando resonancia entre los panoramas económicos de sus países de origen y de acogida. No obstante, la puesta en marcha de iniciativas empresariales siempre va acompañada de obstáculos jurídicos, financieros y socioeconómicos. Estos obstáculos no disuaden el espíritu emprendedor arraigado en muchos refugiados. Por el contrario, sirven como catalizadores de resiliencia e innovación, impulsando la formulación de estrategias de adaptación para superar las barreras y labrar caminos exitosos, subrayando la actividad económica de las personas desplazadas y ejemplificando su capacidad para efectuar cambios positivos en medio de la adversidad.

Palabras clave: Emprendedores refugiados, Emprendimiento social, Dinamizadores, Obstáculos, País de acogida, Revisión sistemática de la literatura.

1. INTRODUCTION

Research on entrepreneurship is not new, with several different strands over time, e.g., entrepreneurial orientation, entrepreneurial intention, entrepreneurship education, rural entrepreneurship, nascent entrepreneurship, technology-based, opportunity-based, necessity-based, social, female entrepreneurship, among many others (Gartner, 2010; Geenen, 2014; Gordo-Molina *et al.*, 2022; Khursheed *et al.*, 2021; Liñán & Fayolle, 2015; Silva & Moreira, 2022). However, in recent years, economic globalization has given rise to global social problems, resulting in the displacement of people due to social and economic effects (Santamaria-Velasco *et al.*, 2021). Poverty has been one of these consequences, leading to an increase in the number of refugees and migrants worldwide, along with their different needs, challenges, and characteristics. As a result, host countries have been challenged to find ways to integrate refugees and migrants into their societies (European Commission, 2016; Meister & Mauer, 2019).

Migrants and refugees have led to the displacement of individuals, which has been growing over time (Santamaria-Velasco *et al.*, 2021; Sinkovics & Reuber, 2021), with social and economic consequences. While migrants and refugees can be considered highly mobile individuals, there is a significant difference between the two. Refugees cannot or do not wish to return to their country of origin due to fear of persecution based on nationality, race, membership, religion, a particular social group, or political opinion (UNHCR, 2010). Refugees exhibit distinct behaviors and face more barriers than traditional migrants (Refai *et al.*, 2018; Wauters & Lambrecht, 2008). As entrepreneurship can be viewed as a source of empowerment for those facing economic adversity (Edmiston, 2008; Slivinski, 2012), there is a need for more knowledge to understand refugee entrepreneurship (RE) as a stand-alone situation distinct from migrant entrepreneurs or self-initiated expatriates (Refai *et al.*, 2018).

Given the high levels of uncertainty and limited traditional career opportunities characterizing the circumstances of refugees, entrepreneurship emerges as a compelling avenue for their integration into the labor market (Obschonka *et al.*, 2018). Concurrently, it serves as a means of facilitating their assimilation into host societies. The impetus for entrepreneurship among refugees is driven by an array of factors, which encompass a survival-oriented or necessity mindset (Shneikat & Alrawadieh, 2019) and the distinctive characteristics of the host country (Alexandre *et al.*, 2019). Nonetheless, the establishment of new businesses by refugees is beset by various obstacles, encompassing legal, financial, and sociocultural dimensions, among others (Refai *et al.*, 2018). This predicament not only poses challenges for refugees themselves but also presents formidable challenges to the receiving nation (Refai *et al.*, 2018).

Despite its importance, there are few comprehensive reviews pertaining to RE within the scholarly literature (Abebe, 2023; Heilbrunn & Iannone, 2020; Sinkovics & Reuber, 2021). While previous literature systematically dissected several macro-contextual facets, at times encompassing the broader realm of migrant entrepreneurship, before ultimately zeroing in on the specifics of RE, no previous review has been singularly dedicated to scrutinizing the primary drivers and obstacles encountered by refugee entrepreneurs or delving into the genesis of how their entrepreneurial intentions emerge.

What are the specific obstacles that refugee entrepreneurs face in their host countries? What are the drivers that motivate refugees in their entrepreneurial behavior? Where does refugees' entrepreneurial intention originate from? This systematic literature review (SLR) aims to address these three gaps that have not been systematically explored in previous literature. Consequently, the main objective of this paper is to analyze the impact of an individual's profile on the entrepreneurial intention of refugees and the environment in the destination country. This article seeks to contribute to the enhancement of the literature on the specific topic of RE.

The paper is structured into six sections. Following this introduction, section 2 presents the key concepts related to the subject under study. Section 3 outlines the methodology employed in the systematic literature review. Section 4 presents the research results, highlighting the publication dates, journals, and research methods of the articles. Section 5 delves into the discussion of the results, subdivided into two subtopics: the refugee profile and entrepreneurial intention, and the host country's environment, addressing refugee integration and the drivers and obstacles of entrepreneurship. Finally, section 6 summarizes the conclusions drawn from the topic under examination.

2. BACKGROUND

The current high influx of refugees has generated significant social, economic, legal, and political debate worldwide (Desai *et al.*, 2021), generating considerable interest among academics and researchers. Refugees are individuals who flee their country due to persecution (Fuller-Love *et al.*, 2006) arising from wars or other dangers related to ethnicity, racial, religion, faith, or other threats to their lives (Zehra & Usmani, 2023). They normally seek refuge in host countries that offer improved life prospects (Fuller-Love *et al.*, 2006).

A comprehensive definition of a refugee was established during the Geneva Convention in 1951 (Welsh *et al.*, 2022, p. 723), which states that s/he "is an individual who fears persecution for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality, and is unable, afraid, or unwilling to avail her/himself of the protection of that country; or who, not having a nationality and being outside the country of his/her habitual residence, as a result of the above events, is unable or afraid to get back to the home country." Within the refugee population, there is a large heterogeneity of socioeconomic and demographic profiles, namely in age, gender, and education levels. The same is true for home and host countries, with various patterns of refugee flows.

It is important to distinguish between immigrants and refugees for multiple reasons. First, the distinction lies in the different motivations that encourage them to leave their home countries (Shneikat & Alrawadieh, 2019). While voluntary immigrants seek new opportunities aiming better lives, refugees, also known as involuntary immigrants, have survival and security of their lives as their main focus (Zehra & Usmani, 2023). Sometimes in the literature the terms ethnic, immigrant, and migrant are used interchangeably, but they refer to different fields of research (Johnson & Shaw, 2019).

Joining the terms refugee and entrepreneurship has giving rise to an increasingly explored construct in the literature: refu-

gee entrepreneurship. According to United Nations Conference on Trade and Development (UNCTAD), entrepreneurship can be defined as the ability and willingness to undertake, organize and run new enterprises, taking into account the associated risks and aiming for profit as a reward (Kachkar & Djafri, 2022).

Refugees turn to entrepreneurial activities as a way to overcome some external barriers in the host country, including discrimination in the labor market, language barriers, and limited of access to capital, among other factors (Kachkar & Djafri, 2022). Entrepreneurship, for refugees, becomes an alternative to employment, as a dignified means of survival, economic self-reliance and self-empowerment, as well as a way to increase their self-esteem (Kachkar & Djafri, 2022). Being their own bosses and the inherent attractiveness they find in entrepreneurship are additional motivating factors for refugees (Fuller-Love *et al.*, 2006). In addition, setting up a business in the host country is seen as an opportunity to feel integrated into that country (Fuller-Love *et al.*, 2006).

Compared to immigrants in general, refugees have fewer social networks in the host country, are less likely to return to their country of origin, and the traumatic events they have experienced may have consequences not only on their well-being, but also for their entrepreneurial activities (Harima *et al.*, 2021). Importantly, entrepreneurial refugees are characterized by high levels of resilience (Welsh *et al.*, 2022), strong determination, strong ability to build social networks, high qualifications, and sometimes prior experience in entrepreneurial activities (Paksoy *et al.*, 2023; Shneikat & Alrawadieh, 2019). Based on these characteristics, Christensen *et al.* (2020) define a refugee entrepreneur as someone who flees a country (home country) under threat and settles in another country (host country) for a period of at least twelve months and establishes a business.

When talking about RE, one can divide it into two types of entrepreneurial activities: entrepreneurship for refugees and entrepreneurship by refugees (Freudenberg & Halberstadt, 2018). This paper focuses mainly on the latter. However, entrepreneurship for refugees will also be addressed, particularly social entrepreneurship, which involves various opportunities to support different segments of society to reduce poverty and unemployment (Jarrar, 2022). This type of entrepreneurship aims to assist refugees in their integration into the host country and in developing entrepreneurial skills (Kong, 2019).

3. PREVIOUS REVIEWS ON REFUGEE ENTREPRENEURSHIP

As there is a paucity of reviews on RE (Abebe, 2023; Heilbrunn & Iannone, 2020; Sinkovics & Reuber, 2021) this section seeks to present previous on that subject, as shown in Table 1.

Table 1
Previous reviews on refugee entrepreneurship

Study	Focus	Method	Study period	Sample	Database	Contribution
Sinkovics and Reuber (2021)	Migrant entrepreneurs including refugees	Thematic analysis. Systematic review.	—	373	WoS	Push factors in international business literature in the host and home country. Push individual, business, working conditions, and institutional factors in the home country. Provision of personal and institutional support, limited opportunity conceptualization, diaspora networks, and individual assets that tend to constrain migrant entrepreneurship in the host country. Success factors in the international business literature.
Abebe (2023)	Comprehensive review and analysis of RE	Systematic Literature Review	1986-2020	131	Scopus	Determinants of RE: enablers, barriers and opportunities of new ventures creation; and institutions, entrepreneurial ecosystem and institutional voids as part of the institutional environment. Distinctiveness of RE: characteristics, self-employment rate and delineation of refugees; and input of RE in terms of self-reliance, integration, socio-economic development. RE as a career path: self-selection, motivations and occupational path as way of entrepreneurial potential; refugee women, informal refugee and solid refugee as type of refugees.
Heilbrunn and Iannone (2020)	Refugee entrepreneurs	Bibliometric analysis	1986-2018	55 journal articles, 9 book chapters and 4 books	EBSCOhost, Google Scholar, and Scopus	It synthesizes the basic foundations of the field. It separates the field of research of refugee and migrant entrepreneurs. It pinpoints the factors that influence RE: competition; uncertainty; culture; social, human and cultural capital; communication; institutional roles, among others. The impact of RE on the integration, social capital, livelihood, and identity for host counties and labor markets.

Source: Authors' own elaboration.

Based on a study that analyzed a sample of 373 manuscripts obtained from the Web of Science (WoS), Sinkovics and Reuber (2021) examined migrant entrepreneurs, including refugees, from an international business perspective. This thematic analysis encompassed the primary antecedents, success factors, and moderators of migrant entrepreneurship. It was possible to conclude that there are negative (push) individual, business, working conditions, and institutional factors in the home country, as well as pull factors in the host country, such as the provision of personal and institutional support, limited opportunity conceptualization, diaspora networks, and individual assets that tend to constrain migrant entrepreneurship (Sinkovics & Reuber, 2021).

In a different context, RE has been systematically addressed through a systematic literature review (SLR) (Abebe, 2023) and a bibliometric study (Heilbrunn & Iannone, 2020). It is clear that RE has been examined from various perspectives, including social sciences, humanities, ethnic studies, and migration studies, with a recent shift in focus away from immigrant, diaspora, and ethnic entrepreneurs (Abebe, 2023). Covering 55 journal articles, nine book chapters, and four books from the EBSCOhost, Google Scholar, and Scopus databases, Heilbrunn and Iannone (2020) propose three main thematic clusters: the contrast between migrant and refugee entrepreneurship, specifically the forced versus unforced nature, based on macro-environmental circumstances, socio-political contexts, and country-specific institutional characteristics; the institutional, human, social, and cultural factors influencing RE; and finally, the impact of RE.

4. RESEARCH METHOD

This paper aims to systematically analyze the literature on RE to assess and organize what is published in the two main academic platforms: Scopus and Web of Science (WoS). The Scopus and WoS databases were used since they are considered to be reliable and relevant, with rigorous selection standards (Yetkin & Tunçalp, 2023). The use of two databases reduced the risk of exclusion of relevant articles pertinent to the paper's objective.

A systematic literature review (SLR) is a scientific research methodology whose goal is to gather, organize, and evaluate the existing literature in a given field (Paul *et al.*, 2021). This method is highly regarded for its explicit and rigorous methods, provided they are properly justified (Denyer & Tranfield, 2006).

In the Scopus database, articles up until June of 2023 were selected, and three searches were conducted. The first search involved the keywords "refugee" and "entrepreneur*," while the second search included "refugee entrepreneur*." To complement the Scopus search, the Web of Science database was also used with the search term "refugee" and "entrepreneur*." The use of the asterisk (*) in the word "entrepreneur" was to encompass various word variations, such as entrepreneurship and entrepreneurs. The third search, complementing the previous ones, conducted in both databases, included to the previous terms combined terms such as "enterprising refugee*," "forced migrant entrepreneur*," "refugee self-employment," and "refugee* small business*," aiming to be as exhaustive as possible without overlooking any relevant articles on refugee entrepreneurs or entrepreneurship.

To ensure a more focused and rigorous search, the following inclusion criteria were applied to both databases: document type (Articles and Reviews), source type (Journals, just for Scopus), study area (Business, Management, and Accounting, for Scopus and Business, Management for WoS), and language (English). No time filters or additional keywords were used in the search. The Scopus search yielded 106 articles, while the Web of Science search resulted in 82 articles after applying the filters. Duplicate articles were checked and removed using the Scopus platform.

After compiling the set of selected articles, they were exported to an excel sheet and individually analyzed by the authors. The analysis considered the titles and abstracts of the articles to determine their relevance to the research theme. Articles that referred only to migrants were excluded since refugees have distinct characteristics that set them apart, making this an exclusion criterion.

The selection of articles was facilitated by using a color-coding method: green was used to signify articles for in-depth analysis, yellow for articles requiring further discussion, and red for articles that did not align with the research objectives. Following this process, 52 articles from the Scopus database and 5 articles from the Web of Science database were selected for further analysis, totaling 57 articles. Figure 1 illustrates the article search and selection process.

The approved documents serve as a foundation to understand the themes addressed in the literature. This allows for segmentation and grouping of the topics present in the results discussion. An interpretive perspective, based on an inductive approach as proposed by Jones *et al.* (2011), was used to analyze the different topics covered by all the articles. Consequently, the articles were organized and classified based on the two main topics identified.

The content analysis of the 57 articles included the following aspects:

- Main topics covered (Refugee's profile on entrepreneurial intention; host country environment: integration and drivers and obstacles);
- Methodology (qualitative or quantitative research; mixed research);
- Name of the journal.

Following Weed (2008) and Mota *et al.* (2021), we combined content and thematic analysis to capture the explanatory value and quantitative aspects of the articles. With this process we aimed to systematize a holistic view of the points preceding entrepreneurial activity in the host country by a refugee, based on the profile of the self and the environment in the host country as a driver or obstacle of the existence and success of entrepreneurial activities.

5. RESULTS

The selected articles for analysis predominantly encompass publications from the last four years, indicating that RE is an emerging theme within the academic literature. It is noteworthy that the earliest articles date back to 2006, while 2021 witnessed a notable surge in interest concerning this theme. Table 2 shows a comprehensive overview of the evolution of published articles.

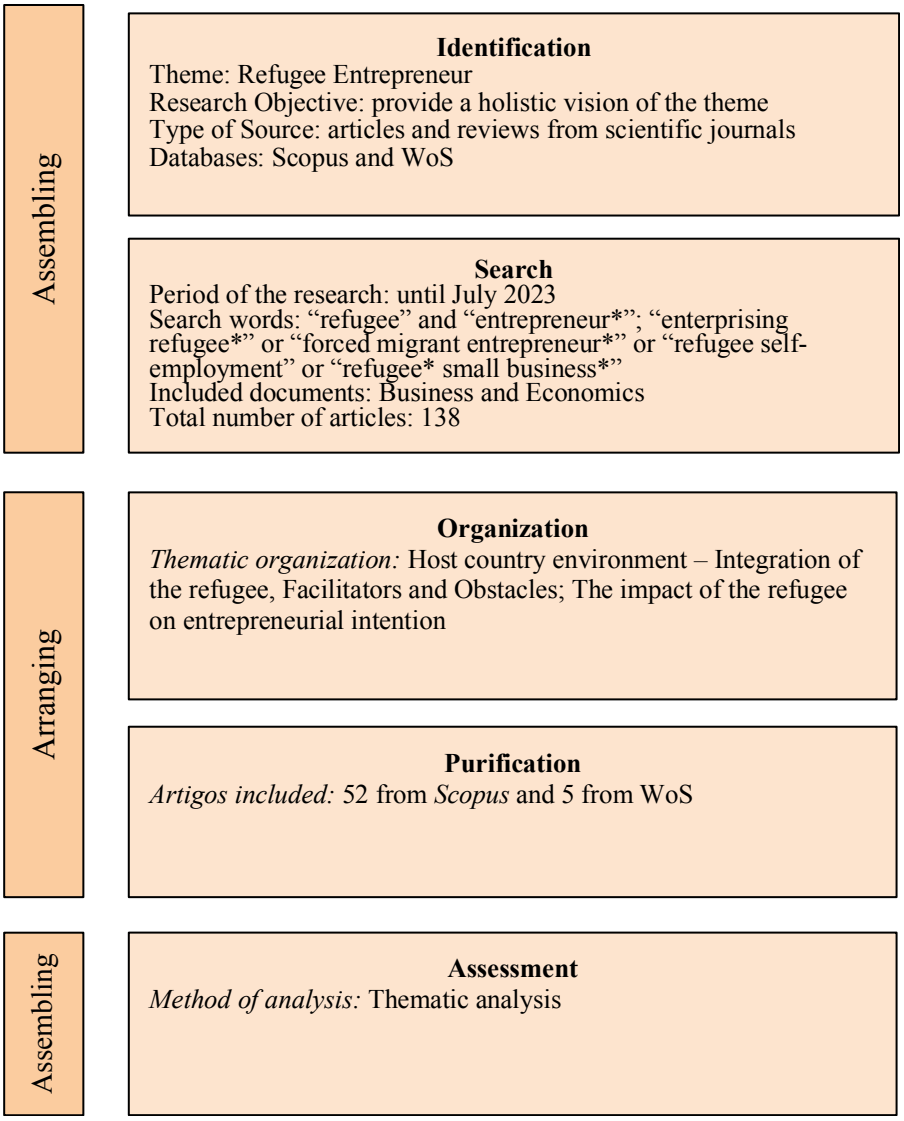

Figure 1
Search and article selection process
Source: Authors' own elaboration.

Table 2
Number of publications per year

Year	Number of Publications
2006	2
2010	1
2017	1
2018	4
2019	8
2020	8
2021	10
2022	10
2023	13

Note: the search was conducted until June 2023.
Source: Authors' own elaboration.

The selected articles were found to be distributed across 32 different journals. Among these, the most important outlet features eight articles: *Journal of Enterprising Communities. The International Journal of Entrepreneurial Behaviour and Research* is also one of the main outlets with six articles as shown in Table 3, which only highlights journals with two or more publications.

Table 3
Journals with two or more publications

Name of Journal	2022 SJR Score	(Best) Quartile	Number of articles	Percentage of articles	Cumulative percentage
J. of Enterprising Communities	0.719	Q2	8	14.04	14.04
Int. J. of Entrepreneurial Behaviour and Research	1.287	Q1	6	10.53	24.56
Small Business Economics	2.732	Q1	5	8.77	33.33
Int. Entrepreneurship and Management J.	1.524	Q1	4	7.02	40.35
J. of Business Venturing	5.029	Q1	2	3.51	43.86
Service Industries J.	1.996	Q1	2	3.51	47.37
Entrepreneurship and Regional Development	1.774	Q1	2	3.51	50.88
J. of Social Entrepreneurship	0.813	Q1	2	3.51	54.39
J. of Entrepreneurship in Emerging Economies	0.824	Q1	2	3.51	57.89
Int. J. of Contemporary Hospitality Management	2.500	Q1	2	3.51	61.40
Int. J. of Entrepreneurship and Innovation	0.855	Q1	2	3.51	64.91
Total			57	100	100

Source: Authors' own elaboration.

Table 4 presents a comprehensive overview of the main research methodologies employed within these articles, with a distinct emphasis on qualitative methodologies. Out of the 57 articles included in the study, 71.9% were identified as qualitative studies. This preference for qualitative approaches may stem from the inherent need for in-depth exploration of multifaceted issues and interpretations, which is often attainable through interviews. A majority of the qualitative studies were reliant on semi-structured interviews, with two studies incorporating the use of focus groups. The prevalence of qualitative studies underscores the nascent stage of research in the field of RE.

Table 4
Main research methods

Quantitative Methods	14
Qualitative Methods	41
Mixed Methods	2

Source: Authors' own elaboration.

Collectively, the 57 articles have garnered a total of 1,120 global citations (TGCs), as depicted in Table 5. TGCs indicate the frequency with which articles have been cited across the SCOPUS platform, underscoring the interdisciplinary nature of the included articles and their overall impact on academic research. Table 5 also presents the total local citations (TLCs), indicating the number of times these articles have been cited within the selected literature. The relatively modest number of TLCs in comparison to TGCs underscores that the topic of RE remains in the early stages of consolidation within the research landscape, reaffirming its status as a recent and evolving subject of study.

6. CONTENT AND DISCUSSION

The two main topics covered in the literature are shown in Table 5. To understand what influences entrepreneurship among refugees, two aspects were evaluated: the drivers and obstacles found at the host country, and the profile of the refugee in entrepreneurial intention.

Table 5
General perspectives and ranking of the articles based on TGC and TLC

			Entrepreneurship Intention				Host country environment						
			Refugee's profile				Drivers			Obstacles			
Authors	TGC	TLC	Human Capital	Social Capital	Refugee's Characteristic	Need factors	Similarities to home country	Business support for refugees	Government policies	Legislative and administrative	Market-related issues	Financial challenges	Sociocultural challenges
Bizri (2017)	127	15									x		
Obschonka *et al.* (2018)	103	4			x								
Shepherd *et al.* (2020)	17	6			x								
Bagwell (2018)	66	—	x	x			x		x				
Alrawadieh *et al.* (2019)	64	8			x			x	x			x	x
Wauters and Lambrecht (2006)	62	9			x				x				

			Entrepreneurship Intention				Host country environment						
			Refugee's profile				Drivers			Obstacles			
Authors	TGC	TLC	Human Capital	Social Capital	Refugee's Characteristic	Need factors	Similarities to home country	Business support for refugees	Government policies	Legislative and administrative	Market-related issues	Financial challenges	Sociocultural challenges
Meister and Mauer (2018)	53	9						x			x		x
Shneikat and Alrawadieh (2019)	48	9							x				
Desai *et al.* (2021)	45	10	x										
Refai *et al.* (2018)	44	7								x			x
Fuller-Love *et al.* (2006)	38	0	x		x								
Mawson and Kasem (2019)	38	11			x		x						x
Sinkovics and Reuber (2021)	38	1						x					
Alexandre *et al.* (2019)	28	9					x						
Harima *et al.* (2020)	21	5						x		x			
Backman *et al.* (2021)	20	4						x	x		x	x	
Harima and Freudenberg (2020)	20	3	x										x
Harima *et al.* (2021)	19	3			x								x
Alrawadieh *et al.* (2021)	18	1	x	x				x	x				
Hack-Polay and Igwe (2019)	18	0							x				
Christensen *et al.* (2020)	17	3	x	x									
Heilbrunn and Iannone (2020)	14	3	x	x	x			x	x	x		x	x
Welsh *et al.* (2022)	12	2	x										
Adeeko and Treanor (2022)	12	2			x								
Almohammad *et al.* (2020)	12	1	x			x		x					x
Senthanar *et al.* (2021)	12	2			x								
Cetin *et al.* (2022)	11	0				x							
Zighan (2020)	10	1								x		x	
Freudenberg and Halberstadt (2018)	10	0		x									
Harima (2022)	9	1	x										
Yeröz (2019)	8	2			x								
Jiang *et al.* (2021)	8	2						x					
Kazlou and Wennberg (2023)	7	2	x	x	x								
Kariv *et al.* (2010)	6	0	x										
Zehra and Usmani (2023)	6	0		x		x				x			x
Johnson and Shaw (2019)	5	1											x
Kachkar and Djafri (2022)	5	0				x					x		x
Santamaria-Velasco *et al.* (2021)	4	1	x	x		x					x		
Kong (2019)	4	0						x					x
Abebe (2023)	3	0			x						x		x
Luseno and Kolade (2023)	2	0		x					x				
Nijhoff (2021)	2	0	x				x			x		x	
Abuhussein (2023)	1	0				x							
Lazarczyk-Bilal and Glinka (2021)	1	1	x		x				x				
Klyver *et al.* (2022)	1	0	x	x						x			
Cifci and Cetin (2023)	0	0	x	x		x		x	x				
Christensen and Newman (2023)	0	0					x						
Gama *et al.* (2023)	0	0						x					
Jarrar (2022)	0	0						x					
Kassab *et al.* (2022)	0	0				x			x				
McSweeney (2023)	0	0						x					
Noorbakhsh and Teixeira (2023)	0	0	x	x						x		x	x
Paksoy *et al.* (2023)	0	0				x		x					
Qin (2023)	0	0						x					
Richey *et al.* (2022)	0	0								x			x
Schmich and Mitra (2023)	0	0										x	x
Yeshi *et al.* (2022)	0	0								x			x

Source: Authors' own elaboration.

6.1. Refugee's profile of entrepreneurial intention

Refugees who are economically active, irrespective of their home or host country, exhibit similar characteristics and backgrounds. However, it is crucial to acknowledge that intentions determine behavior, although accurately predicting the latter is challenging (Wauters & Lambrecht, 2006), as it depends mainly on the stability of entrepreneurial intentions and external factors beyond individual control. The resilience of individuals is pertinent in the face of adversity (Obschonka *et al.*, 2018; Shepherd *et al.*, 2020), whether driven by self-interest or a desire to help others (Shepherd *et al.*, 2020). Thus, entrepreneurial intention can be defined as the intention to start a business arising from a conscious decision-making process that combines market and external environment issues with personal capabilities (Krueger *et al.*, 2000; Mawson & Kasem, 2019).

In the subsequent subsections, the factors influencing the entrepreneurial intention of refugees will be addressed, contributing to the delineation of a possible profile of the refugee entrepreneur in the host country.

6.1.1. Human Capital: Education and Work Experience

Personal characteristics, particularly human capital, play a crucial role in all entrepreneurial activities (Nijhoff, 2021). Human capital, encompassing refugees' education, work experience, and prior entrepreneurial ventures, determines their access to the labor market and the potential to establish businesses in the host country (Nijhoff, 2021; Santamaria-Velasco *et al.*, 2021). The human capital among refugees is notably diverse (Kazlou & Wennberg, 2023).

Human capital can be categorized into three distinct yet interconnected areas (Christensen *et al.*, 2020): general human capital, referring to basic activities like writing, reading, and basic calculations, which are not considered highly differentiating factors; specific human capital, related to specific and localized skills and knowledge that create substantial added value due to their rarity; and hidden human capital, encompassing individuals' perceptions, attitudes, and beliefs when confronted with various contexts, such as how they interact with people from diverse backgrounds or social classes.

Education, as a general measure of human capital (Kazlou & Wennberg, 2023; Noorbakhsh & Teixeira, 2023), significantly shapes the career paths of refugees (Lazarczyk-Bilal & Glinka, 2021) and plays a key role in the success of entrepreneurship (Kazlou & Wennberg, 2023). Some refugees encounter difficulties in having their professions recognized in the host country, whether due to lack of national-level requirements, discrimination, or a lack of local network. Therefore, RE becomes an avenue for highly educated refugees, possessing language skills, for example (Bagwell, 2018), to integrate into the labor market, particularly in light of the previously described situations (Welsh *et al.*, 2021) (Almohammad *et al.*, 2020). Refugees with higher education tend to be opportunity-driven entrepreneurs, while those with less education are more inclined toward necessity-driven entrepreneurship (Kariv *et al.*, 2010). Additionally, refugees with higher qualifications may find it easier to secure conventional job opportunities if their entrepreneurial ventures do not yield the desired results (Kazlou & Wennberg, 2023).

Human capital can also be influenced by the skills developed by refugees (Desai *et al.*, 2021). Managerial skills and competencies can enhance business performance (Fuller-Love *et al.*, 2006; Kariv *et al.*, 2010), and individuals need to familiarize themselves with the market conditions and structure of the host country when embarking on an entrepreneurial path, as starting a business involved different responsibilities and processes across countries (Desai *et al.*, 2021). Skills and knowledge with global applicability, such as in information technology and engineering, can become valuable assets in entrepreneurial endeavors (Harima *et al.*, 2020).

However, certain know-how possessed by refugees may not be viable in a given country due to cultural and institutional differences or different consumer habits (Harima, 2022; Harima *et al.*, 2020). Entrepreneurs relying on skills and qualifications from their home country must assess whether they can be effectively applied and transferred in the host country (Harima *et al.*, 2020). It is essential to recognize that stocks of human capital are not immediately transferable to the host economy (Noorbakhsh & Teixeira, 2023). Furthermore, higher levels of education, skills, and experience aid in better assimilating the host country's culture (Kariv *et al.*, 2010).

Moreover, having prior experience as self-employed increases the likelihood of entrepreneurial intention in the host country (Lazarczyk-Bilal & Glinka, 2021). Work experience in industries or sectors where refugees aspire to establish their entrepreneurial ventures, whether acquired in their home country or the host country, is also significant (Alrawadieh *et al.*, 2021). Additionally, previous entrepreneurship experience strongly influences the success of entrepreneurial ventures in the host country (Cifci & Cetin, 2023; Kariv *et al.*, 2010). Complementarily, risk-taking propensity and a strong need for achievement are crucial success factors for refugees becoming entrepreneurs (Paksoy *et al.* (2023). Furthermore, Klyver *et al.* (2022) emphasize that crisis self-efficacy, the ability to perform well in stressful life events and persist in the face of adversity, are among the most significant factors for refugee entrepreneurs.

6.1.2. Social Capital: networking activities

Social capital refers to the accumulation of real and virtual resources by individuals or groups through enduring networks of more or less institutionalized relationships involving knowledge and mutual recognition (Bourdieu & Wacquant, 1992; Luseno & Kolade, 2023). Within social capital, the structures and patterns of connections, norms of reciprocity and trust, and personal relationships among stakeholders influence their behaviors, including entrepreneurial behavior (Christensen *et al.*, 2020).

In the field of entrepreneurship, social capital has been recognized for its impact on individuals' career decisions, particularly in their choice to become entrepreneurs (Santamaria-Velasco *et al.*, 2021). It is especially relevant for refugees seeking business opportunities in unfamiliar environments (Santamaria-Velasco *et al.*, 2021) and can be considered a competitive advantage (Bagwell, 2018).

Networking activities are crucial for the establishment and exploration of new entrepreneurial ventures. However, refugees often face limitations in resources when starting businesses in the host country, with few nearby friends and family members to rely on for support and limited capital to build new networks (Christensen *et al.*, 2020; Cifci & Cetin, 2023). Nonetheless, successful networking, particularly through family members or individuals from the same ethnic background, greatly benefits refugees, both at the business level and emotionally (Alrawadieh *et al.*, 2021). Such networking enhances resilience and enables the creation of new entrepreneurial environments and markets (Klyver *et al.* 2022), facilitating the exchange and co-production of knowledge among entrepreneurial refugees and adding value to their ventures (Luseno & Kolade, 2023).

Family plays a significant role in promoting or hindering entrepreneurial behaviors among refugees (Zehra & Usmani, 2023). Families provide important intangible resources such as values, information, stories, and social skills, along with tangible assets like financial capital and unpaid labor (Alrawadieh *et al.*, 2021). Access to financial capital from families becomes vital for refugees, who often lack established relationships with financial institutions in the host country (Bagwell, 2018; Kazlou & Wennberg, 2023). Therefore, social capital can compensate for the lack of certain human capital in various contexts (Luseno & Kolade, 2023). However, due to the negative circumstances under which refugees flee their home countries, they may sometimes experience low social capital as family networks become fragmented (Noorbakhsh & Teixeira, 2023).

6.1.3. Characteristics of the refugee as moderating variables: gender

A subtopic that has emerged in the literature on RE is refugee women entrepreneurship (Abebe, 2023). Women, in general, face more challenges than men when it comes to entrepreneurship (Lazarczyk-Bilal & Glinka, 2021). Refugee women often choose entrepreneurship for its flexible schedules, enabling them to work from home and balance household chores and childcare responsibilities (Senthanar *et al.*, 2021). Language barriers and discomfort working in male-dominated environments are additional factors contributing to their preference for entrepreneurship (Senthanar *et al.*, 2021).

Education (human capital), as discussed earlier, is a crucial factor enabling women to embark on entrepreneurial activities (Yeröz, 2019). While women may excel at social contacts (social capital), male entrepreneurs tend to exhibit more confidence and possess better business networks (Fuller-Love *et al.*, 2006). As a result, women are underrepresented in entrepreneurship and often earn less than male entrepreneurs.

Entrepreneurship provides women with a sense of independence, income generation, and improved social standing (Adeeko & Treanor, 2022). They are also more likely to focus on activities related to their culture and serve the broader refugee community (Senthanar *et al.*, 2021). Additionally, in certain contexts, women engage in entrepreneurial activities in collaboration with their husbands.

Regarding male entrepreneurship, past experience in self-employment or exposure to family members as entrepreneurs increases the likelihood of men starting their own businesses (Fuller-Love *et al.*, 2006). Age is also identified as a factor affecting self-employment (Kazlou & Wennberg, 2023). In general, refugee entrepreneurs are characterized as highly educated, young, male, and experienced in similar types of businesses in their home country (Alrawadieh *et al.*, 2019).

6.2. *The host-country context*

6.2.1. Integration of refugees in the host country

The profile of refugees significantly impacts their entrepreneurial activity, but the environment in the host country also plays a crucial role in shaping their path. Understanding the factors that influence refugees' integration and subsequently affect their entrepreneurial endeavors is important.

When refugees find themselves in a new country, they face a set of factors that influence their integration, which can be grouped into three major groups (Abebe, 2023; Nijhoff, 2021): the individual level; the social level; and the institutional level.

More specifically, the individual level focuses on lack of language proficiency (Abebe, 2023; Kong, 2019; Zehra & Usmani, 2023), cultural understanding (Harima & Freudenberg, 2020; Johnson & Shaw, 2019), educational and qualification recognition (Mawson & Kasem, 2019; Nijhoff, 2021; Zehra & Usmani, 2023), limited market knowledge and opportunities (Abebe, 2023), and psychological trauma (Nijhoff, 2021; Yeshi *et al.*, 2022; Zehra & Usmani, 2023).

At the community level, the social aspects encompass the network of contacts and connections, limited access to finance, and lack of formal support (Backman *et al.*, 2021; Nijhoff, 2021). Xenophobia and social exclusion can also be highlighted here (Abebe, 2023; Yeshi *et al.*, 2022), which may accentuate barriers already present.

At institutional level, the legal status of refugees stands out, which is a lengthy process that translates into an uncertain residency status (Nijhoff, 2021), bureaucratic obstacles (Meister & Mauer, 2018; Yeshi *et al.*, 2022), restrictions on employability (Santamaria-Velasco *et al.*, 2021) and regulatory regimes that impose limitations on entrepreneurship. In addition to these barriers, existing problems in the destination country, such as economic crises and high unemployment rates, can exacerbate limitations faced by refugees (Zighan, 2020).

As a consequence of the legal issues presented, many refugees are forced to work in industries that exploit them, enduring manipulations and precarious payments (Refai *et al.*, 2018). Even when refugees obtain legal work permits, they are still struggling with low-wage issues (Shneikat & Alrawadieh, 2019) and working extended hours (Zighan, 2020), and also in jobs that local citizens do not want to perform, often considered dead-end jobs (dirty, difficult, and dangerous) (Alrawadieh *et al.*, 2019). It is also common for refugees without legal status to work on the black market as informal labor (Alrawadieh *et al.*, 2019). However, the presence of the legal status may allow them to work legally and therefore based on their qualifications and educational level (Alrawadieh *et al.*, 2019).

It is also important to highlight that refugees may have high skills in several areas, being able to produce high-quality prod-

ucts (Refai *et al.*, 2018). However, working for lower wages, compared to the local community, triggers social tensions, since they produce high-quality products at lower cost compared to local citizens (Refai *et al.*, 2018). Cifci and Cetin (2023) provide insights into additional characteristics and success factors related to RE, which is relevant to complement the aforementioned organizational factors, including the type of business, marketing, and employees.

Refugees face yet another problem, "deprofessionalization" (Lazarczyk-Bilal & Glinka, 2021; Richey *et al.*, 2022), where they lose the recognition of their credentials from their country of origin. This loss can be especially shocking for refugees who held high-skilled positions, such as doctors or professors, and it often leads to unemployment or unsatisfactory employment. Consequently, it can have detrimental effects on their mental health, leading to a decline in self-esteem (Mawson & Kasem, 2019) and feelings of isolation, which may cause them to withdraw from social situations, making it difficult for them to establish new social connections (Richey *et al.*, 2022).

Another significant issue that contributes to the discrimination of refugees in the mainstream labor market is the lack of language skills (Shneikat & Alrawadieh, 2019), particularly in terms of vocalization and comprehension. Furthermore, their qualifications may not be recognized in the host country, and they may face prejudice simply because they are perceived as outsiders (Alrawadieh *et al.*, 2019). While RE can play a crucial role in economic and social integration, it is essential to address the barriers that refugees face in the host country to prevent them from becoming vulnerable again (Schmich & Mitra, 2023).

6.2.2. Drivers

Refugees may embark on the entrepreneurial process due to both negative antecedents, known as push factors, and positive antecedents, known as pull factors (Sinkovics & Reuber, 2021). Pull factors are associated with motivations and facilitators that drive refugees to become entrepreneurs.

The existing literature highlights that refugees engage in entrepreneurship due to a combination of individual and contextual factors (Abuhussein, 2023; Cetin *et al.*, 2022). Individual factors pertain to the refugee's own entrepreneurial ambitions and personal desire for integration (Berns, 2017; Cetin *et al.*, 2022), as discussed earlier. On the other hand, contextual factors relate to constraints that hinder refugees from accessing the conventional labor market, leading them towards self-employment (Cetin *et al.*, 2022; Fong *et al.*, 2007). Thus, RE is often driven by necessity. Refugees initiate entrepreneurial activities to gain more independence and autonomy or because they face unfavorable employment conditions and cannot find suitable opportunities under others' supervision (Almohammad *et al.*, 2020; Kassab *et al.*, 2022). These endeavors aim to improve their quality of life and economic situation (Santamaria-Velasco *et al.*, 2021).

Christensen and Newman (2023) propose that the RE process can be categorized into two strategies: reinvention and reinforcement. Reinvention occurs when refugees distance themselves from their home country identity and seek a new identity, while reinforcement happens when they want to maintain a strong connection with their home country identity.

Alexandre *et al.* (2019) suggest that refugees may be more motivated to become entrepreneurs in countries where they find common cultural aspects with their country of origin. The relationships between the home and host country also influence refugees' entrepreneurial pursuits (Bagwell, 2018). For instance, Syrian refugees may be more inclined to start businesses in Lebanon due to shared socio-cultural characteristics, such as food and language, which facilitate their integration. Additionally, they are attracted to countries where their financial assets, family, and personal savings hold significant value, and where establishing a business is feasible (Paksoy *et al.*, 2023).

To facilitate this entrepreneurial process, providing support for refugees is essential. Entrepreneurial support refers to business services that help refugee entrepreneurs overcome obstacles and structural disadvantages (Qin, 2023). Social enterprises play a role in formulating social capital, promoting greater social interaction and knowledge exchange in diversified societies (Kong, 2019). Moreover, social entrepreneurship fosters self-reliance among refugees and can contribute to gender empowerment (McSweeney, 2023), specially when social entrepreneurship disrupts the institutional conditions of poverty and improve the lives of refugees (McSweeney, 2023).

Within this framework, business incubators with a focus on supporting refugees emerge, playing a crucial role in the development of social networks and the exploration of opportunities. Given the uncertain circumstances faced by refugee entrepreneurs in the host country, the need for a tailored incubation model is evident (Meister & Mauer, 2018). For these incubators to be effective, it is imperative that they support refugee entrepreneurs across five domains: providing structured business knowledge; alleviating concerns regarding institutional disparities; motivating participants; leveraging the host country's social capital; and addressing personal matters (Harima *et al.*, 2020). Crowdfunded microfinance institutions offer another avenue to assist refugees, serving as intermediaries between lenders and refugee entrepreneurs, thereby expanding the avenues for financing (Gama *et al.*, 2023).

Training programs exemplify a valuable tool that assumes great significance (Almohammad *et al.*, 2020; Alrawadieh *et al.*, 2019, 2021; Meister & Mauer, 2018) for refugees who were unable to acquire specific skills in their home country due to the absence of quality educational institutions (Sinkovics & Reuber, 2021). These programs not only aid entrepreneurial refugees in improving their language proficiency but also equip them with a more comprehensive understanding of existing regulations (Alrawadieh *et al.*, 2019). For instance, training in social skills, network development, and dynamic strategies can help refugee entrepreneurs familiarize themselves with host country resource channels, thus facilitating the acquisition of valuable information for their business ideas (Jiang *et al.*, 2021).

Government policies, when designed to facilitate entrepreneurship, encourage refugees to establish their businesses, as they are subject to fewer restrictions related to work permits (Kassab *et al.*, 2022; Bagwell, 2018). Host country policies create opportunities for refugees to contribute to the host nation while aiding in their financial and social recovery (Cifci & Cetin, 2023; Luseno & Kolade, 2023). In other words, it is not only refugees who stand to benefit but also the host country. To promote the

integration of refugee entrepreneurs, policies should focus on enhancing their language skills, strengthening their family and co-ethnic networks, and improving their relations with the host country's society (Alrawadieh *et al.*, 2021). However, political and economic changes have weakened governments, rendering them sometimes incapable of meeting all the needs of refugees. To complement government efforts, other institutions such as voluntary agencies play an increasingly vital role. Hack-Polay and Agu Igwe (2019) advocate the importance of establishing strategic partnerships between the public and voluntary sectors.

Significantly, policies may exhibit greater efficacy when implemented within a decentralized context (Alrawadieh *et al.*, 2019). This stems from the fact that local governments and municipalities, possessing a deeper understanding of regional nuances, are better positioned to cater to the diverse needs of refugees residing in disparate regions (Alrawadieh *et al.*, 2019).

From the perspective of the host country, the integration of refugees into society can be facilitated through the promotion of RE (Shneikat & Alrawadieh, 2019; Wauters & Lambrecht, 2006). Furthermore, fostering entrepreneurship in general can assume a more prominent role (Wauters & Lambrecht, 2006). As elucidated by Alrawadieh *et al.* (2021), entrepreneurship within the tourism sector enhances the social standing of refugee entrepreneurs, as it immerses them in aspects related to the host country's culture on a daily basis. According to Cifci & Cetin (2023), the tourism and hospitality sector holds advantages for refugees, as it does not demand language proficiency and enables them to initiate ventures with limited capital.

The perception that refugees receive greater support in the host country than in their country of origin encourages them to embrace entrepreneurship. For instance, Lazarczyk-Bilal and Glinka (2021) illustrate that in Syria, refugee women experienced a lack of support from their homeland and encountered daily struggles for their rights, whereas in Sweden, they perceive their rights as readily available and equitable, affording them the opportunity to engage in work of their choosing. Additionally, they consider the availability of day care centers pivotal, as it enables them to pursue careers rather than solely tending to their children, as was the case in their home country.

In addition to these factors, one of the motivations for refugees to pursue entrepreneurship is the potential to generate job opportunities, not only for the broader society but also for their own refugee community (Almohammad *et al.*, 2020; Cifci & Cetin, 2023).

6.2.3. Obstacles

Refugees often encounter obstacles and barriers when establishing and developing their entrepreneurial activities. Due to their integration in the host country, many refugees are driven to become entrepreneurs as a means to bridge the gap in precarious work and overcome discrimination (Refai *et al.*, 2018). They also seek better wages that align with their skills, qualifications, and experience (Alrawadieh *et al.*, 2019).

Racism can serve as a driving force for entrepreneurial activity among refugees, leading them to form interconnected networks with other refugees to generate and exchange ideas (Bizri, 2017). Entrepreneurship thus emerges as an alternative way for refugees to leverage their personal resources (Almohammad *et al.*, 2020) and achieve better socioeconomic integration within society (Alrawadieh *et al.*, 2019).

Within context of entrepreneurial activity, refugees encounter challenges that can be aggregated into four major groups (Almohammad *et al.*, 2020; Alrawadieh *et al.*, 2019): legislative and administrative challenges; market-related problems; financial challenges; and sociocultural challenges.

Legislative and administrative challenges refer to issues related to the refugee-state relationship, including bureaucratic processes, unclear legislation, and a lack of government support (Yeshi *et al.*, 2022). Such complex administrative procedures related with starting a business could discourage potential entrepreneurs from starting their own firm (Noorbakhsh & Teixeira, 2023). All of this is exacerbated when refugees themselves have an uncertain legal status, since without legal status they cannot officially start businesses (Zighan, 2020).

Market challenges encompass issues such as a lack of qualified human resources, the influence of the black market, stakeholder discrimination, market ambiguity and instability, limited revenues, and unfamiliarity with the local market environment (Meister & Mauer, 2018). Financial challenges (Noorbakhsh & Teixeira, 2023) affect business growth due to limited access to financial resources such as credit, rigid bank processes, high fees, restrictions on capital movements, and limited payment facilities. Few banks are willing to assist refugees (Alrawadieh *et al.*, 2019), partly due to the instability of residence permits and temporary status (Nijhoff, 2021; Schmich & Mitra, 2023) and the lack of collaterals required for loans (Zighan, 2020).

Sociocultural challenges (Noorbakhsh & Teixeira, 2023) include difficulties in adapting to the local culture, language barriers, racism, discrimination, and social insecurity (Meister & Mauer, 2018; Yeshi *et al.*, 2022). Language barriers are particularly significant obstacles for refugee entrepreneurs, especially in the bureaucratic process of starting a new business (Schmich & Mitra, 2023).

The lack of business management skills, knowledge of the local market and business nature, and the absence of innovation and technology adoption also pose challenges for refugee entrepreneurs (Noorbakhsh & Teixeira, 2023; Zighan, 2020).

Among these barriers, legal issues are particularly critical. Regulations that prohibit full employment for refugees without legal status hinder the development of businesses and opportunities for refugees (Refai *et al.*, 2018). As a result, some refugees turn to informal entrepreneurial activities, which occur without formal government recognition (Zehra & Usmani, 2023). Examples of such entrepreneurship include small stores, clothing stores, and hairdressers (Zehra & Usmani, 2023). Informal activities can serve as a foundation for later formalizing economic integration in the host country through small businesses (Zehra & Usmani, 2023). The challenges of entrepreneurial activity can lead some refugees to give up and seek employment instead, resulting in feelings of frustration, anger, and a lack of opportunities (Refai *et al.*, 2018).

To address these initial difficulties, business incubators have emerged to assist refugees in overcoming challenges associated with establishing new businesses. However, the obstacles faced by refugees differ from those experienced by local entrepreneurs,

particularly concerning the lack of resources and institutional constraints. Therefore, it is crucial to adapt the support and environment to effectively assist refugees in their entrepreneurial activities (Harima *et al.*, 2020; Klyver *et al.*, 2022).

In addition to business incubators, social institutions play an essential role in providing refugees financial and psychological support. However, refugee entrepreneurs face other complications in accessing support, particularly concerning financial assistance for starting new projects. Difficulties may arise from technical issues in completing forms such as economic feasibility studies, which refugees may lack the knowledge to develop (Zighan, 2020).

7. CONCLUSIONS

This paper aimed to comprehensively investigate the state of the art in the field of RE by examining the various factors that encompass a wide range of drivers and barriers within host countries. Regarding the impact of refugee characteristics on entrepreneurial activities, our findings suggest that younger men exhibit a higher propensity to initiate entrepreneurial ventures in their host country. Furthermore, it is crucial to underscore the substantial influence of human capital, encompassing aspects like education and work experience, as well as social capital, which pertains to the refugee's social network and the role played by their family. The emergence of refugee women entrepreneurship is a relatively novel area in the literature, poised for growth, driven primarily by social gender disparities and cultural distinctions between host and home countries.

One of the key theoretical implications of this article pertains to the significance of several variables for host countries. These include the entrepreneurial intentions of refugees and their socio-economic implications, the importance of human capital (education) and prior work experience for business success, especially in the context of opportunity-driven entrepreneurship, and their adaptability to the local culture. At the socio-economic level, it is imperative to emphasize the pivotal role of the refugee's social capital and family ties in fostering opportunity-seeking behaviors, securing financing, and enhancing the competitive advantage of newly established ventures. Gender issues are particularly important, since women face unique challenges in accessing business opportunities compared to their male counterparts due to familial, social, and cultural factors inherent in refugee communities. Given the importance of aligning refugees' internal capabilities with decision-making processes and their inherent self-interest, we recommend that future studies investigate variations among different groups of refugees, accounting for differing levels of human capital (education), social capital, age cohorts, previous technical work experience, and the use of gender as a moderating variable to validate these concerns.

RE is often associated with necessity-driven entrepreneurship, stemming from refugees' perceptions of unfavorable job conditions, compelling them to pursue entrepreneurship as a means of achieving greater independence and improving their quality of life. However, other contextual factors also motivate refugees to engage in entrepreneurship, including the discovery of familiar aspects, such as culinary or linguistic elements, in the host country reminiscent of their home country. Additionally, government policies and business support for refugees can significantly bolster their motivation and willingness to pursue entrepreneurial endeavors. While the absence of institutional and financial support can hinder socio-economic integration, exacerbating integration challenges, the presence of financial and institutional support can help leverage relational capital, thereby preventing the accumulation of factors that exacerbate the divide between refugees and the market.

On the other hand, entering a new country presents numerous obstacles, particularly for forcibly displaced individuals like refugees. These individuals grapple with an array of socio-economic challenges that drive them toward necessity-driven entrepreneurship but do not necessarily foster the development of their entrepreneurial activities. These barriers encompass legal issues, as well as factors related to the refugees themselves, such as inadequate cultural integration skills, project management deficiencies, and limited access to economic and financial support, among others.

While this paper contributes significantly to the existing literature by aggregating information on the antecedents of RE in host countries, certain limitations were identified. Firstly, there exists a gap concerning the influence of the home country and its consequences on refugees' entrepreneurial activities. It should be acknowledged that certain characteristics of the home country are inherently linked to the refugee, shaping their background when they arrive in the host country. Additionally, the authors of the reviewed articles did not distinctly differentiate between drivers and obstacles, possibly due to an oversight regarding the contextual importance in RE.

If push and pull factors differentially impact refugees' entrepreneurial aspirations, it is advisable to scrutinize how the social and business ecosystem supports or constrains refugee entrepreneurs, as most refugees require comprehensive institutional support (including training, financial aid, social integration, language support, and business incubation) to thrive. This has profound implications for both theory and future research, necessitating quantitative approaches that consider context-specific research projects, accounting for the cultural disparity between home and host countries. This demands a broader perspective on the business ecosystem and a more structured research focus.

Furthermore, it would be valuable to examine whether entrepreneurship represents a viable option for refugees or merely serves as a means to overcome xenophobia, discrimination, or precarious employment. While it is evident that refugees face various administrative, financial, sociocultural, and market-related challenges, more comprehensive theoretical frameworks are required to not only assess the significance of each obstacle but also understand their interrelatedness. Consequently, future studies should delve deeper into these obstacles to facilitate refugee integration and contribute positively to the host economy.

Finally, an integrative perspective is also necessary to address RE from both the resources and market perspectives. This is the result of the need refugees have of their limited resource base to overcome their entrepreneurial challenges but, at the same time, it is mandatory to be market oriented to succeed with their new ventures.

The article possesses several limitations. Firstly, it exclusively adopts an interpretivist perspective in analyzing the reviewed articles, aligning with the entrepreneurial orientation and the drivers and obstacles from the host country's viewpoint. Consequently, future studies should consider how the home country perspective influences the host country perspective among refugees. Another avenue for exploration lies in addressing survival bias, as the analysis has been based solely on refugees who successfully navigate the complexities of living in foreign countries. Additionally, this study focuses on RE from an individual standpoint, overlooking institutional and business-form perspectives, and how these businesses thrive in the market while considering how institutions perceive refugees vis-à-vis other migrants.

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The role of Passion and Self-Efficacy in entrepreneurial activities in the gig economy: An Unsupervised Machine Learning Analysis with Topic Modeling

El papel de laPasión y la Autoeficacia en las actividades emprendedoras en la Economía gig: Un análisis de aprendizaje automático no supervisado con modelación temática

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ABSTRACT

This research examines passion and self-efficacy through experience and knowledge, as motivational factors that support entrepreneurs within the gig economy (GE). It sheds light on entrepreneurs' sources of passion in the GE literature. The sample is composed of all the 1164 entrepreneurship activities offered worldwide through Airbnb, Tour by Locals, and Withlocals on 5 May 2022. The study is supported by unsupervised machine learning models and seeks to find latent topics emerging from the analysis of the entrepreneurs' descriptions and exposes the main correlated clustered dimensions. There are six main motivators behind GE platforms as a first step toward entrepreneurship: Experience, Passion for share, Knowledge, Classic traditions, Empowered community and local activities, and Well-being. It also confirms the correlation between passion and self-efficacy through experience, pointing them as main factors behind entrepreneurship in the GE. Five of the six sources of passion previously pointed by theory were found: Passion for growth, for people, for product/service, for innovation and for social mission. This study discloses self-efficacy and the sources of passion and points directions to practitioners involved in entrepreneurial activities in the GE ecosystem. This work used machine learning models to access quantitatively a paradigm that is inductive by nature. The results point to well-being as a significant factor to be addressed in future research regarding entrepreneurship. This research only studies individuals involved in the GE; as such, further studies should cohort new populations from different fields.

Keywords: Gig economy, Entrepreneurship, Passion, Self-efficacy, Content Analysis, Latent Dirichlet Allocation.

R E S U M E N

Esta investigación examina la pasión y la autoeficacia a través de la experiencia y el conocimiento, como factores motivacionales que apoyan a los emprendedores dentro de la economía gig (EG). Crea nuevas sobre las fuentes de pasión de los emprendedores en la literatura de la EG. La muestra se compone de todas las 1.164 actividades de emprendimiento ofrecidas en Airbnb, Tour by Locals y Withlocals el cinco de Mayo de 2022. El estudio se apoya en modelos de aprendizaje automático no supervisado trata de encontrar temas latentes que emergen del análisis de las descripciones de esos emprendedores y expone las principales dimensiones agrupadas correlacionadas. Hay seis motivadores principales detrás de las plataformas de EG como primer paso hacia el emprendimiento: Experiencia, Pasión por compartir, Conocimiento, Tradiciones clásicas, Empoderamiento de la comunidad y actividades locales, y Bienestar. También se confirma la correlación entre la pasión y la autoeficacia a través de la experiencia, señalándolas como factores principales detrás del espíritu empresarial en la EG. Se encontraron cinco de las seis fuentes de pasión señaladas anteriormente por la teoría: Pasión por el crecimiento, por las personas, por el producto/servicio, por la innovación y por la misión social. Este trabajo revela la autoeficacia y las fuentes de pasión y señala direcciones a los profesionales implicados en actividades emprendedoras en el ecosistema de la EG. Este trabajo utilizó modelos de aprendizaje automático para acceder cuantitativamente a un paradigma que es inductivo por naturaleza. Los resultados apuntan al bienestar como un factor significativo que debe abordarse en futuras investigaciones sobre el espíritu empresarial. Esta investigación sólo estudia individuos involucrados en la EG; como tal, estudios posteriores deberían cohortar nuevas poblaciones de diferentes ámbitos.

Palabras clave: Economía Gig, Emprendimiento, Pasión, Autoeficacia, Análisis de Contenido, Asignación Latente de Dirichlet.

1. INTRODUCTION

Gig economy (GE) platforms act as intermediaries in facilitating peer-to-peer short-term contracts and are widely used by various digital platforms in the sharing and collaborative economy (Broda, 2021; Cho & Cho, 2020). Their impact on entrepreneurial activity is substantial, as they offer valuable solutions for individuals to participate in entrepreneurial landscapes (Anwar, 2018; Scheepers & Bogie, 2020). These platforms operate through transient contractual arrangements, as extensively utilized by diverse digital platforms, and play a crucial role in enabling the exchange of services and products within the economic landscape (Pankov *et al.*, 2021; Schmidt, 2017). The integration of GE platforms is consistently associated with sharing, collaboration, and platform economies (Chalmers & Matthews, 2019; Klarin & Suseno, 2021).

It is imperative to investigate the multifaceted implications of GE on the macroeconomic ecosystem within the business sphere because GE's influence extends beyond the individual level (Allon *et al.*, 2023; Burke & Cowling, 2019). Entrepreneurs participating in the GE are categorized as "independent workers", "gig workers" (GWs), or "freelancers" (Katz & Krueger, 2019; Poon, 2019). These GWs exhibit high autonomy and flexibility in their work arrangements (Ray & Pana-Cryan, 2021), which are integral to the GE (Kost *et al.*, 2020; Turner, 2023).

Within this context, GWs emphasize the episodic nature of their work engagements, reflecting the notion of conducting discrete gigs or tasks, often for various clients or platforms (Larsson & Teigland, 2020). Similarly, freelancers underscore their status as independent contractors who offer expertise and services on a project-specific basis. These designations collectively capture the essence of the GWs, where individuals not only embrace but also thrive on the values of independence and flexibility, which are central tenets of their professional pursuits.

Even in low-income countries, mainly due to the Covid-19 crises, GE has experienced growth and is proposed as a solution for macroeconomic growth and sustainable development (UNCTAD, 2018; United Nations, 2020). The diffusion of technological resources associated with GE's business opportunities can stimulate growth-oriented entrepreneurship, because it encourages GWs to exploit new, healthier and sustainable economic activities (Barratt *et al.*, 2020; Burke & Cowling, 2020). Therefore, it is urgent to assess this ecosystem to understand individuals' motivations for adhering to these platforms and to maintain them as a means of entrepreneurship.

There is scarce empirical evidence in the literature on GWs' motivations to adhere to GE. Economic needs, search for autonomy, solutions for resource constraints due to the low risk of breaking the entry barrier, and emotional affections such as passion are the most cited (Burke & Cowling, 2019). Passion, which refers to one's excitement to adopt a determined action, has shown latent significance towards the intent to adhere to GE for entrepreneurial purposes. Moreover, passion increases an individual's positive feelings towards entrepreneurial actions and is considered a motivational factor that positively affects their decision to become an entrepreneur (Li *et al.*, 2020). Conversely, there are hardly any studies that closely address this matter, pointing to the most significant factors impacting entrepreneurial intent through GE platforms or confirming the affective significance of passion (Vasques *et al.*, 2017).

The entrepreneurship literature supports the idea that passion predicts entrepreneurial intention, entrepreneurial orientation, and the formation of some entrepreneurial behaviors, such as self-efficacy (Norena-Chavez & Guevara, 2020). Similarly, in the GE literature, it is consensual that GWs' belief in their capacities is a decisive motivational factor that translates into self-efficacy (Ravenelle, 2019).

Silva and Moreira (2022) have highlighted the significance of GWs' control over the products they offer and the affectivity of activities mediated through platforms as critical determinants of GE Entrepreneurship. Behaviors and engagement with services on these platforms impact the GW's personal and professional experiences and are amplified by their passion for work (Vasques *et al.*, 2017). GWs are highly motivated to pursue entrepreneurial opportunities in activities they are passionate about while also being conscientious of their control (Gandini, 2016). However, there is a gap in the relationship between passion and self-efficacy towards various entrepreneurial factors, such as social support and entrepreneurial intention, which remain to be explored using different populations and methods of analysis (Cardon & Kirk, 2015).

Although passion has been assessed through its impact on entrepreneurial outcomes, performance, and success, there is a latent need to understand the foundations of an individual's passion (Cardon & Kirk, 2015). Moreover, Cardon *et al.* (2009) and Santos *et al.* (2020) note that it is important to further investigate the types of passion to predict entrepreneurial behaviors individuals engage in without being strictly related to entrepreneurship, such as creativity and perseverance, with consequences for different entrepreneurial ecosystems and all stakeholders involved. Therefore, assuming that individuals involved in GE-based entrepreneurial activities are strongly motivated by passion (Codagnone *et al.*, 2016; Huarng, 2018; Scheepers & Bogie, 2020), and consequently, tend to focus more on their endeavors, this investigation also aims to confirm the sources of passion found among GE entrepreneurs under the conceptualized sources of passion by Cardon *et al.* (2017). Therefore, to address these gaps, this study seeks to answer the following research questions:

RQ1: What are the main motivators influencing entrepreneurial intention on GE platforms?

RQ2: Are passion and self-efficacy among entrepreneurial intention motivators in GE platforms? If so, how do they relate to self-efficacy experience and knowledge components?

RQ3: If passion is one of the factors influencing entrepreneurial intention in GE platforms, what are the types of passion found among these GW?

In this study, we aim to uncover the main motivational factors using a phenomenological approach with a dataset comprising 1164 observations. We utilized a mixed method involving machine learning algorithms to identify factors and relevant keywords based on frequency, which were then labeled. We used topic probabilities associated with these factors in a Principal Components Analysis (PCA) to determine their statistical relationships and correlations. Additionally, we employed an

algorithm to assess distributions by gender and innovator type, distinguishing between innovators and non-innovators, which played a central role in interpreting the results alongside other variables.

This paper presents theoretical implications confirming passion and self-efficacy, driven by experience or knowledge, as drivers of GE entrepreneurship. It also reinforces the link between passion and the experiential aspect of self-efficacy while highlighting well-being as a significant motivational factor necessitating further exploration. Furthermore, the framework of passion sources is tested and demonstrates its reliability across various types of passion, while emphasizing the pursuit of knowledge as a new foundation of passion. Notably, women exhibited higher levels of passion and were more prominent in innovation-related aspects.

The study has five sessions. Section 2 reviews pertinent literature on the topic and formulates research hypotheses. Section 3 outlines the methodology, divided into two parts: first, it employs machine learning techniques based on latent Dirichlet allocation to identify emerging factors using topic and keyword frequency analysis; subsequently, it employs the findings from the first part to conduct cluster analysis and PCA to infer factor correlations. Section 4 discusses the main findings and their theoretical and practical implications. Finally, Section 5 concludes the study, offering key insights and acknowledging limitations while suggesting future research directions.

2. LITERATURE REVIEW

2.1. Passion, entrepreneurship and GE platforms

Passion, a powerful emotion, impacts motivation toward specific concepts, individuals, objects, or activities and is linked to affection, identity, and the willingness to invest time and energy (Santos *et al.*, 2020). Two primary types of passion exist (Murnieks *et al.*, 2020; Vallerand *et al.*, 2003): obsessive passion, characterized by intense action regardless of outcomes, and harmonious passion, rooted in self-control and meaningful motivation from life experiences. Those with high levels of harmonious passion tend to pursue their goals more objectively than those with lower levels.

In entrepreneurship literature, passion is considered a complementary emotional trait that propels entrepreneurial activities through motivation and integration (Cardon *et al.*, 2017). It is fundamental for achieving business success, encouraging entrepreneurial persistence, and is often referred to as the heart of entrepreneurship due to its constant presence in studies on the entrepreneurial process and creative entrepreneurial intentions (Biraglia & Kadile, 2017). Passion also enhances self-efficacy, vision, and strategic behaviors, ultimately improving opportunity perception and innovative thinking (Cardon & Kirk, 2015).

To investigate how passion's antecedents influence entrepreneurial activity, understanding its sources is essential (Cardon *et al.*, 2009; Clarysse *et al.*, 2015). Cardon *et al.* (2017) identify six main sources of passion: Passion for growth (focused on business development); passion for people (emphasizing stakeholder relationships), passion for products/services; passion for competition (desiring superiority); passion for inventing (motivated by innovation); and passion for a social mission (dedicated to solving problems for underprivileged groups).

The experience of doing something with passion is associated with enjoyment, a key determinant in the GE literature that influences adherence to GE platforms (Liang *et al.*, 2018). GWs are driven not only by the financial benefits of their services but also by the sense of meaningful contribution (Cho & Cho, 2020; Choi & Choi, 2019). Autonomy, flexible schedules, and technological resources provided by GE platforms open doors for GWs to develop themselves and serve as resources for self-improvement (Burke *et al.*, 2019; Ravenelle, 2019). Emotions associated with their activities in this ecosystem play a crucial role in motivating their entry and sustaining their performance (Vasques *et al.*, 2017; Zhang *et al.*, 2019). Consequently, building upon the concepts of the sources of passion motivating entrepreneurship, we propose the following hypothesis linking passion to GE platforms:

H1. Passion is a factor that motivates the intention to entrepreneurship through GE platforms.

2.2. Entrepreneurship, knowledge and GE platforms

In behavioral studies, knowledge is based on previous interactions or dedicated study (Roxas, 2014; Memon *et al.*, 2019). It contributes to one's experiences and life journey. It is closely tied to the process of learning and a practical interplay with a certain matter or subject (Liguori *et al.*, 2018; Sobakinova *et al.*, 2020). Observations and actions lead to unique personal experiences and, consequently, knowledge (Lumpkin *et al.*, 2011). Knowledge and experience are intertwined, as in the entrepreneurial intention literature, where they are vital for the development of self-efficacy (SE), perceived controllability and alertness (Vamvaka *et al.*, 2020).

SE is one of the most studied constructs that comprises the intention towards a behavior, followed by controllability (Ajzen, 2002; Bolton & Lane, 2012; Carsrud & Brännback, 2009). Both are components of perceived behavior control and are influenced by knowledge and experience (Dempsey & Jennings, 2014; Zhao *et al.*, 2005). Accumulated experience builds confidence, and this confidence is supported by internal and external factors, shaping behavioral, normative and control beliefs that guide human behaviors (Ajzen, 2002).

In the entrepreneurship literature, knowledge and experience indirectly influence self-efficacy, due to their affective experiential and instrumental cognitive foundations (Liao *et al.*, 2022). These components play a pivotal role in forming constructs like entrepreneurial intention, entrepreneurial orientation, alertness and attitude towards entrepreneurial behavior, all influenced by passion through affective experiential domains (Pfitzner-Eden, 2016; Wang *et al.*, 2021). Entrepreneurial orientation (EO) studies link entrepreneurial knowledge (EK) and entrepreneurial experience (EE) to positively performance (Santos *et al.*, 2020), innovation and alertness to opportunities (Yitshaki & Kropp, 2016). Yet, EK is highly associated with the development of EO, and affects entrepreneurial growth (Hallak *et al.*, 2011; Wach *et al.*, 2018), although research relating the impact of EK on individual EO is in high demand.

Combining EK and EE significantly improves entrepreneurs' likelihood of success (Roxas, 2014; Sobakinova *et al.*, 2020). Moreover, Wach *et al.* (2018) confirm the impact of EK and EE on performance, highlighting their importance in facilitating business and network building. Recent publications on social capital show that entrepreneurs developing EK and EE stablish valuable business networks, reinforcing the importance of subjective norms in entrepreneurial intention (Ali & Yousuf, 2019; Liñán & Santos, 2007; Sulistyani *et al.*, 2022).

EK and EE drive the adoption of GE platforms in entrepreneurship, influenced by self-efficacy. GWs' activities rely on their experience and knowledge, reducing entry barriers related to finances, support, and networks (Belk, 2014; Netto & Tello-Gamarra, 2020; Trabucchi *et al.*, 2019). GE platforms serve as facilitators, enhancing perceived controllability and reducing fear of external factors, increasing knowledge acquisition and benefiting self-efficacy (Burtch *et al.*, 2018). Slack resources contribute to platform-based knowledge/experience (Klarin & Suseno, 2021). More connections lead to increased EK and EE, forming the basis for self-efficacy and perceived controllability (Silva & Moreira, 2022). Furthermore, GWs are involved in entrepreneurial activities on GE platforms not only for economic reasons but also due to emotional factors like passion, which positively influence entrepreneurial intention, self-efficacy and alertness. Based on this, the following hypotheses are proposed and presented in Figure 1:

H2. The relationship between GWs and GE platforms contributes to the development of self-efficacy through experience (SEE).

H3. The relationship between GWs and GE platforms contributes to the development of self-efficacy through knowledge (SEK).

H4. GWs' self-efficacy through experience (SEE) correlates with passion.

H5. The self-efficacy of GWs through knowledge (SEK) correlates with PA.

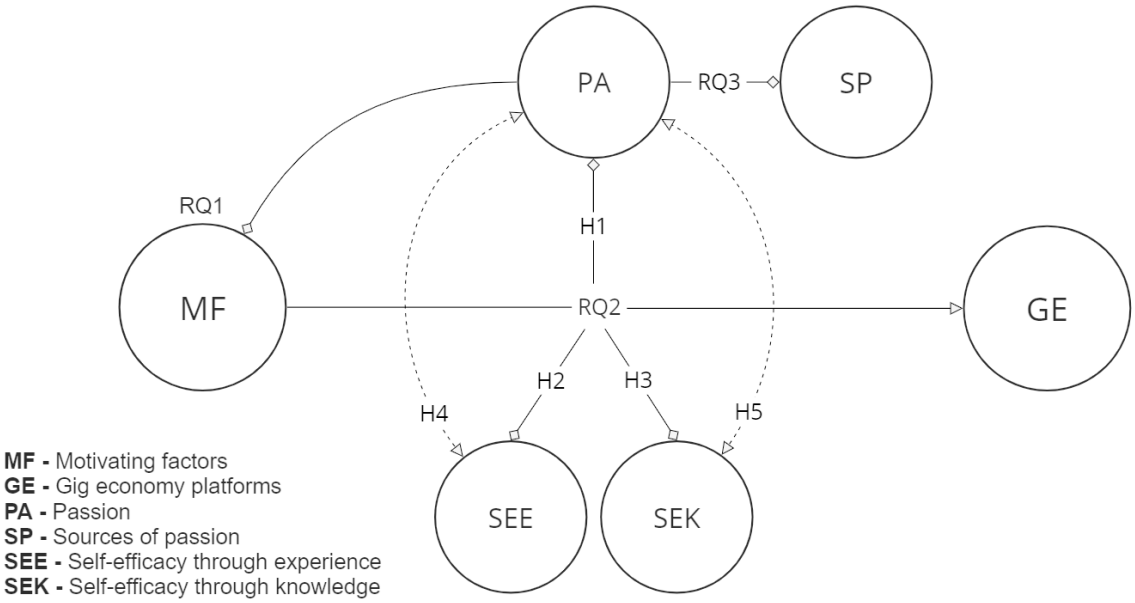

Figure 1
Research model of the investigation
Source: Own elaboration.

3. METHODOLOGY

3.1. Main steps

To ensure precision, a two-step phenomenological approach (Cardon *et al.*, 2017) was executed in R for machine learning. This open-source software, utilized for statistical analysis and visualization, enabled the inference of statistically significant factors (R Core Team, 2022). Machine algorithms automatically determine topics and their meanings, enhancing machine learning's robustness in this research. Step one encompassed online data collection, including temporal, gender, product offerings on GE platforms, and "about me" textual profiles, inveigling motivations. The analysis combined deductive unsupervised machine learning and inductive qualitative methods to identify core latent topics.

The second step entailed assessing the relatedness between the identified themes and the theoretical definitions proposed by Cardon and Kirk (2015) and Cardon *et al.* (2017). The topics derived from users' descriptions were contrasted with theoretical frameworks to proxy sources of passion and self-efficacy through experience and knowledge. Additionally, the definition of innovation —based on Yuan *et al.* (2016), to find solutions through technology to solve problems combining new applications with existing resources— was employed to evaluate passion for growth, passion for products, and passion for inventing. GWs have shown availability, transforming their online service delivery through technical solutions and altering elements of the previous model/system (Liang *et al.*, 2018). Therefore, the user's start date and number of offers on the platform were used to proxy innovation using binary codes (innovators or non-innova-

tors). Innovators were those providing diverse experiences and those who registered prior to March 2020, coinciding with the OMS's confirmation of the Covid-19 pandemic and the introduction of online features by GE platforms.

3.2. Data collection and Sample

The data collected in this research closely mirror the approach used by Williamson *et al.* (2022), which employed secondary data for netnographic analysis. Specifically, on May 5, 2022, we accessed the platforms Airbnb, Tour by Locals, and Withlocals to gather user descriptions related to their tourism services. Our data collection was exhaustive, encompassing information from openly accessible profiles worldwide at that time, without any specific language or demographic restrictions. This comprised 40.9% men, 53.8% women, 5.1% couples (2 individuals), and 0.3% groups (more than 3 individuals).

The scraping technique was used to optimize the collection. This method utilizes a pre-defined algorithm to systematically navigate through pages and extract the relevant data (Ferrara *et al.*, 2014), encompassing all online tourism experiences offered on the three websites. The data retrieved from these sources yielded 1173 observations and six variables, including name, activity, host, entry date, location, and page link. Subsequently, this data was organized into a table sheet as the initial step in the pre-processing phase. To further refine the data, a CSV file was imported into the R studio environment for the subsequent cleansing process.

3.3. Methods and techniques

This study utilized a mixed methods approach, exploring topics through Latent Dirichlet Allocation (LDA) analysis and reinforcing the hypotheses through K-means clustering and Principal Component Analysis (PCA).

3.3.1. TF-IDF

Term frequency inverse document frequency (*tf-idf*) was used to identify the most relevant terms. It refers to the importance of a term within a corpus of documents based on the equation

$$idf(\text{term}) = ln\left(\frac{n_{documents}}{n_{documents\ containing\ term}}\right)$$

to measure the weight of a word by its collocation. Commonly used words appearing in all collections are scored with low values, and those that are used less overall are highly scored. Therefore, they are adjusted in a compound by combining the multiples of frequency and rarity of the terms in descending order. This procedure also yields a median utilized in establishing the minimum accepted frequency probability per document. This aids in determining the sparsity threshold for computing the quantity of terms to be excluded from the corpus. Put simply, following the computation of *tf-idf* scores, we also compute the *tf-idf* median for the entire corpus of documents, which in turn assists in pinpointing the minimum accepted frequency probability.

3.3.2. Latent Dirichlet Allocation Analysis

LDA is a probabilistic model widely used in text analysis for topic modelling. LDA assumes that documents are mixtures of topics and topics are mixtures of words (Blei *et al.*, 2003). It employs Dirichlet distributions to represent these mixtures, with Dirichlet parameters (α) influencing the distribution characteristics and the discovery of topics (Wallach *et al.*, 2009). This machine learning technique does not require a predefined dictionary or interpretative rules for identifying latent clusters of co-occurring words in a collection (Hannigan *et al.*, 2019). Instead, it establishes correlations between words within documents, and treats them as topics of interest.

The LDA model is described by the equation: $\theta_j \sim D[\alpha]$, $\phi_k \sim D[\beta]$, $z_{ij} \sim \theta_j$, $x_{ij} \sim \phi_{zij}$, where α and β are the prior Dirichlet parameters automatically computed via a statistical Dirichlet distribution (Newman *et al.*, 2009). θ_j represents the topic distribution for document j, φ_k signifies the word distribution for topic k, z_{ij} denotes the topic for the ith word in document j, and x_{ij} indicates a specific word (Blei *et al.*, 2003). The machine learning algorithm computes suitable Dirichlet prior distributions α and β based on the data using the *Topicmodels package v0.2-12* in R (Grün *et al.*, 2021). The key outputs derived from LDA include the extracted topics, their constituent keywords ranked by probability, gamma (γ) values quantifying overall topic popularity, and theta (θ) values representing topic prevalence in specific documents.

3.3.3. Gibbs sampling

This study applied the generative Gibbs sampling method, a validated Markov Chain Monte Carlo (MCMC) technique (Mimno *et al.*, 2008). It iteratively estimated latent topics within documents while determining the statistically optimal number of topics (k). To mitigate human bias, a comprehensive set of four metrics was utilized (Arun *et al.*, 2010; Cao *et al.*, 2009; Deveaud *et al.*, 2014; Griffiths & Steyvers, 2004). Building upon LDA, the unsupervised Gibbs method (Mimno *et al.*, 2008) probabilistically identifies the optimal k value, processes local data, and maps term co-occurrences across documents and topics. The machine deductive algorithm, utilizing the R package Topicmodels 0.2-12 (Hornik & Grün, 2011), ensures an automated statistical approach.

3.3.4. K-means clustering

These initial parameterization of these LDA topics involved cluster analysis using the k-means algorithm. Additional statistical validation was achieved through an additional cluster analysis conducted using *the KablExtra 1.3.4* and *DoParallel 1.0.17* libraries in R Studio (Daniel *et al.*, 2022; Zhu *et al.*, 2021). This approach offered enhanced comprehension of topic distribution within the document collection. The cluster analysis aimed to provide a deeper understanding of how topics were distributed across the collection of documents under study. This step enhances the researchers' understanding of distribution patterns and relationships among the identified topics, contributing to the overall robustness of the analysis. The works of Zhu *et al.* (2021) and Daniel *et al.* (2022) served as key references and resources for implementing this statistical validation approach.

3.3.5. Principal Component Analysis

PCA was conducted to quantitatively validate hypotheses derived from LDA topics. PCA utilizes eigenvalue decomposition, effectively reducing multidimensional data into principal components (Jolliffe, 2002). The LDA topics, parameterized through a cluster analysis using the k-means algorithm, were subjected to PCA to identify relationships among topic dimensions, based on the proximity of eigenvectors and eigenvalues (Abdi & Williams, 2010). The fraction of the total variance explained by each dimension effectively highlighted the core topics. This analytical shift from exploratory LDA to confirmatory PCA empowered the statistical validation of hypothesized relationships, relying on the outcome of PCA for topic correlations rather than solely on the qualitative LDA results. Further statistical validation was achieved through an additional cluster analysis conducted using the *KablExtra 1.3.4* and *DoParallel 1.0.17* libraries in R Studio (Daniel *et al.*, 2022; Zhu *et al.*, 2021), enhancing comprehension of topic distribution within the document collection. Simultaneously, PCA was applied, considering the probability of observations appearing in each cluster (topic), and subsequently dimensionally reduced it to calculate topic variance based on eigenvalues. The reduction of dimensions and cross-validation of identified topics were executed using the k-means algorithm parameterized by the machine (Chan *et al.*, 2013).

3.4. Pre-processing

The pre-processing protocol comprised seven steps, as depicted in Figure 2. This process included:

1. Translating all texts into English using the TranslateR 1.0 package (Lucas & Tingley, 2015). While most observations were already in English, translation ensured full English readability, with results reviewed by the authors to enhance reliability.
2. Creating a corpus containing all texts about the host, utilizing the Pdftools 3.3.0 and TM 0.7-8 libraries in R Studio (Feinerer, 2015; Ooms, 2022). The "about the host" variable was transformed into a unified full corpus.
3. Performing a preliminary cleansing process to eliminate non-contributory words for topic formation. This included encoding the corpus in a UTF-8 pattern, converting words to lowercase to prevent errors in detecting special characters, removing stop words (e.g., "the," "is," "and," "for," "can"), as well as eliminating numbers, whitespaces and punctuation.
4. Carrying out the second phase of the cleansing process, where recurring non-representative terms, persisting in the corpus after the initial cleansing, were removed using an algorithm.
5. Implementing stem processing to retain only the word stems, thus replacing words with the same meaning and plurals. This prevents bias through double calculations in statistical inferences. The algorithm identifies and retains only the core of the words. As for instance, it keeps only the "experi" from "experience" and "experiences", counting them as the same term. It enriches topic modelling and avoids bias through double calculations in statistical inferences.
6. Applying term frequency inverse document frequency (*tf-idf*).
7. Applying the determined median (0.16975) from the *tf-idf* model to the corpus, as referenced in Table 1, to establish the minimum accepted frequency probability per document. This contributed to defining the sparsity value (<0.983%) to determine the number of terms to omit from the research. Consequently, nine observations were excluded, as they did not contain any of the identified *tf-idf* terms, resulting in 1164 remaining observations. The most frequently used terms are presented in Figure 3.

Table 1
Summary of *tf-idf* to define sparsity and terms to omit

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.03158	0.13447	0.16975	0.19598	0.21670	4.07395

Source: Own elaboration.

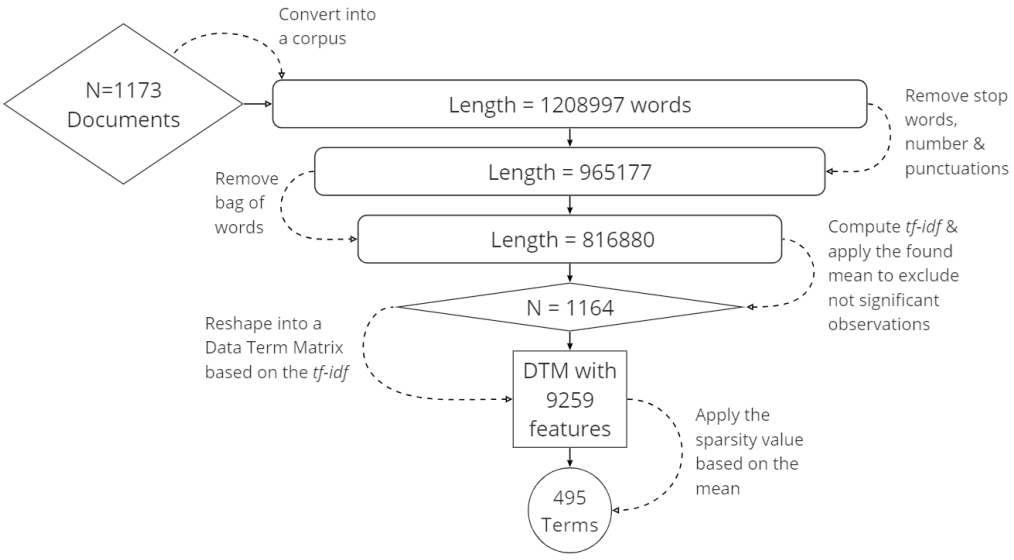

Figure 2
Protocol modelled for pre-processing step
Source: Own elaboration.

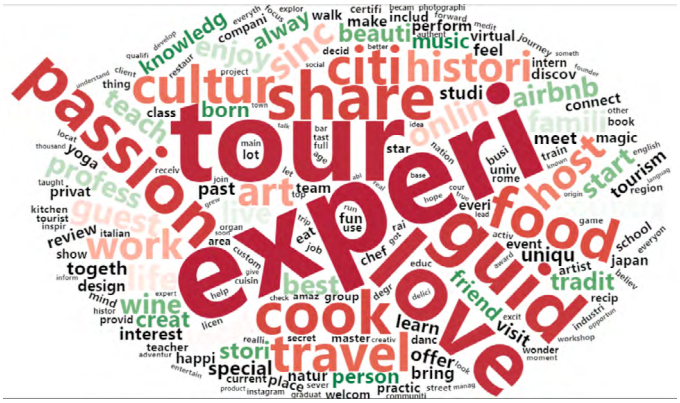

Figure 3
Word cloud with the most frequent terms
Source: Own elaboration.

4. DATA ANALYSIS

4.1. Topic modelling

The Gibbs method was initially applied before LDA to determine the statistically optimal number of topics (K) emerging from the document corpus. To ensure reproducibility, a fixed seed of 77 was chosen, which guarantees consistent results each time random numbers are generated. A fixed seed asserts the same results every time that random numbers are generated. This is particularly valuable in fields like statistics, machine learning, and simulations, where replicating experiments or analyses is essential for validation and comparison.

Four metrics were considered (Arun *et al.*, 2010; Cao *et al.*, 2009; Deveaud *et al.*, 2014; Griffiths & Steyvers, 2004) to provide insights into the number of topics required. *CaoJuan2009* and *Deveaud2014* metrics exhibited consistent decreases in values as the number of topics decreased, indicating improved topic coherence and distinctiveness. In contrast, *Griffiths2004* shows an ascending trend, suggesting a better model fit with fewer topics. Most notably, *Arun2010* displayed a substantial increase in value as the number of topics decreased, reflecting enhanced topic interpretability.

Figure 4 reveals a range of latent topics from 4 to 12. However, a closer examination of Figure 5 confirmed the presence of six statistically significant latent topics. This robust statistical evidence supports the choice of six topics as the optimal configuration for topic modelling analysis. The selection is influenced by contextual factors, the corpus size, which encompasses 495 features, and the dataset's nature, which comprises 1164 individual observations (Lakshminarayanan & Raich, 2011; Mimno *et al.*, 2008). This decision harmoniously aligns with our dataset's unique characteristics, ensuring that the resulting topics are not only statistically sound but also contextually relevant to our research domain. These findings collectively validate the selection of six topics, striking a balance between quantitative metrics and meaningful topic interpretation in alignment with research objectives and dataset characteristics.

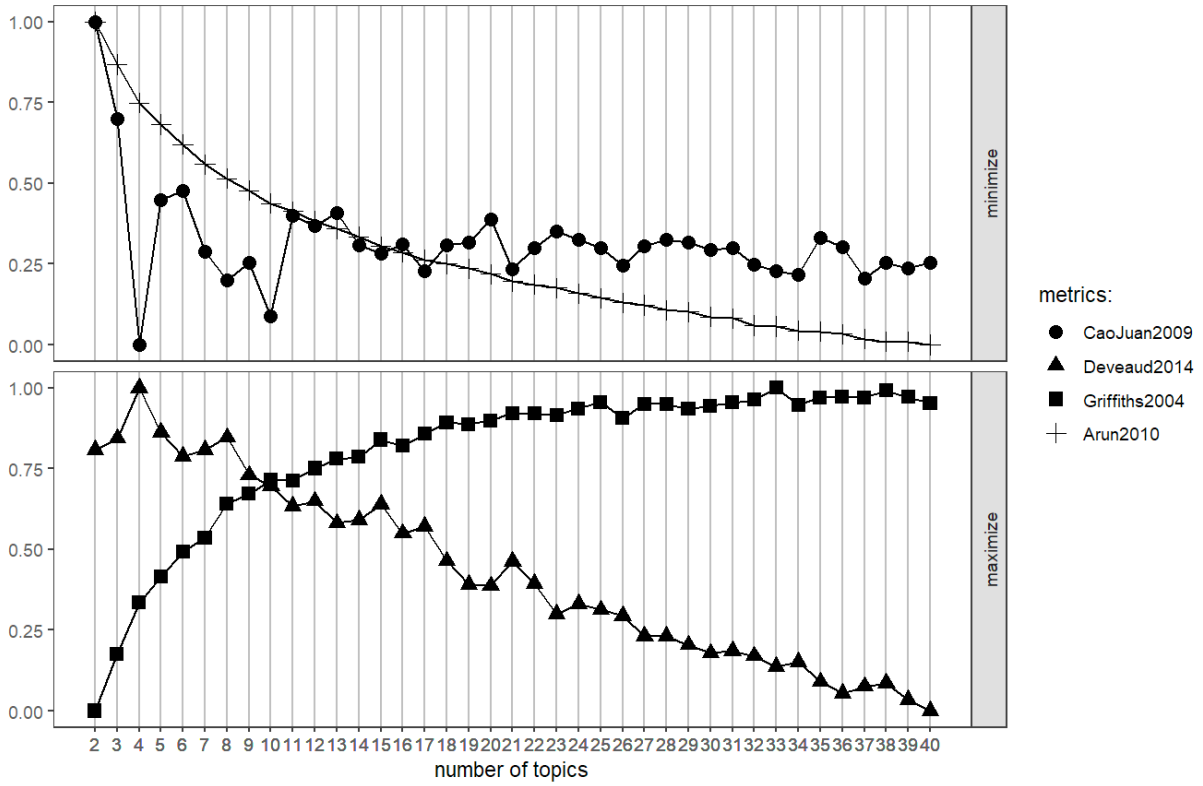

Figure 4
Topic-probability visualization
Source: Own elaboration.

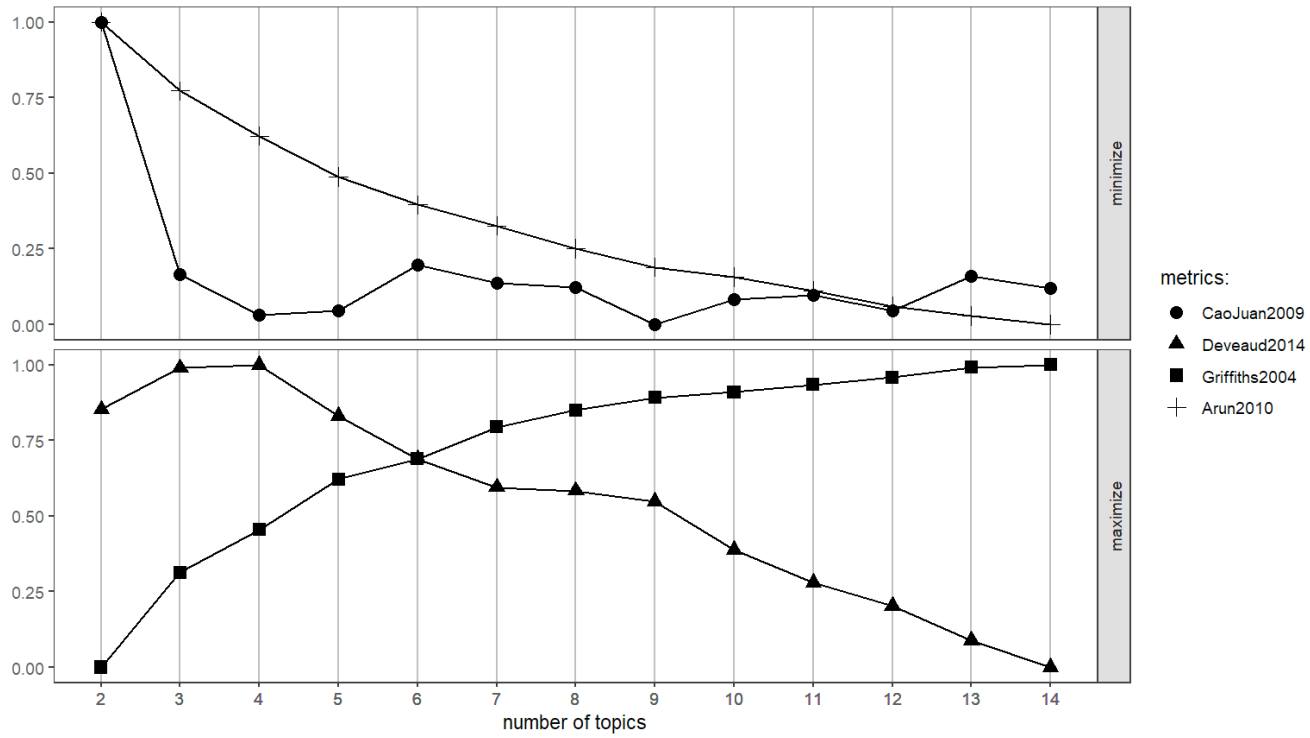

Figure 5
Topic-probability dendrogram
Source: Own elaboration.

The (k) value based on the outcome of the Gibbs sampling procedure was used to access the data, as shown in Figure 6, using LDA to capture substantial inter-intra structures of the data (Sagadevan *et al.*, 2022). As mentioned above, the seed number of 1961 was also set to the LDA to ensure reproducibility.

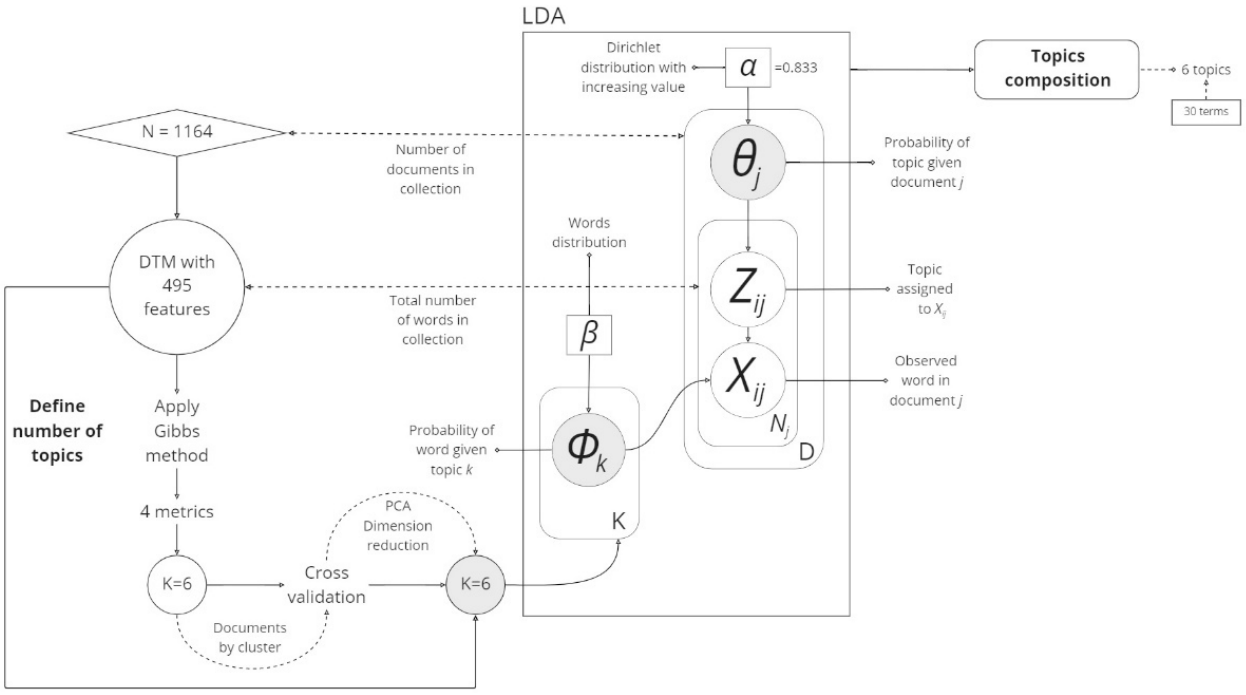

Figure 6
Protocol model for topic-modelling steps
Source: Own elaboration.

Alpha (α) and beta (β) hyperparameters, governing topic-document and topic-word distributions respectively, were not predefined but algorithmically inferred by the model to tailor Dirichlet prior to the data. The model estimated an alpha value of 0.833, indicating uniform topic mixtures among the documents. This automated approach ensured parameters tailored to the data without imposing strong preconceived assumptions (Wallach *et al.*, 2009). The authors prioritized the statistical correlation identifications by machine before conducting contextual inductive analysis.

A total of 500 iterations were employed with a burn-in of 0 iterations to achieve model convergence. This optimal number of iterations assured a stable state, and converges the model throughout its execution. Following best practices (Blei *et al.*, 2003; Lakshminarayanan & Raich, 2011), the log-likelihood value that quantifies the model's fit to the data, stabilized at –215963.3. This stabilization indicates that our LDA model had reached a relatively stable state in terms of performance. Additionally, perplexity, a metric used to assess model quality, was calculated to be 351.6628, which also suggests that the model provided a satisfactory representation of the data, as shown in Figure 7.

Beta weights were estimated using automated procedures as a 6 × 532 matrix representing the word distributions for each topic. The machine-generated weights provided an objective statistical foundation for understanding the topic-word relationships prior to being accessed by the authors for inductive analysis. This data-driven approach increases the robustness of merging automated statistical outputs with human interpretative processes to interpret and contextualize topics on behalf of the research goals.

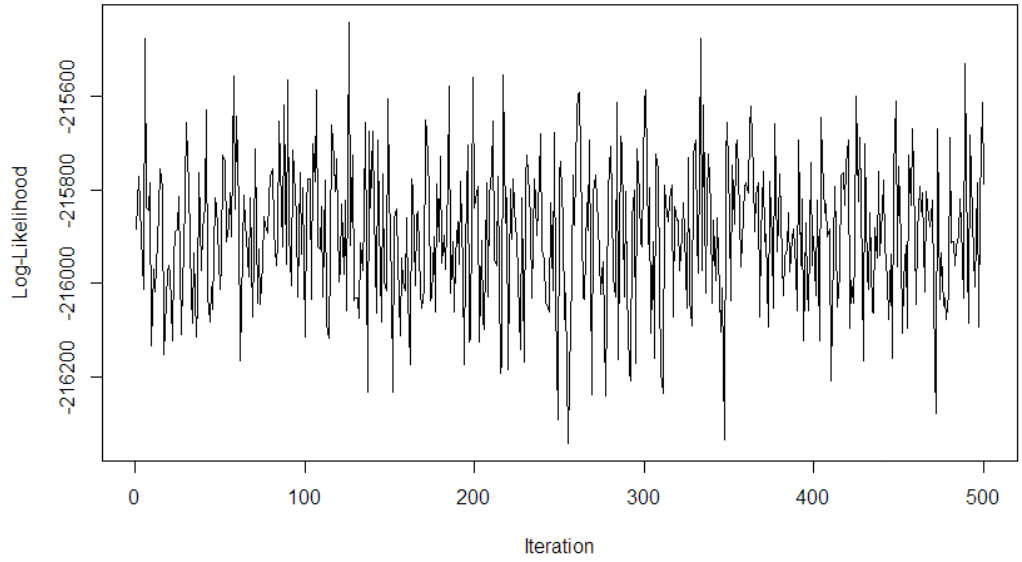

Figure 7
Log-Likelihood Convergence Plot
Source: Own elaboration.

4.1.1. Topic model analysis

After setting the optimal number of six latent topics, LDA identified the words to compose each topic through the assigned probabilities, ranking them in decreasing order to determine their influence on the topic's meaning. The authors considered the keywords with the highest probability in each specific topic based on their theta value, accounting for the model's admixture approach allowing a word to belong to different topics. Furthermore, the algorithm specified the gamma value of each topic to gauge its relevance to the model.

Following automated extraction, the authors proceeded with the interpretative phase, conducting a qualitative analysis to make sense of the topics and their respective word lists according to the observations they were related to. The interpretation involved relating the terms to the broader context of our research objectives and existing knowledge. This process allowed the calibration of topics and align with the study's nuances.

Before starting the labeling process, the corpus containing all texts was reverted to its initial format of individual observations using the Quanteda R package. This library, designed for quantitative textual data analysis, facilitated the transformation of the table back to its original form, including new columns for variables: topic number, label, keywords, and gamma values. This approach increased the reliability of interpreting topic meanings in the contextual inductive analysis, as it exposed the authors to the top-30 terms of each topic and the most relevant statistically assigned observations (Benoit *et al.*, 2018), as seen in Table 2, Figure 8, and Figure 9. This procedure mitigates bias and guides the researchers' work (Maier *et al.*, 2018). Additionally, a statistical approach considering the top-10 words and their probability scores complemented the authors' qualitative interpretation in naming the topics through thorough analysis.

Table 2
Topics, keywords, gamma, and referred observations

Topic number	Label by beta	Top 30 keywords	Gamma	N Obs.	Related Obs.
1	Experi love sinc best enjoy profess connect	Experi, love, sinc, best, enjoy, profess, connect, happi, virtual, person, start, rome, guest, decid, job, focus, design, realli everyone, got, activ, alway, italian, moment, tourism, communit, real, ever, offer, opportun.	0.1692834	135	523, 710, 775, 798, 887
2	Passion share love cultur countri friend born	Passion, share, love, cultur, countri, friend, born, live, special, uniqu, meet, stori, discov, lot, rai, region, tourism, local, thing, amaz, wonder, everyth, secret, work, qualifi, expert, hope, goal, give, main.	0.1680775	173	62, 986, 244, 864, 172
3	Work creat knowledge team wine event includ	Work, wine, creat, knowledg, team, event, includ, natur, compani, univ, experi, live, intern, profess, busi, degr, industry, show, educ, top, tast, nation, organ, bar, excit, award, photographi, workshop, entertain, creativ.	0.1668134	185	103, 114, 118, 230, 233
4	Experi famili cook food host onlin airbnb	Experi, cook, food, host, onlin, famili, airbnb, guest, tradit, togeth, start, review, eat, japan, learn, class, star, chef, past, recip, kitchen, welcom, cuisin, restaur, delici, instagram, authent, bring, grew, bake.	0.1661938	225	24, 31, 42, 222, 332
5	Tour guid histori citi travel beauti local	Tour, guid, travel, cit, histor, beaut, local, visit, interest, feel, place, privat, alway, group, area, walk, custom, licen, tourist, offer, let, trip, english, explor, histor, look, town, museum, plea, everi.	0.1657290	219	9, 107, 659, 700, 825
6	Art, life, teach, practic, music, studi, perform,	Art, life, teach, music, studi, perform, yoga, practic, artist, school, mind, teacher, master, danc, magic, train, certif, game, inspir, believ, current, age, use, journey, medit, client, taught, combin, heal, techniqu.	0.1639029	227	60, 71, 205, 284, 291

Source: Own elaboration.

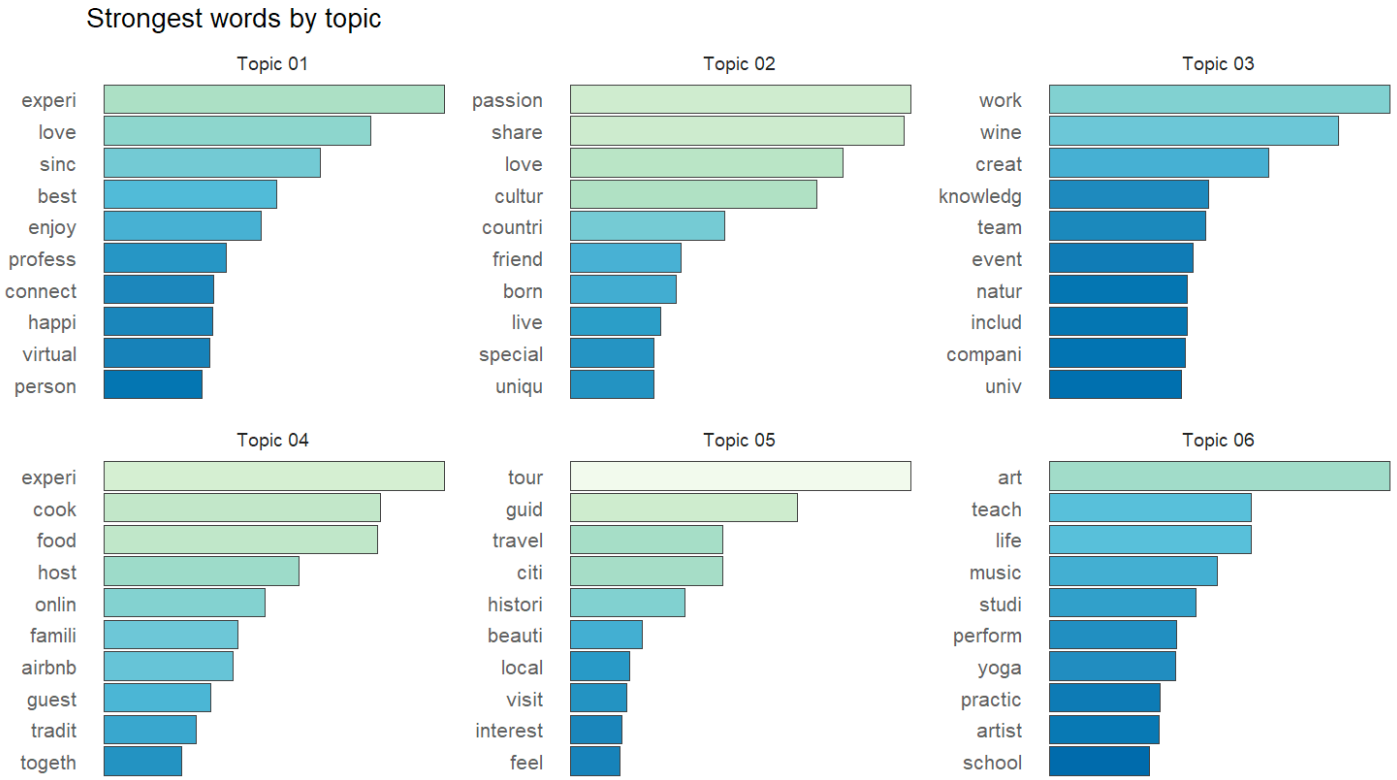

Figure 8
Strongest keywords by topic
Source: Own elaboration.

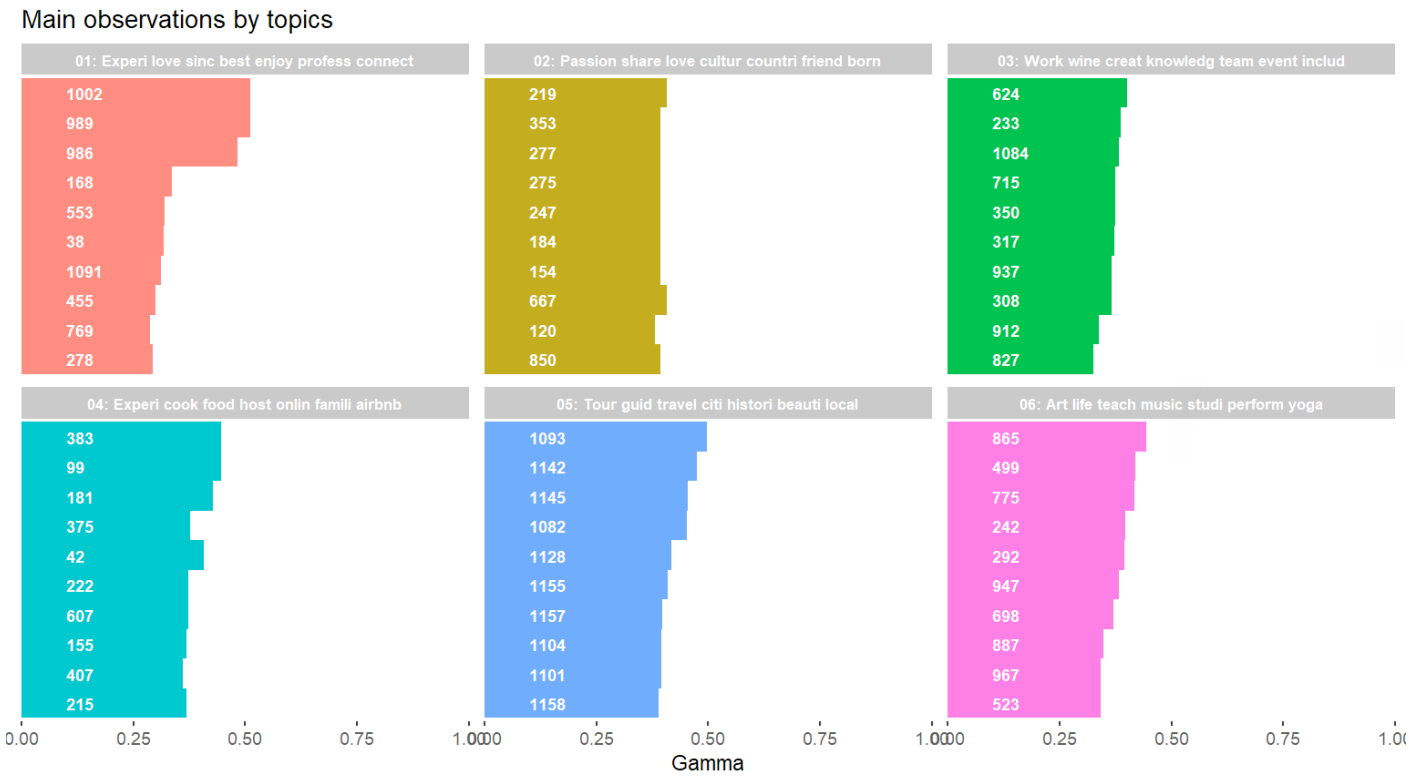

Figure 9
Main observations by topic
Source: Own elaboration.

4.1.2. Topic model per descriptive statistics and control variables

The R function GenderizeR 0.6.0 was additionally employed to determine the gender of GWs, serving as a control variable. This library uses a localized database from various countries to conduct a statistical analysis, accurately assigning gender based on (Santamaría & Mihaljević, 2018; Wais, 2016). The researchers randomly reviewed the results, and all of them had a certainty score no less than 0.75 – from 0 to 1. In addition to gender, two other nominal variables were also recorded: "couple," indicating products developed by two individuals on the GE platform; and "group," denoting cases where more than two individuals offered the gig (see Table 3).

Furthermore, the innovation feature was calculated by considering the date frame variable. GWs with a profile on GE platforms before March 2020 or those offering multiple experiences were assigned a value of 1; otherwise, 0. The aforementioned procedure resulted in a new CSV file comprising 1164 observations and eight variables, including innovation, topic number, and gender (see Table 3, 4 and 5).

Table 3
Descriptive statistics of the data by gender and other nominal groups

Gender	Topics												Total	
	T1		T2		T3		T4		T5		T6			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Men	38	3.3	91	7.8	64	5.5	87	7.5	70	6.0	126	10.8	476	40.9
Women	75	6.4	144	12.4	94	8.1	86	7.4	76	6.5	151	13.0	626	53.8
Couple	2	0.2	0	0.0	11	0.9	6	0.5	25	2.1	15	1.3	59	5.1
Group	0	0.0	1	0.1	0	0.0	0	0.0	1	0.1	1	0.1	3	0.3
Total	115	9.9	236	20.3	169	14.5	179	15.4	172	14.8	293	25.2	1164	100.0

Source: Own elaboration.

Table 4
Descriptive statistics of the data by innovation variable

Innovate	Topics												Total	
	T1		T2		T3		T4		T5		T6			
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
No	11	0.9	23	2.0	11	0.9	18	1.5	31	2.7	52	4.5	146	12.5
Yes	104	8.9	213	18.3	158	13.6	161	13.8	141	12.1	241	20.7	1018	87.5
Total	115	9.9	236	20.3	169	14.5	179	15.4	172	14.8	293	25.2	1164	100.0

Source: Own elaboration.

Table 5
Descriptive statistics of the innovation variable by gender

Innovated	Gender								Total	
	Men		Women		Couple		Group			
	#	%	#	%	#	%	#	%	#	%
No	58	5.0	80	6.9	8	0.7	0	0.0	146	12.5
Yes	418	35.9	546	46.9	51	4.4	3	0.3	1018	87.5
Total	476	40.9	626	53.8	59	5.1	3	0.3	1164	100.0

Source: Own elaboration.

4.2. Clustering and PCA

A cluster analysis was conducted to provide statistical validation through visualization using the KablExtra 1.3.4 and DoParallel 1.0.17 libraries in R Studio (Daniel *et al.*, 2022; Zhu *et al.*, 2021). It enhances the comprehension of topic distribution across the various documents in the collection. Additionally, PCA was performed. It considered the probability of observations appearing in each cluster (topic) by analysis of Theta and Gamma value correlations before dimensionally reducing it to calculate the topic variance based on its eigenvalues. The machine parameterized *k-means* was used for cross-validation of the identified topics and dimensionality reduction (Chan *et al.*, 2013).

To augment the depth and rigor of the analysis, the researchers employed PCA as a complementary method to LDA. While LDA offers insights into term-topic-document relationships and latent topics, it is essentially exploratory. In contrast, PCA, known for its confirmatory nature, quantifies these relationships, contributing to hypothesis validation through exploratory visualization (Jollife & Cadima, 2016; Ogunleye *et al.*, 2023). The application of PCA to LDA topics rigorously confirmed the extent to which these topics relate to the research questions, significantly enhancing the credibility and validity of the findings (Inoue *et al.*, 2023). This strategic blend of statistical exploratory and confirmatory analyses strengthens the study's robustness (Sosianika *et al.*, 2018; Koyuncu & Kılıç, 2019; Shahrakipour, 2021).

The percentage of variance in Table 6 reveals the core of the six topics, facilitating further analysis. The visualized proximity between dimensions helped confirm the topics' meanings by associating them and analyzing the proximity of centroids, thus establishing their relevance. Hypotheses H4 and H5 are confirmed as RQ2 is addressed based on the proximity of the dimension's core.

Table 6
PCA's summary

Dimensions	Eigenvalue	Variance %	Cumulative Variance %
Dim.1	1.6	25.9	25.9
Dim.2	1.4	22.7	48.6
Dim.3	1.2	19.3	67.9
Dim.4	1.0	17.4	85.3
Dim.5	0.9	14.7	100.0
Dim.6	0.0	0.0	100.0

Source: Own elaboration.

5. RESULTS

5.1. Topic model findings

After applying the aforementioned protocol, as depicted in Figure 6, to answer RQ1, the topics were labeled as follows: Topic one (T1) was designed as "professional experience," reflecting the GW's intention to further develop themselves through professional experience. It conveys the perceived opportunity to act focused on their offered gig to activate and connect with their guest (user) in a real and enjoyable way; Topic two (T2) was titled "passion for sharing," signifying GW's joy in sharing their expertise with clients; Topic three (T3) was named "knowledge

through creative work and education," linked to educational experiences through business or scholarly paths, involving relations that contribute to acquiring knowledge. Topic four (T4) is tagged as "classic traditional experience." It is associated with the experience acquired through familiar or community learning of GWs. They are focused on authenticity and specialized in the field of their offers. Topic five (T5) relates to the "GW's interest in showing their feelings," reflecting the GW's interest in showcasing the places they guide. There is a demonstration of pleasure in offering their look at the town, exploring historical places with a singular view. Topic six (T6) was labelled "well-being experience," emphasizing the GW's aim to inspire users with mastered experiences.

5.1.1. Descriptive statistics and control variables

Table 3 illustrates a balanced gender distribution within the sample, with a higher percentage of women (53,8%). The majority of participants engaged in innovation through GE platforms (87.5%), as shown in Table 4. Women accounted for 46.9% of the innovators in the sample, whole products offered in groups were the least representative (0.3%) (Table 5). Additionally, as shown in Table 3, T6 and T2 emerged as the most prominent topics within the sample (25.2% and 20.3%, respectively) and were particularly representative within the women's population (13% and 12.4%, respectively). Despite T1 having the highest gamma value (based on the frequency and inverse frequency) (*Table 2*), it was not the topic with the most frequently used words by individuals in the sample. Furthermore, the population with a passion for sharing (T2) and well-being experience (T6) exhibited the highest number of identified innovators.

5.1.1. Topics and Hypotheses

To address RQ2, the authors examined topic formation and associations. T1 and T2 confirm H1, as the terms found in both topics were associated with the passion that motivates GWs when offering their gigs and products on GE platforms.

H2 received confirmation from T1, T3, and T4, indicating that the interaction between GWs and GE platforms contributes to their entrepreneurial learning curve and personal development. Based on previous or actual interactions, the relationships among peers through these platforms contribute to personal and professional development and support an increase in SEE.

T3 corroborated H3 by revealing that internalizing knowledge is influenced by previous learning experiences through educational or professional interactions and is amplified through relationships between peers on GE platforms to achieve business value. This corroborates the assumption that, when involved with entrepreneurial activities, GWs are prone to increase their SEK supporting increased SEK.

5.2. Confirming results with PCA

As seen in Figure 10, PCA confirmed six nodes with high proximity between four of them. Node one and two, corresponding to T1 and T2, supported the validation of H4, emphasizing the relationship between SEE and GWs motivated by passion. On the other hand, dimensions three and four, T3 and T4, respectively, slightly overlap dimension two, but the central nodes of their centroids are quite different. However, H4 is validated due to the distance between the cores of the centroids, which is mainly influenced by nodes one and two.

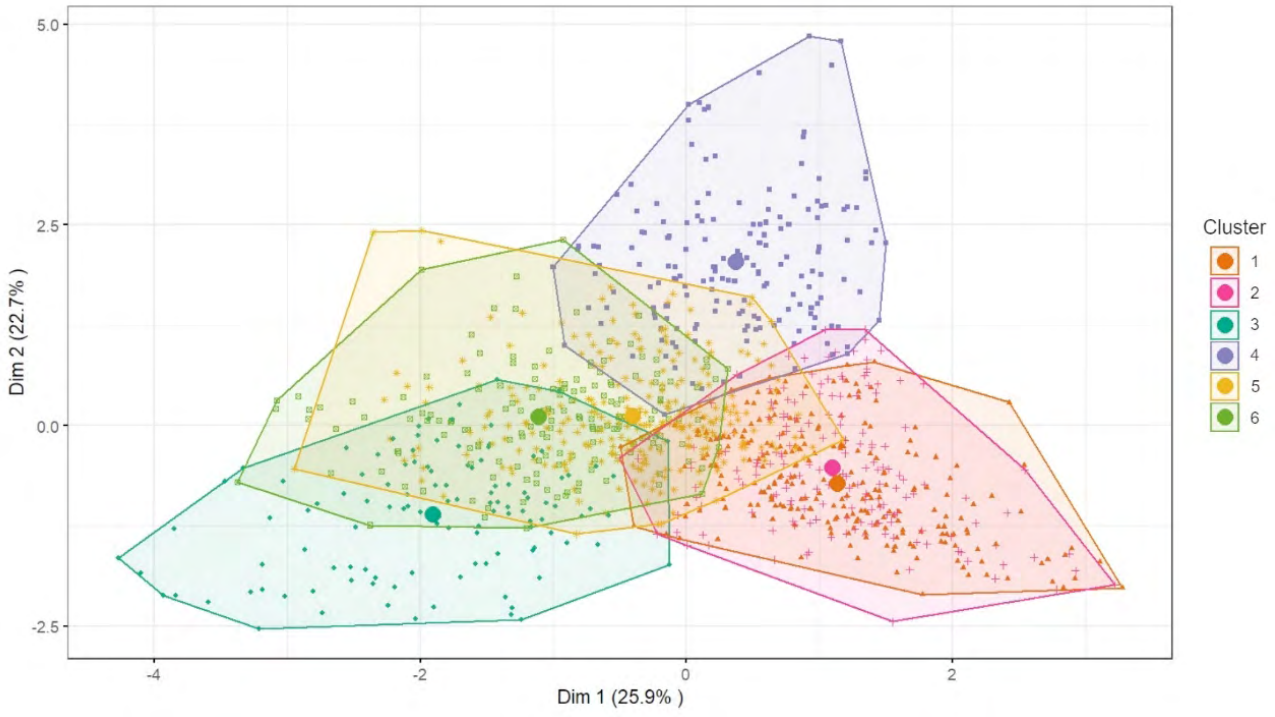

Figure 10
Observation distribution by the six identified dimensions

Node three, T3, does not contribute to confirm H5. Its distance from node two, even with some overlapping, is large, which leads to the assumption that SEK is not correlated with the GWs passion. Nevertheless, nodes five and six, T5 and T6, present a significant proximity and overlap between them, and are very close to node three, which will be discussed further. Table 7 summarizes the results of this study.

5.2. Passion through proximity of the topics

To respond to RQ3 all previous findings were considered. Therefore, passion for growth was found through the analysis of the close core relationship between T1 and T2 and the probabilistic proximity with T6 (Figure 10). Moreover, Table 4 shows that T1, T2, and T6 represent 47.9% of the ones that innovated. This assumption was made because of the search for development associated with the persistence of keeping their businesses on the platforms, even if reformulation of the products was required. From this perspective, passion for products/services and passion for inventing was confirmed.

Passion for people is found in the core proximity between T5 and T6, and T2 connects through some vertices, as shown in Figure 10. Therefore, 60.3% of the players share their products motivated by the passion they have for connecting with people through experiences, which is the main explanation for this source of passion. Furthermore, aggregating the association with T4 confirms passion for a social mission. They represent 75.7% of the sample, motivated by their will to connect with people, community, and share experiences at the same time, impacting their perceptions of their culture, society, and behaviors. Their intent is to create or consolidate a positive perception of their community or the culture they are part of. Passion for competition was not confirmed.

Table 7
Summary of results

Research questions	Hypothesis #	Synopsis of hypotheses	Topics	Findings
RQ1		Motivating factors	6	T1 - Experience cumulation T2 - Passion sharing T3 - Knowledge and creativity T4 - Classic traditional experience T5 - Feeling community local T6 - Well-being experience
RQ2	H1	GE relates with PA	T1 and T2	Supported
	H2	GE relates with EE	T1, T3 and T4	Supported
	H3	GE relates with EK	T3	Supported
	H4	EE relates with PA	T1 and T2	Partially supported
	H5	EK relates with PA	Not	Rejected
RQ3		Sources of passion	5	Passion for growth; Passion for people; Passion for product/services; Passion for innovation; Passion for social mission.

Source: Own elaboration.

6. DISCUSSION

This research contributes to the understanding of passion and self-efficacy as key motivators for entrepreneurship among GWs on GE digital platforms. It reveals that passion, self-efficacy through experience, and knowledge drive GWs to venture into entrepreneurship. The study involved a two-step process, beginning with LDA topic modeling of 1164 observations from GWs' profiles to unveil their motivations for offering products on GE platforms. Six topics were identified, with two confirming the importance of passion for business activities on GE platforms. This highlights the role of passion as a determinant in entrepreneurial orientation or intention beyond a narrow entrepreneurship-focused approach.

Moreover, the study found that self-efficacy through experience and knowledge motivates GWs to engage with GE platforms as an initial step toward entrepreneurship, increasing their perception of self-control. The strong association between topics related to sharing life experiences and accumulated knowledge underscores the value of self-awareness and locus of control in entrepreneurial endeavors.

Second, further analysis using PCA reveals that while passion is closely linked to self-efficacy through experience, it has a weaker connection with self-efficacy through knowledge. This suggests that passion's influence on offering services on GE platforms is primarily driven by the desire to gain experience, rather than knowledge, which requires emotional involvement.

Third, two distinct groups emerged based on core proximity analysis. The first group, composed of T1 and T2, reflects GWs who engage with GE platforms not solely for business but out of genuine affection. They derive passion and satisfaction from their work, drawing on past experiences or pursuing new ones. The second group, encompassing T5 and T6, is motivated by an inner sense of well-being and a desire to share personal appraisals about places, objects, or activities. The convergence of these groups highlights GWs with a heightened inclination for innovation.

Incorporating T4, which reveals an intent to impact the community and preserve local social and cultural traditions, nearly

all passion sources are represented, aligning with Cardon *et al.'s* (2017) findings. The exception is passion for competition, which remains elusive due to limited control imposed by GE platforms. These platforms offer a range of features, but control is vested in algorithms determining which results occupy the top tier of the page.

Although GWs can enhance their services, innovate technically, and leverage positive reviews to expand their reach, full comprehension of the platforms' underlying artificial intelligence (AI) remains obscured. This underscores existing literature highlighting policy and AI implications that restrict entrepreneurs from exercising complete control over their businesses.

T3 is conspicuous for not aligning with established passion sources. Neither automated statistical analysis of keywords and observations nor authors' visual assessments reveal a connection to any known passion source. This suggests that T3 may represent an undiscovered passion source arising from this study. While it typically derives from other factors or goals, like experience transfer (Geissinger *et al.*, 2019), it might signify a novel source: a passion for knowledge. Moreover, the proximity between T3 and T2 implies that Self-Efficacy through Knowledge (SEK) accumulates from Self-Efficacy through Experience (SEE), contributing to the understanding of GE platforms as an urgent entrepreneurial ecosystem, impacting entrepreneurial intention through self-efficacy accumulation.

The findings further endorse existing literature suggesting that GE platforms empower women in entrepreneurship (Md Isa *et al.*, 2020; Silva & Moreira, 2022). The sample reveals that women offer a higher number of products than men and exhibit greater innovation in leveraging GE platforms for their entrepreneurial activities. They have pioneered novel approaches to selling their services online, demonstrating heightened sensitivity to identifying opportunities and a strong sense of alertness. Hence, it can be argued that this outcome is associated with women's greater pursuit of passion and well-being when engaging with GE platforms for entrepreneurial endeavors. This is substantiated by the larger percentage of women displaying passion for growth, people, products, innovation and social mission.

Lastly, GWs with pre-existing relationships with GE platforms demonstrate a keen awareness of business opportunities and are more adept at developing new services within the ecosystem, drawing on their prior experiences. In conjunction with topics related to the impact and well-being of GWs' communities, it is reasonable to assert that GE platforms are fostering a sustainable entrepreneurial environment. By mitigating risk, fostering innovation, and alleviating resource constraints, GE platforms dismantle barriers to the development of entrepreneurial ideas that extend beyond mere profit.

7. CONCLUSION

This investigation has several practical implications, reinforcing established theories. First, GWs display high levels of entrepreneurial alertness and tend adopt GE platform's innovation strategy. Their motivation stems from passion and self-efficacy for their products, lowering barriers related to resources and social capital, reducing entry risk of GWs and fostering a fair entrepreneurial ecosystem. This suggests that GWs, driven by passion, prioritize well-being over pure profit.

This study aligns with existing theories on entrepreneurs' sources of passion, confirming Cardon *et al.'s* (2017) framework. The innovative methods employed, such as LDA to mitigate topic modeling bias and inductive statistical inferences, expand the understanding of the phenomenological approach. The research protocol, emphasizing efficiency in data access, preprocessing, and analysis using R packages, contributes to knowledge building. While the study covered data from the initial three GE platforms, further research could explore additional platforms with different business activities.

Though the study did not confirm passion for competition as a motivation factor, it underscored the significance of knowledge and well-being. Consequently, further research is needed to explore this phenomenon from a different angle. Lastly, researchers may apply similar methods to different populations, such as students, or employ alternative research approaches to solidify the importance of passion, extending beyond early-stage entrepreneurship on GE platforms.

This investigation presents certain limitations, including its focus on data from the only three GE platforms innovating on online tourism experiences at the time, which may limit its generalizability to other platforms due to their unique purposes and dynamics. The study's collective analysis of GWs without demographic granularity suggests a need for a more detailed approach to understanding their particularities. The evolving GE platforms highlight the importance of considering temporal factors and their influence on motivations and strategies, necessitating longitudinal studies. The method employed in this investigation is novel and requires further exploration and refinement, prompting new research to adopt its principles and integrate different databases and metrics. Lastly, the correlation between innovation and GE platforms demands a more comprehensive investigation.

8. ACKNOWLEDGMENTS

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Special Section / Sección Especial: New trends in entrepreneurship

Guest Editors: *María del Mar García de los Salmones and Elisa Baraibar-Diez*

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